МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

ДНУ «Український інститут науково-технічної експертизи та інформації»

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ДОСЛІДЖЕННЯ НАУКОМЕТРИЧНОЇ АКТИВНОСТІ У СВІТІ ЗА ТЕМАТИКОЮ «МЕХАНІЗОВАНІ І ТАНКОВІ ВІЙСЬКА»

Науково-аналітична записка

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Дослідження наукометричної активності у світі за тематикою «Механізовані і танкові війська: науково-аналітична записка / Т.В. Писаренко, Т.К. Кваша, О.Ф.Паладченко, І.В. Молчанова. – Київ: УкрІНТЕІ, 2025. – 88 с.

Викладено результати дослідження перспективних світових наукових напрямів досліджень у сфері «Механізовані і танкові війська» на основі БД Web of Science Core Collection (WoS). Дослідження здійснено з метою можливого врахування отриманих результатів при розробленні та прийнятті відповідних рішень щодо наукових і технологічних напрямів досліджень, технічного переоснащення, модернізації та реформування оборонно-промислового комплексу України.

Розраховано на представників органів державної влади, наукових працівників, інженерних кадрів, викладачів закладів вищої освіти, аспірантів і студентів відповідних спеціальностей.

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ЗМІСТ

ВСТУП

Збройні Сили України за видами поділяються на Сухопутні війська, Повітряні Сили, Військово-Морські Сили, медичні сили[1].

Сухопутні війська є головною бойовою силою української армії та відіграють ключову роль як у мирний, так і у воєнний час. Основу Сухопутних військ складають механізовані і танкові війська, які відповідають за утримання та захист зайнятих рубежів, прорив оборони противника та знищення його сил[2].

До основних складових механізованих та танкових військ відносяться[3, 4]:

Броньовані автомобілі – це транспортні засоби, кузов та/або скло яких укріплені для захисту пасажирів від куль, вибухів та інших загроз. Їх можна поділити на заводського бронювання (виробляються з броньованих компонентів) та місцевого бронювання (захищені після виробництва), а також на загальний тип (седани, кросовери, позашляховики) та спеціальний (інкасаторські авто).

Бойовий танк – самохідна броньована бойова машина, яка має велику вогневу потужність, головним чином завдяки основній гарматі з великою початковою швидкістю снаряда для ведення вогню прямою наводкою, необхідною для завдання поразки броньованим та іншим цілям, високу мобільність на пересіченій місцевості, високий рівень захищеності і яка не сконструйована і не обладнана головним чином для транспортування бойових військ. Такі броньовані машини є основною системою зброї танкових та інших бронетанкових формувань сухопутних військ.

Бронетранспортер – бойова броньована машина, сконструйована та обладнана для транспортування бойового піхотного відділення, яка, як правило, озброєна вбудованою або штатно встановлюваною зброєю калібру до 20 міліметрів.

Бойова машина піхоти – бойова броньована машина, сконструйована та обладнана головним чином для транспортування бойового піхотного відділення, яка звичайно забезпечує десанту можливість вести вогонь з машини під прикриттям броні і яка озброєна вбудованою або штатно встановлюваною гарматою калібру не менше 20 міліметрів та інколи пусковою установкою протитанкових ракет. Бойові машини піхоти становлять основну систему зброї мотопіхоти або механізованих танкових або механізованих формувань і частин сухопутних військ.

Бойова машина з важким озброєнням – бойова броньована машина з вбудованою або штатною гарматою калібру не менше 75 міліметрів для ведення

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[1] Закон України Про Збройні Сили України від 6 грудня 1991 року № 1934-XII (Відомості Верховної Ради України (ВВР), 1992, № 9, ст.108). URL : https://zakon.rada.gov.ua/laws/show/1934-12#Text

[2] Міністерство оборони України. / Сухопутні війська Збройних Сил України. URL :https://mod.gov.ua/pro-nas/suhoputni-vijska-zbrojnih-sil-ukrayini

[3] Тактична підготовка артилерійських підрозділів : підручник / П. Є. Трофименко, Ю. І. Пушкарьов, С. П. Латін та ін. – Суми : Сумський державний університет, 2012. – 776 с. URL : https://buklib.net/books/37521/

[4] Договір про звичайні збройні сили в Європі (Договір ратифіковано Постановою ВР N 2526-XII (2526-12) від 01.07.92). URL : https://zakon.rada.gov.ua/laws/show/994_314#Text

вогню прямою наводкою, яка має суху вагу не менше 6-ти метричних тонн і не підпадає під визначення бронетранспортера, бойової машини піхоти або бойового танка.

Мета дослідження – визначити перспективні наукові напрями у сфері «Механізовані і танкові війська» для можливого врахування отриманих результатів при розробленні та прийнятті відповідних рішень щодо наукових і технологічних напрямів досліджень, технічного переоснащення, модернізації та реформування оборонно-промислового комплексу України.

Дослідження наукометричної активності у світі у сфері озброєння та оборони, що відносяться до військових транспортних засобів, проведено на платформі бази даних Web of Science (WoS) із використанням БД WoS Core Collection за тематикою «Механізовані і танкові війська» для публікацій, інформація яких не становить державну таємницю. Аналіз наявних даних виконаний стосовно основних напрямів діяльності механізованих та танкових військ на основі таких критеріїв пошуку: розширений пошук; усі мови; усі типи документів; за період 2019 - 2024 рр.

1. Наукометрична активність за складовими військових транспортних засобів та галузями досліджень

Сукупна вибірка за визначений період за вказаною тематикою у світі становила 1960 публікацій.

У 2024 р. *кількість публікацій* склала 374 одиниці, що у 1,2 разу більше цього ж показника за 2019 рік. Публікаційна активність у світі за вказаною тематикою за період 2019-2024 рр. щорічно зростала в межах 301-374 одиниць.

Кількість цитувань публікацій за визначений період становила 9806 од., із щорічним зростанням із 82 од. у 2019 р. до 3584 од. у 2024 р., тобто, майже у 43,7 разів.

Частка публікацій від вибірки в розрізі складових військових транспортних засобів склала:

- «Бойові машини піхоти (БМП)» – 25,8% (від загальної кількості відібраних публікацій);
- «Бронетранспортери (БТР)» – 35,2%;
- «Броньовані автомобілі» – 12,3%;
- «Танки» – 26,7%.

За результатами дослідження за період 2019-2024 рр. за вказаною тематикою було виокремлено наступні *галузі досліджень*:

- інженерія – 44,1% (від загальної кількості відібраних публікацій);
- інформатика – 20,7%;
- системи автоматизованого управління – 15,3%;
- транспорт – 12,5%;
- матеріалознавство – 4,0%;

- механіка – 2,2%;
- телекомунікації – 1,2%.

Найвищі індекси цитування у 2019-2024 рр. відмічені за галуззю дослідження «Телекомунікації» – 9025,0 %, «Матеріалознавство» – 6800,0% і «Транспорт» (рис. 1).

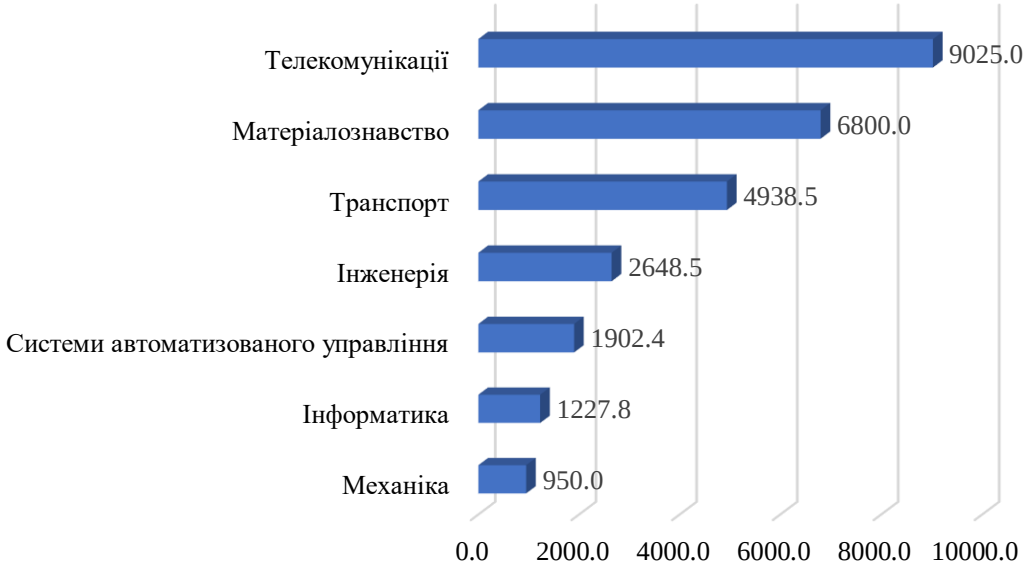

Рис. 1. Індекси цитування у світі за галузями дослідження тематики «Механізовані і танкові війська», 2019-2024 рр., %

Джерело: розроблено авторами на основі даних Web of Science

1.1 Наукометрична активність за складовою військових транспортних засобів «Бойові машини піхоти»

У таблиці 1 наведена наукометрична активність за складовою військових транспортних засобів *«Бойові машини піхоти»* визначеної тематики в розрізі галузей дослідження.

Таблиця 1 - Тенденції наукометричної активності в світі за складовою військових транспортних засобів «Бойові машини піхоти (БМП)» в розрізі галузей дослідження, 2019-2024 рр.

Галузі досліджень	Країни з найбільшою кількістю публікацій	Організації з найбільшою кількістю публікацій	Індекс публікацій (2024/2019 рр.), %	Індекс цитування (2024/2019 рр.), %	Частка публікацій від загальної кількості публікацій галузі дослідження, %
Інженерія	США, Китай, Індія	DEFENCE RESEARCH DEVELOPMENT ORGANISATION DRDO (Індія), UNITED STATES ARMY (США), BEIJING INSTITUTE OF TECHNOLOGY (Китай)	188,0	5420,0	**42,7**

Галузі досліджень	Країни з найбільшою кількістю публікацій	Організації з найбільшою кількістю публікацій	Індекс публікацій (2024/2019 рр.), %	Індекс цитування (2024/2019 рр.), %	Частка публікацій від загальної кількості публікацій галузі дослідження, %
Інформатика	США, Китай, Індія	STATE UNIVERSITY SYSTEM OF FLORIDA (США), DEFENCE RESEARCH DEVELOPMENT ORGANISATION DRDO (Індія), HARBIN ENGINEERING UNIVERSITY (Китай)	271,4	5550,0	**17,4**
Системи автоматизованого управління	Китай, Канада, США	ONTARIO TECH UNIVERSITY (Канада), BEIHANG UNIVERSITY (Китай), UNIVERSITY OF MICHIGAN (США)	300,0	2750,0	**6,1**
Транспорт	США, Канада, Індія	ONTARIO TECH UNIVERSITY (Канада), CLEMSON UNIVERSITY (США) , INDIAN INSTITUTE OF TECHNOLOGY IIT MADRAS (Індія)	225,0	2366,7	**8,7**
Матеріалознавство	Індія, Китай, Польща	MILITARY UNIVERSITY OF TECHNOLOGY IN WARSAW (Польща), DEFENCE RESEARCH DEVELOPMENT ORGANISATION DRDO (Індія), COMBAT VEHICLES RESEARCH DEVELOPMENT ESTABLISHMENT CVRDE (Індія), ANHUI ENGN LAB INTELLIGENT DRIVING TECHNOL APPL (Китай)	425,0	3983,3	**14,2**
Механіка	США, Індія, Китай	UNITED STATES ARMY (США), INDIAN INSTITUTE OF TECHNOLOGY SYSTEM IIT SYSTEM (Індія), NANJING UNIVERSITY OF SCIENCE TECHNOLOGY (Китай), UNITED STATES MILITARY ACADEMY (США)	600,0	3600,0	**3,8**
Телекомунікації	Китай, США, Канада	UNIVERSITY OF QUEBEC (Канада), STATE UNIVERSITY SYSTEM OF FLORIDA (США), ARMY ENGINEERING UNIVERSITY OF PLA (Китай)	500,0	2333,3	**7,1**

Джерело: розроблено авторами на основі даних Web of Science

Найбільша частка кількості публікацій від загальної кількості публікацій за складовою «Бойові машини піхоти (БМП)» належить галузі дослідження «Інженерія» – 42,7%, найменша – галузі дослідження «Механіка» – 3,8 %. У трійку світових країн-лідерів за кількістю публікацій входять США, Індія і Китай.

Найбільший індекс публікацій 2024/2019 рр. належить галузі «Механіка» – 600,0%; найбільший індекс цитування – галузі «Інформатика» – 5550,0,%.

1.2 Наукометрична активність за складовою військових транспортних засобів «Бронетранспортери»

За складовою військових транспортних засобів «*Бронетранспортери» (БТР)*, наукометрична активність представлена у таблиці 2 у розрізі галузей дослідження.

Таблиця 2 - Тенденції наукометричної активності в світі за складовою військових транспортних засобів «Бронетранспортери» (БТР) у розрізі галузей дослідження, 2019-2024 рр.

Галузі досліджень	Країни з найбільшою кількістю публікацій	Організації з найбільшою кількістю публікацій	Індекс публікацій (2024/2019 рр.), %	Індекс цитування (2024/2019 рр.), %	Частка публікацій від загальної кількості публікації галузі дослідження, %
Інженерія	Китай, США, Італія	NATIONAL UNIVERSITY OF DEFENSE TECHNOLOGY CHINA (Китай), BEIJING INSTITUTE OF TECHNOLOGY (Китай), UNITED STATES ARMY (США), POLYTECHNIC UNIVERSITY OF MILAN (Італія)	123,3	3766,7	**42,9**
Інформатика	Китай, США, Польща	NATIONAL UNIVERSITY OF DEFENSE TECHNOLOGY CHINA (Китай), ARIZONA STATE UNIVERSITY (США), MILITARY UNIVERSITY OF TECHNOLOGY IN WARSAW (Польща)	250,0	5975,0	**13,8**
Системи автоматизованого управління	Китай, США, Італія	POLYTECHNIC UNIVERSITY OF MILAN (Італія), UNIVERSITY OF PADUA (Італія), GUANGDONG UNIVERSITY OF TECHNOLOGY (Китай), GEORGIA INSTITUTE OF TECHNOLOGY (США)	220,0	3950,0	**14,6**
Транспорт	Китай, США, Італія	BEIJING INSTITUTE OF TECHNOLOGY (Китай), POLYTECHNIC UNIVERSITY OF MILAN (Італія), TONGJI UNIVERSITY (Китай), UNIVERSITY OF CALIFORNIA BERKELEY (США)	164,3	6933,3	**15,2**
Матеріалознавство	Китай, Польща, Індія	BEIJING INSTITUTE OF TECHNOLOGY (Китай), MILITARY UNIVERSITY OF TECHNOLOGY IN WARSAW (Польща), WROCLAW UNIVERSITY OF SCIENCE TECHNOLOGY (Польща),	366,7	5500,0	**5,9**

Галузі досліджень	Країни з найбільшою кількістю публікацій	Організації з найбільшою кількістю публікацій	Індекс публікацій (2024/2019 рр.), %	Індекс цитування (2024/2019 рр.), %	Частка публікацій від загальної кількості публікації галузі дослідження, %
		CHENNAI INSTITUTE OF TECHNOLOGY (Індія)			
Механіка	Китай, Російська Федерація, США	NATIONAL UNIVERSITY OF DEFENSE TECHNOLOGY CHINA (Китай), LOMONOSOV MOSCOW STATE UNIVERSITY (Російська Федерація), ADV SCI AUTOMAT CORP (США)	400,0	4500,0	**4,7**
Телекомуні-кації	Китай, США, Канада	UNIVERSITY OF WISCONSIN MADISON (США), BEIJING INSTITUTE OF TECHNOLOGY (Китай), UNIVERSITY OF VICTORIA (Канада)	350,0	3900,0	**2,9**

Джерело: розроблено авторами на основі даних Web of Science

Найбільша частка кількості публікацій від загальної кількості публікацій за складовою «Бронетранспортери» (БТР) належить галузі дослідження «Інженерія» – 42,9%, найменша – галузі дослідження «Телекомунікації» – 2,9%. У трійку світових країн-лідерів за кількістю публікацій входять Китай, США та Італія.

Найбільший індекс публікацій 2024/2019 рр. належить галузі «Механіка» – 400,0%; найбільший індекс цитування 2024/2019 рр. – галузі «Транспорт» – 6933,3%.

1.3 Наукометрична активність за складовою військових транспортних засобів «Броньовані автомобілі»

За складовою військових транспортних засобів «*Броньовані автомобілі*» наукометрична активність у розрізі галузей дослідження представлена у таблиці 3.

Таблиця 3 - Тенденції наукометричної активності в світі за складовою військових транспортних засобів «Броньовані автомобілі» в розрізі галузей дослідження, 2019-2024 рр.

Галузі досліджень	Країни з найбільшою кількістю публікацій	Організації з найбільшою кількістю публікацій	Індекс публікацій (2024/2019 рр.), %	Індекс цитування (2024/2019 рр.), %	Частка публікацій від загальної кількості публікації галузі дослідження, %
Інженерія	Китай, Індія, США	BEIJING INSTITUTE OF TECHNOLOGY (Китай), CHINA NORTH VEHICLE RES INST (Китай), NANJING UNIVERSITY OF SCIENCE TECHNOLOGY (Китай), ANNA UNIVERSITY (Індія),	311,1	6200,0	**47,9**

Галузі досліджень	Країни з найбільшою кількістю публікацій	Організації з найбільшою кількістю публікацій	Індекс публікацій (2024/2019 рр.), %	Індекс цитування (2024/2019 рр.), %	Частка публікацій від загальної кількості публікації галузі дослідження, %
		UNITED STATES ARMY (США)			
Інформатика	Китай, США, Польща	ARMY ACAD ARMORED FORCES (Китай), STATE UNIVERSITY SYSTEM OF FLORIDA (США), MILITARY UNIVERSITY OF TECHNOLOGY IN WARSAW (Польща)	300,0	2000,0	**13,7**
Системи автоматизованого управління	Китай, Німеччина, Республіка Корея	ACAD ARMY ARMORED FORCES (Китай), RWTH AACHEN UNIVERSITY (Німеччина), DAEGU GYEONGBUK INSTITUTE OF SCIENCE & TECHNOLOGY DGIST (Республіка Корея)	300,0	300,0	**3,8**
Транспорт	Китай, Індія, США	NANJING UNIVERSITY OF SCIENCE TECHNOLOGY (Китай), COMBAT VEHICLES RESEARCH DEVELOP (Індія), U S ARMY CORPS OF ENGINEERS (США)	300,0	1200,0	**4,6**
Матеріалознавство	Китай, Індія, Україна	DEFENCE RESEARCH DEVELOPMENT ORG (Індія), BEIHANG UNIVERSITY (Китай), G S PISARENKO INSTITUTE FOR PROBLEMS OF STRENGTH NATIONAL ACADEMY OF SCIENCES OF UKRAINE (Україна)	200,0	6350,0	**18,7**
Механіка	Китай Індія Франція	BEIJING INSTITUTE OF TECHNOLOGY (Китай), AMRITA VISHWA VIDYAPEETHAM (Індія), CENTRE NATIONAL DE LA RECHERCHE SCI (Франція)	500,0	5000,0	**7,1**
Телекомунікації	Китай, США, Республіка Корея	BEIJING NORTH VEHICLE GRP CORP (Китай), STATE UNIVERSITY SYSTEM OF FLORIDA (США), KOREA ADVANCED INSTITUTE OF SCIENC (Республіка Корея)	300,0	1600,0	**4,2**

Джерело: розроблено авторами на основі даних Web of Science

Найбільша частка кількості публікацій від загальної кількості публікацій за складовою «Броньовані автомобілі» належить галузі дослідження «Інженерія» – 47,9%, найменша – галузі дослідження «Системи автоматизованого управління» – 3,8%. У трійку світових країн-лідерів за кількістю публікацій входять Китай, Індія та США.

Найвищий індекс публікацій 2024/2019 рр. має галузь дослідження «Механіка» – 500,0%; найвищий індекс цитування – галузь дослідження «Інженерія» – 12400,0%.

1.4 Наукометрична активність за складовою військових транспортних засобів « Танки»

За складовою військових транспортних засобів «*Танки*» наукометрична активність у розрізі галузей дослідження представлена у таблиці 4.

Таблиця 4 - Тенденції наукометричної активності в світі за складовою військових транспортних засобів «Танки» в розрізі галузей дослідження, 2019-2024 рр.

Галузі досліджень	Країни з найбільшою кількістю публікацій	Організації з найбільшою кількістю публікацій	Індекс публікацій (2024/2019 рр.), %	Індекс цитування (2024/2019 рр.), %	Частка публікацій від загальної кількості публікації галузі дослідження, %
Інженерія	Китай, США, Республіка Корея	BEIJING INSTITUTE OF TECHNOLOGY (Китай), NANJING UNIVERSITY OF SCIENCE TECHNOLOGY (Китай), CHINA NORTH VEHICLE RES INST (Китай), UNITED STATES ARMY (США), SEOUL NATIONAL UNIVERSITY SNU (Республіка Корея)	190,0	5180,0	**36,3**
Інформатика	Китай, США, Італія	BEIJING INSTITUTE OF TECHNOLOGY (Китай), VIRGINIA POLYTECHNIC INSTITUTE STATE UNIVERSITY (США), POLYTECHNIC UNIVERSITY OF TURIN (Італія)	166,7	2657,1	**17,4**
Системи автоматизованого управління	Китай, США, Італія	NANJING UNIVERSITY OF SCIENCE TECHNOLOGY (Китай), BEIJING INSTITUTE OF TECHNOLOGY (Китай), COLD REGIONS RESEARCH ENGINEERIN (США), UNIVERSITY OF BOLOGNA (Італія)	350,0	5600,0	**11,0**
Транспорт	Китай, Російська Федерація, Канада	BEIJING INSTITUTE OF TECHNOLOGY (Китай), CHINA NORTH VEHICLE RES INST (Китай), BAUMAN MOSCOW STATE TECHNICAL UNIVERSITY (Російська Федерація), UNIVERSITY OF SHERBROOKE (Канада)	440,0	6150,0	**13,4**
Матеріало-знавство	Китай, Республіка Корея, Російська Федерація	CHINA NORTH VEHICLE RES INST (Китай), SEOUL NATIONAL UNIVERSITY SNU (Республіка Корея), KURGAN STATE UNIVERSITY (Російська Федерація)	225,0	7200,0	**11,8**

Галузі досліджень	Країни з найбільшою кількістю публікацій	Організації з найбільшою кількістю публікацій	Індекс публікацій (2024/2019 рр.), %	Індекс цитування (2024/2019 рр.), %	Частка публікацій від загальної кількості публікації галузі дослідження, %
Механіка	Китай, США, Індія	NANJING UNIVERSITY OF SCIENCE TECHNOLOGY (Китай), UNIVERSITY OF WISCONSIN MADISON (США), ANNAMALAI UNIVERSITY (Індія)	266,7	7800,0	**5,5**
Телекомуні-кації	Китай, Канада, Німеччина	BEIJING INSTITUTE OF TECHNOLOGY (Китай), UNIVERSITY OF WATERLOO (Канада), HELMHOLTZ ASSOCIATION (Німеччина)	600,0	6400,0	**4,6**

Джерело: розроблено авторами на основі даних Web of Science

Найбільша частка публікацій від їх загальної кількості за складовою «Танки» належить галузі дослідження «Інженерія» – 36,3%, найменша – галузі дослідження «Телекомунікації» – 4,6%. У трійку світових країн-лідерів по кількості публікацій входять Китай, США, Російська Федерація.

Найвищий індекс публікацій 2024/2019 рр. має галузь дослідження «Телекомунікації» – 600,0%; найвищий індекс цитування 2024/2019 рр. – галузь дослідження «Системи автоматизованого управління» – 11200,0%.

Публікації з найбільшою кількістю цитування за кожною складовою військових транспортних засобів наведені у Додатку А.

ВИСНОВКИ

Дослідження публікаційної активності за період 2019-2024 рр. дало можливість визначити найбільш актуальні та перспективні напрями наукових досліджень за тематикою «Механізовані та танкові війська» та її складовими:

- *Бойові машини піхоти (БМП)* – у галузях досліджень «Матеріалознавство», «Механіка», «Системи автоматизованого управління», «Телекомунікації», «Інженерія», «Інформатика»;
- *Бронетранспортери (БТР)* – у галузях досліджень «Механіка», «Матеріалознавство», «Телекомунікації», «Інформатика», «Транспорт»;
- *Броньовані автомобілі* – у галузях досліджень «Механіка», «Інженерія», «Матеріалознавство»;
- *Танки* – у галузях досліджень «Транспорт», «Телекомунікації», «Системи автоматизованого управління», «Інженерія», «Матеріалознавство», «Механіка».

За сферою «Механізовані і танкові війська» найбільше досліджень здійснюється за галузями науки «Механіка» та «Матеріалознавство», друге місце поділяють галузі «Телекомунікації» та «Інженерія». Найбільший

вплив/найбільший інтерес викликають публікації за галузями «Телекомунікації» та «Матеріалознавство».

За складовими механізованих і танкових військ:

найбільше публікацій/найбільша частка досліджень спостерігається за складовими «Бронетранспортери (БТР)» – 690 од. або 35,2% від загальної кількості відібраних публікацій (Інженерія – 43% загального обсягу цих публікацій), «Танки» – 524 од. або 26,7% (Інженерія – 36%), «Бойові машини піхоти (БМП)» – 506 од. або 25,8% (Інженерія – 42%);

найбільший інтерес або найбільш цікава для наукової спільноти тематика – це «Танки» – індекс цитування становить 7800,0% (механіка – 7800%, матеріалознавство – 7600%).

Отже, за складовими механізованих та танкових військ з найбільшими частками публікацій найбільш популярними є дослідження за галуззю «Інженерія», а найбільш впливовими – публікації за галузями «Механіка» та «Матеріалознавство».

Додаток А

Перелік публікацій з найбільшою кількістю цитування за тематикою «Механізовані і танкові війська» (2019-2024рр.)

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
БОЙОВІ МАШИНИ ПІХОТИ (БМП)				
Інженерія				
1	Класифікація послідовних зображень радара із синтезованою апертурою на основі двонаправленої згортково-рекурентної мережі	Sequence SAR Image Classification Based on Bidirectional Convolution-Recurrent Network. Bai, XR; Xue, RH; Wang, L.; Zhou, F. IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING. 2019. Volume 57. Issue 11. Page 9223-9235.	Although the deep convolutional neural network (DCNN) has been successfully applied to target classification of military vehicles based on synthetic aperture radar (SAR), most of the available methods do not fully exploit the characteristics of continuous SAR imaging and only utilize single image for recognition. To extract significant identification features contained in the image sequence, this paper proposes a sequence of SAR target classification method based on bidirectional convolution-recurrent network. In this network, we extract spatial features of each image through DCNNs without the fully connected layer, and then learn sequence features by bidirectional long short-term memory networks. Finally, we design the average softmax classifier to obtain the classification results. Compared with the available methods, the proposed network takes advantage of the significant information in the image sequence and achieves higher classification accuracy in the moving and stationary target acquisition and recognition data set. In addition, it has shown robustness to large depression angle variants, configuration variants, and version variants.	https://www.webofscience.com/wos/woscc/full-record/WOS:000496155200065
2	Розробка та оцінка ефективності великомасштабних ауксетичних захисних систем для локалізованих імпульсних навантажень	Development and performance evaluation of large-scale auxetic protective systems for localised impulsive loads. Remennikov, A.; Kalubadanage, D.; Ngo, T.; Mendis, P.; Alicia, G.; Whittaker, A. . INTERNATIONAL JOURNAL OF PROTECTIVE	Cellular core structures with a negative Poisson's ratio, also known as auxetic core structures, are gaining attention due to their unique performance in sandwich panel systems for protecting critical infrastructures and military vehicles that are at high risk of blast and impact loads due to accidental and deliberate events. To help develop a high-performance protective system, this article outlines the performance evaluation of five different auxetic cell configurations based on a quantitative/qualitative review of an experimental load-deformation relationship of three-dimensional-printed auxetic panels from nylon plastics and the overall performance evaluation of metallic	https://www.webofscience.com/wos/woscc/full-record/WOS:000480818400008

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		STRUCTURES, 2019. Volume 10. Issue 3. Page 390-417.	re-entrant honeycomb core sandwich panels as one type of lightweight protective system under static and dynamic loads via experimental testing and numerical simulations. The re-entrant honeycomb design displayed the most consistent auxetic behaviour. Quasi-static compression and drop hammer impact tests were performed using the proposed full-scale sandwich panel design with two different configurations as a protective system for concrete wall structures in combination with plastic face plates. The effect of the internal angle of the re-entrant honeycomb design and the effect of the core material under static and dynamic loads were evaluated using full-scale sandwich panels. Furthermore, two separate materials - acrylonitrile butadiene styrene and low-density polyethylene - were used as face plates, and the low-density polyethylene was effective for lightweight and smooth load transferring and distribution into the auxetic core. Auxetic panel deformation under static and dynamic load was examined using a normal speed camera and high-speed video recording data and all auxetic panels indicated excellent systematic crushing behaviour with drawing materials into the load path to effectively resist the impact load. Numerical simulations were performed using LS-DYNA and indicated good agreement with the experimental results. Finally, protective systems utilising sandwich panels with a re-entrant honeycomb core indicated strong potential for the development of high-performance lightweight impact-resistant protective systems.	
3	Дослідження впливу вібрацій на гідравлічні клапани у військових машинах	Research of vibrations effect on hydraulic valves in military vehicles. Stosiak, M.; Karpenko, M.; Prentkovskis, O.; Deptula, A.; Skackauskas, P. DEFENCE TECHNOLOGY. 2023. Volume 30. Page 111-125.	The paper discusses minimizing the effect of external mechanical vibration on hydraulic valves in different military hydraulic drive systems. The current research work presents an analysis of the potential to reduce vibration on the valve casing by installing a valve flexibly on a vibrating surface, i.e., by introducing a material with known stiffness and damping characteristics between the valve casing and the vibrating surface - a steel spring package or special cushions made of elastomer material or of oilresistant rubber. The article also demonstrates that elastomer cushions placed inside the valve casing between the casing and the centering springs - can be used as a supplementary or alternative solution in the analyzed method for mitigating the transfer of vibrations. By using materials with appropriately selected elastic and dissipative properties, the effectiveness of vibro-isolation can be increased. The presented theoretical analyzes by linear and non-linear mathematical models have been verified experimentally.	https://www.webofscience.com/wos/woscc/full-record/WOS:001184862000001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
4	Розпізнавання цілей на зображеннях радара із синтезованою апертурою за допомогою глибокого навчання з доповненням навчальних даних	Target Recognition in SAR Images by Deep Learning with Training Data Augmentation. Geng, Z.; Xu, Y.; Wang, BN; Yu, X.; Zhu, DY; Zhang, G. SENSORS. 2023. Volume 23. Issue 2, 941.	Mass production of high-quality synthetic SAR training imagery is essential for boosting the performance of deep-learning (DL)-based SAR automatic target recognition (ATR) algorithms in an open-world environment. To address this problem, we exploit both the widely used Moving and Stationary Target Acquisition and Recognition (MSTAR) SAR dataset and the Synthetic and Measured Paired Labeled Experiment (SAMPLE) dataset, which consists of selected samples from the MSTAR dataset and their computer-generated synthetic counterparts. A series of data augmentation experiments are carried out. First, the sparsity of the scattering centers of the targets is exploited for new target pose synthesis. Additionally, training data with various clutter backgrounds are synthesized via clutter transfer, so that the neural networks are better prepared to cope with background changes in the test samples. To effectively augment the synthetic SAR imagery in the SAMPLE dataset, a novel contrast-based data augmentation technique is proposed. To improve the robustness of neural networks against out-of-distribution (OOD) samples, the SAR images of ground military vehicles collected by the self-developed MiniSAR system are used as the training data for the adversarial outlier exposure procedure. Simulation results show that the proposed data augmentation methods are effective in improving both the target classification accuracy and the OOD detection performance. The purpose of this work is to establish the foundation for large-scale, open-field implementation of DL-based SAR-ATR systems, which is not only of great value in the sense of theoretical research, but is also potentially meaningful in the aspect of military application.	https://www.webofscience.com/wos/woscc/full-record/WOS:000915614300001
5	Вплив процесів зварювання плавленням на міцність на розрив з'єднань броньованих, високотовстих, нетермічно оброблюваних алюмінієвих сплавів	Effect of fusion welding processes on tensile properties of armor grade, high thickness, non-heat treatable aluminium alloy joints. Vasu, K.; Chelladurai, H.; Ramaswamy, A.; Malarvizhi, S.; Balasubramanian, V. DEFENCE TECHNOLOGY. 2019. Volume 15. Issue 3. Page 353-362.	AA5059 is one of the high strength armor grade aluminium alloy that finds its applications in the military vehicles due to the higher resistance against the armor piercing (AP) threats. This study aimed at finding the best suitable process among the fusion welding processes such as gas tungsten arc welding (GTAW) and gas metal arc welding (GMAW) by evaluating the tensile properties of AA5059 aluminium alloy joints. The fracture path was identified by mapping the low hardness distribution profile (LHDP) across the weld cross section under tensile loading. Optical and scanning electron microscopies were used to characterize the microstructural features of the welded joints at various zones. It is evident from the results that GTAW joints showed superior tensile properties compared to GMAW joints and this is primarily owing to the presence of finer grains in the weld metal zone	https://www.webofscience.com/wos/woscc/full-record/WOS:000471844400015

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			(WMZ) and narrow heat-affected zone (HAZ). The lower heat input associated with the GTAW process effectively reduced the size of the WMZ and HAZ compared to GMAW process. Lower heat input of GTAW process results in faster cooling rate which hinders the grain growth and reduces the evaporation of magnesium in weld metal compared to GMAW joints. The fracture surface of GTAW joint consists of more dimples than GMAW joints which is an indication that the GTAW joint possess improved ductility than GMAW joint.	
Інформатика				
1	Оцінка предикторної структури для високошвидкісних телекерованих військових безпілотних машин	Evaluation of a Predictor-Based Framework in High-Speed Teleoperated Military UGVs. Zheng, YS; Brudnak, MJ; Jayakumar, P.; Stein, JL; Ersal, T. IEEE TRANSACTIONS ON HUMAN-MACHINE SYSTEMS. 2020. Volume 50. Issue 6. Page 561-572.	Mobility of teleoperated unmanned ground vehicles can be significantly compromised under large communication delays, if the delays are not compensated. This article considers a recently developed delay compensation theory and presents its first empirical evaluation in improving mobility and drivability of a high-speed teleoperated vehicle under large delays. The said delay compensation theory is a predictor-based framework. Two realizations of this framework are considered: a model-free realization that relies only on model-free predictors, and a blended realization, where the heading predictions from the model-free predictor are blended with those from a steering-model-based feedforward predictor for a more accurate prediction of the vehicle heading. A teleoperated track-following task is designed in a human-in-the-loop simulation platform. This platform is used to compare the teleoperation performance with and without the predictor-based framework under both constant and varying delays. Through repeated measurement analysis of variance, it is concluded that the predictor-based framework is effective in achieving a higher vehicle speed, more accurate lateral control, and better drivability as indicated by the three performance metrics of track completion time, track keeping error, and steering control effort, respectively. In addition, it is shown that the blended architecture can lead to further improvements in these metrics compared to using the model-free predictors alone. The analysis also shows that there is no statistically significant difference between constant and varying delay cases in the designed experiment, nor there is any direct relation between drivers' skill level and level of improvement in metrics.	https://www.webofscience.com/wos/woscc/full-record/WOS:000591809500008
2	Гібридна модель контролю доступу з динамічним статичним конфліктом інтересів для безпечної	A Hybrid Access Control Model With Dynamic COI for Secure	Secure localization of vehicles is gaining the attention of researchers from both academia and industry especially due to the emergence of internet of things (IoT). The modern vehicles are usually equipped with	https://www.webofscience.com/wos/woscc/full-

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
	локалізації транспортних засобів на основі супутників та Інтернету речей	Localization of Satellite and IoT-Based Vehicles. Aftab, MU; Munir, Y.; Oluwasanmi, A.; Qin, ZG; Aziz, MH; Zakria; Son, NT; Iran, VD. IEEE ACCESS. 2020. Volume 8. Page 24196-24208.	circuitries that gives connectivity with other vehicles and with cellular networks such as 4G/Fifth generation cellar network (5G). The challenge of secure localization and positioning is magnified further with the invention of technologies such as autonomous or driverless vehicles based on IoT, satellite, and 5G. Some satellite and IoT based localization techniques exploit machine learning, semantic segmentation, and access control mechanism. Access control provides access grant and secure information sharing mechanism to authorized users and restricts unauthorized users, which is necessary regarding security and privacy of government or military vehicles. Previously, static conflict of interest (COI) based access control was used for security proposes. However, static COI based access control creates excesses and administrative overload that creates latency in execution, which is the least tolerable factor in modern IoT or 5G control vehicles. Therefore, in this paper, a hybrid access control (HAC) model is proposed that implements the dynamic COI in the HAC model on the level of roles. The proposed model is enhanced by modifying the role-based access control (RBAC) model by inserting new attributes of the RBAC entities. The HAC model deals with COI on the level of roles in an efficient manner as compared to previously proposed models. Moreover, this model features significant improvement in terms of dynamic behavior, decreased administrative load, and security especially for vehicular localization. Furthermore, the mathematical modeling of the proposed model is implemented with an example scenario to validate the concept.	record/WOS:000525406200003
3	Виявлення та класифікація військових машин на основі периферійних пристроїв з БПЛА	Edge device based Military Vehicle Detection and Classification from UAV. Gupta, P.; Pareek, B.; Singal, G.; Rao, DV. MULTIMEDIA TOOLS AND APPLICATIONS. 2022. Volume 81. Issue 14. Page 19813-19834.	Detection and recognition of military vehicle from a given image or a video frame with the help of unmanned aircraft system is the major issue which we are concerned about. Vehicle identification and classification from a resource constraint device embedded on an aerial vehicle integrated with an intelligent object detection algorithm, is a big support for defence agency. The vehicle can be controlled both manually and autonomously. However, there is no military objects/vehicles dataset openly available with different varieties of military classes. Hence, we propose our dataset having 6772 images with classes namely, Military Trucks, Military Tanks, Military Aircrafts, Military Helicopters, Civilian Car and Civilian aircraft. Quantize SSD Mobilenet v2 and Tiny Yolo v3 deep learning models are trained on our dataset and compared its performance over resources constraint edge devices. The observations and results from the research	https://www.webofscience.com/wos/woscc/full-record/WOS:000676052800002

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			show that Tiny Yolo v3 performs well over the other model and is highly efficient and can even run with edge based devices due to it's light weight. There is a detailed generalised mathematical calculation provided which calculates the number of flight paths and the total number of frames required to cover a given area for surveillance using available hardware specification. This work will be suitable for classifying the military and civilian vehicle in the real time scenario using edge device over UAVs.	
4	Забезпечення безпеки транспортного засобу, що рухається: контекстно-залежна система виявлення вторгнень для безпеки CAN-шини у машині	Keep the Moving Vehicle Secure: Context-Aware Intrusion Detection System for In-Vehicle CAN Bus Security. Rajapaksha, S.; Kalutarage, H.; Al-Kadri, MO; Madzudzo, G.; Petrovski, A. 2022 14TH INTERNATIONAL CONFERENCE ON CYBER CONFLICT: KEEP MOVING (CYCON). Page 309-330.	The growth of information technologies has driven the development of the transportation sector, including connected and autonomous vehicles. Due to its communication capabilities, the controller area network (CAN) is the most widely used in-vehicle communication protocol. However, CAN lacks suitable security mechanisms such as message authentication and encryption. This makes the CAN bus vulnerable to numerous cyberattacks. Not only are these attacks a threat to information security and privacy, but they can also directly affect the safety of drivers, passengers and the surrounding environment of the moving vehicles. This paper presents CAN-CID, a context-aware intrusion detection system (IDS) to detect cyberattacks on the CAN bus, which would be suitable for deployment in automobiles, including military vehicles, passenger cars and commercial vehicles, and other CAN-based applications such as aerospace, industrial automation and medical equipment. CAN-CID is an ensemble model of a gated recurrent unit (GRU) network and a time-based model. A GRU algorithm works by learning to predict the centre ID of a CAN ID sequence, and ID-based probabilistic thresholds are used to identify anomalous IDs, whereas the time-based model identifies anomalous IDs using time-based thresholds. The number of anomalies compared to the total number of IDs over an observation window is used to classify the window status as anomalous or benign. The proposed model uses only benign data for training and threshold estimation, avoiding the need to collect realistic attack data to train the algorithm. The performance of the CAN-CID model was tested against three datasets over a range of 16 attacks, including fabrication and more sophisticated masquerade attacks. The CAN-CID model achieved an F1-Score of over 99% for 13 of those attacks and outperformed benclunark models from the literature for all attacks, with near real-time detection latency.	https://www.webofscience.com/wos/woscc/full-record/WOS:000853652000018

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
5	Виявлення об'єктів військової техніки на основі ієрархічного представлення ознак та уточненої локалізації	Military Vehicle Object Detection Based on Hierarchical Feature Representation and Refined Localization. Ouyang, Y.; Wang, XQ; Hu, RZ; Xu, HH; Shao, FM. IEEE ACCESS. 2022. Volume 10. Page 99897-99908.	Military vehicle object detection technology in complex environments is the basis for the implementation of reconnaissance and tracking tasks for weapons and equipment, and is of great significance for information and intelligent combat. In response to the poor performance of traditional detection algorithms in military vehicle detection, we propose a military vehicle detection method based on hierarchical feature representation and reinforcement learning refinement localization, referred to as MVODM. First, for the military vehicle detection task, we construct a reliable dataset MVD. Second, we design two strategies, hierarchical feature representation and reinforcement learning-based refinement localization, to improve the detector. The hierarchical feature representation strategy can help the detector select the feature representation layer suitable for the object scale, and the reinforcement learning-based refinement localization strategy can improve the accuracy of the object localization boxes. The combination of these two strategies can effectively improve the performance of the detector. Finally, the experimental results on the homemade dataset show that our proposed MVODM has excellent detection performance and can better accomplish the detection task of military vehicles.	https://www.webofscience.com/wos/woscc/full-record/WOS:000861328400001
Системи автоматизованого управління				
1	Стійке стримування виходу гетерогенних спільних та змагальних багатогрупових систем	Resilient Output Containment of Heterogeneous Cooperative and Adversarial Multigroup Systems. Zuo, S.; Lewis, FL; Davoudi, A. IEEE TRANSACTIONS ON AUTOMATIC CONTROL. 2020. Volum 65. Issue 7. Page 3104-3111.	This note introduces a new concept of cooperative and adversarial multigroup system, which consists of cooperative leaders and followers, as well as adversaries. For example, cooperation of multiple military vehicles operate in complex dynamic networked environments with unknown enemies and hidden malicious attackers. The lack of global situational awareness in distributed settings makes autonomous vehicles prone to cyberattacks and infiltration. Each agent is unaware of the motives of its neighbors and may receive information/data from both the teammates and the adversaries. Secure and resilient control protocols are essential for the networked multigroup systems to prevent the adversaries' attacks from propagating across the network, which may influence the system performance and even overall stability. To counter sensor faults and attacks from the adversaries, a distributed resilient control architecture is proposed, which guarantees uniform ultimate boundedness of the closed-loop dynamical system. Numerical simulations illustrate the effectiveness of the proposed results.	https://www.webofscience.com/wos/woscc/full-record/WOS:000543961200026

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
2	Синтез аналізу принципу максимуму Понтрягіна для оптимізації профілю швидкості повністю електричних транспортних засобів	Synthesis of Pontryagin's Maximum Principle Analysis for Speed Profile Optimization of All-Electric Vehicles. Abbas, H.; Kim, Y.; Siegel, JB; Rizzo, DM. JOURNAL OF DYNAMIC SYSTEMS MEASUREMENT AND CONTROL-TRANSACTIONS OF THE ASME. 2019. Volum 141. Issue 7, 071004.	This paper presents a study of the energy-efficient operation of all-electric vehicles lever-aging route information, such as road grade, to adjust the velocity trajectory. First, Pontryagin's maximum principle (PMP) is applied to derive necessary conditions and to determine the possible operating modes. The analysis shows that only five modes are required to achieve minimum energy consumption: full propulsion, cruising, coasting, full regeneration, and full regeneration with conventional braking. Then, the minimum energy consumption problem is reformulated and solved in the distance domain using dynamic programming to find the optimal speed profiles. Various simulation results are shown for a lightweight autonomous military vehicle. The sensitivity of energy consumption to regenerative-braking power limits and trip time is investigated. These studies provide important information that can be used in designing component size and scheduling operation to achieve the desired vehicle range.	https://www.webofscience.com/wos/woscc/full-record/WOS:000468869100005
3	Призначення цілей безпілотною наземною зброєю на основі мережі глибокого Q-навчання з удосконаленим багатоцільовим алгоритмом штучної бджолиної колонії	Unmanned ground weapon target assignment based on deep Q-learning network with an improved multi-objective artificial bee colony algorithm. Wang, T.; Fu, LY; Wei, ZX; Zhou, YH; Gao, S. ENGINEERING APPLICATIONS OF ARTIFICIAL INTELLIGENCE. 2023. Volume 117, 105612.	Various objective functions in the operation process of unmanned ground combat vehicles (UGVs) have an important impact on the equilibrium of the system. Unbalanced scheduling of unmanned ground combat vehicles and poor target strikes exist in complex urban battlefields. A new multi-weapon target assignment architecture and a multi-objective artificial bee colony (MOABC) algorithm with an elite strategy are proposed to solve these problems. Considering the influence of mutation operator on multi-objective assignment, by introducing the action mechanism of the self-adaptive variation operator and combining the state representation of the nectar source with the overall allocation scheme, the deep Q-learning network with improved multi-objective artificial bee colony (MOADQN) algorithm is proposed. Through comparative analysis with multi-objective artificial bee colony algorithm, non-dominated sorting genetic algorithm-II (NSGA-II), multi-objective particle swarm optimization (MOPSO), the multi-objective evolutionary algorithm based on decomposition with electronic countermeasure (ECM-MOEA/D) and the deep Q-learning network with multi -objective artificial bee colony (MOAIQL) algorithm, the proposed MOADQN algorithm can solve the problems such as poor allocation effectiveness and low gain of traditional algorithms. The proposed MOADQN algorithm has significant advantages in solving multi-objective optimization	https://www.webofscience.com/wos/woscc/full-record/WOS:000894963300004

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			problems and strong expansion performance in the complex urban environment.	
4	Стан досліджень зварювання глибоким проплавленням алюмінієвих сплавів середньої товщини	Research status of deep penetration welding of medium-thick plate aluminum alloy. Wang, TH; Li, YW; Mao, YH; Liu, HF; Babkin, A.; Chang, YL. INTERNATIONAL JOURNAL OF ADVANCED MANUFACTURING TECHNOLOGY. 2022. Volume 120. Issue 11-12. Page 6993-7010.	The amount of metal materials is gradually increasing with the rapid development of manufacturing industry. Medium-thick plate aluminum alloy is widely used in heavy military vehicles, marine engineering, and other fields for weight reduction or corrosion resistance. However, it is difficult to obtain high-quality deep penetration welds by traditional welding technology to meet the requirements. Based on the welding solution of plate aluminum alloy, this paper summarizes the deep penetration welding process of aluminum alloy plates and analyzes the mechanism and research progress of various process methods. It mainly includes active flux tungsten inert gas welding, pulse melting electrode inert gas welding, swing arc narrow gap GMAW welding, high energy beam welding and laser arc hybrid welding, etc. The welding technology assisted by external magnetic field or ultrasonic field can also realize deep penetration of the weld, and can improve the weld forming, reduce porosity and cracks and other defects. The research on deep penetration welding technology is helpful to promote the high-speed development of plate aluminum alloy welding to automation and intelligence.	https://www.webofscience.com/wos/woscc/full-record/WOS:000784630400002
5	Картування прохідності в позашляховому середовищі з використанням семантичної сегментації	Traversability Mapping in Off-Road Environment using Semantic Segmentation. Dabbiru, L.; Sharma, S.; Goodin, C.; Ozier, S.; Hudson, CR; Carruth, DW; Doude, M.; Mason, G.; Ball, JE. AUTONOMOUS SYSTEMS: SENSORS, PROCESSING, AND SECURITY FOR VEHICLES AND INFRASTRUCTURE. 2021. Volume 11748.	Autonomous driving in off-road environments is challenging as it does not have a definite terrain structure. Assessment of terrain traversability is the main factor in deciding the autonomous driving capability of the ground vehicle. Traversability in off-road environments can be defined as the drivable locations which differs based on the type of vehicle. It is very crucial for the autonomous ground vehicle (AGV) to avoid obstacles such as trees, boulders etc. while traversing through the trails. A key requirement in developing autonomous navigation algorithms is the availability of labeled data to train and test the machine learning algorithms. The labeled two-dimensional camera and threedimensional LiDAR datasets which are available at present are almost exclusively for structured on-road environments. There are few labeled off-road datasets available and there is a need for producing these off-road labeled data for different applications. The goal of this research has three main objectives: a) collection of 2D camera data in the off-road and unstructured environment, b) annotation of 2D camera data depending on the vehicles' ability to drive through the trails, and c) application of semantic segmentation algorithm on the labeled dataset to predict the	https://www.webofscience.com/wos/woscc/full-record/WOS:000698179900008

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			trajectory based on the type of ground vehicle. The ground vehicles considered in this work are a sedan, a pickup truck, and a military vehicle (for example HMMWV). The data are collected at the Center for Advanced Vehicular Systems (CAVS) proving grounds during different seasons of the year. Our models and labeled datasets will be publicly available.	
Транспорт				
1	Інтегрована система оптимізації проектування та керування гібридним військовим транспортним засобом з використанням літій-іонного акумулятора та суперконденсатора як пристроїв накопичення енергії	An Integrated Design and Control Optimization Framework for Hybrid Military Vehicle Using Lithium-Ion Battery and Supercapacitor as Energy Storage Devices. Abdullah-Al Mamun; Liu, ZF; Rizzo, DM; Onori, S. IEEE TRANSACTIONS ON TRANSPORTATION ELECTRIFICATION. 2019. Volume 5. Issue 1. Page 239-251.	One of the existing challenges toward the electrification of military vehicles is the selection of the most suitable energy storage device. Moreover, a single energy storage technology might not provide the most benefit out of powertrain electrification. In this paper, a generalized framework for the simultaneous selection of the optimal energy storage device, in the form of a standalone or hybrid solution, and online energy management is presented. This paper investigates the cooperation of energy-dense Li-ion batteries and power-dense supercapacitors to assist engine operation in a series hybrid electric military truck. Pontryagin's minimum principle is adopted as the energy management strategy in a forward-looking vehicle simulator, in which the optimal design and control parameters are found using particle swarm optimization. Simulation results show that adopting a hybrid energy storage system reduces fuel consumption by 13% compared to the case of battery-only hybridized powertrain.	https://www.webofscience.com/wos/woscc/full-record/WOS:000462379200020
2	Моделювання та прогнозування виникнення дорожньо-транспортних пригод у Чаттанузі, штат Теннессі	Modeling and predicting vehicle accident occurrence in Chattanooga, Tennessee. Roland, J.; Way, PD; Firat, C.; Doan, TN; Sartipi, M. ACCIDENT ANALYSIS AND PREVENTION. 2021. Volume 149, 105860	Given the ever present threat of vehicular accident occurrence endangering the lives of most people, preventative measures need to be taken to combat vehicle accident occurrence. From dangerous weather to hazardous roadway conditions, there are a high number of factors to consider when studying accident occurrence. To combat this issue, we propose a method using a multilayer perceptron model to predict where accident hotspots are for any given day in the city of Chattanooga, TN. This model analyzes accidents and their associated weather and roadway geometrics to understand the causes of accident occurrence. The model is offered as a live service to local law enforcement and emergency response services to better allocate resources and reduce response times for accident occurrence. Multiple models were made, each having different variables present, and each yielding varying results.	https://www.webofscience.com/wos/woscc/full-record/WOS:000598055300005

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
3	Комплект автоматизації для дворежимного військового безпілотного наземного транспортного засобу для місій спостереження	Automation Kit for Dual-Mode Military Unmanned Ground Vehicle for Surveillance Missions. Naranjo, JE; Jiménez, F.; Anguita, M.; Rivera, JL. IEEE INTELLIGENT TRANSPORTATION SYSTEMS MAGAZINE. 2020. Volume 12. Issue 4. Page 125-137.	The field of autonomous vehicles is an area of great importance nowadays among Intelligent Transport Systems. These autonomous vehicles must meet high standards of robustness, safety and protection to make autonomous driving safer than human driving, thus improving current accident rates and energy efficiency, so its complete implementation in the market is expected in the long term. However, there are other areas, such as the agricultural and military sectors, where the demand for technologies related to autonomous driving is also high but the applicability could be faster. In this sense, the unmanned ground military vehicles (UGV) are a technology available in international armies for some years, but that is still subject to a series of technical, logistical and material limitations that reduce its applicability. This paper presents an automation kit for transforming military service vehicles into military UGVs, developed through the transfer of autonomous vehicle technology from the civil sector to the military sector. This kit has been installed in a quite common vehicle of the Spanish army, in order to provide two functional capabilities: autonomous navigation and teleoperation, in off-road environments with minimal or no traffic marks or infrastructure aids. The vehicle equipped with this kit is oriented to different missions such as circulation in convoys, operation as tele-operated probe vehicle and perimeter surveillance. The automation kit involves no permanent modifications in the vehicle that can be driven manually when desired, allows vehicles to be used both in missions in conflict zones and to support operations in emergencies and natural catastrophes, and can be easily installed in any kind of vehicle.	https://www.webofscience.com/wos/woscc/full-record/WOS:000584607700010
4	Вплив нелінійності конструкції спиць та матеріалу на жорсткість та довговічність непневматичних шин	Effect of Spoke Design and Material Nonlinearity on Non-Pneumatic Tire Stiffness and Durability Performance. Dhrangdhariya, P.; Maiti, S.; Rai, B. SAE INTERNATIONAL JOURNAL OF PASSENGER CARS-MECHANICAL SYSTEMS. 2021. Volume 14. Issue 2. Page 117-135.	The non-pneumatic tire (NPT) has been widely used due to its advantages of no run-flat, no need for air maintenance, low rolling resistance, and improvement of passenger comfort due to its better shock absorption. It has a variety of applications in military vehicles, earthmovers, the lunar rover, stair-climbing vehicles, etc. Recently, the Unique Puncture-Proof Tire System (UPTIS) NPT has been introduced for passenger vehicles. In this study, three different design configurations, viz., Tweel, Honeycomb, and newly developed UPTIS, have been compared. The effect of polyurethane (PU) material nonlinearity has also been introduced by applying five different nonlinear PU material properties in the spokes. The combined analysis of the PU material nonlinearity and spoke design configuration on the	https://www.webofscience.com/wos/woscc/full-record/WOS:000743051300003

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			overall tire stiffness and spoke damage prediction is done using three-dimensional (3D) finite element modelling (FEM) simulations performed in ANSYS 16.0. It has been observed that the Mooney-Rivlin five-parameter model is best to capture the nonlinearity of all five studied PU materials. The effect of material nonlinearity on various spoke designs has been studied. The best combination of spoke design and the use of nonlinear material has been suggested in terms of riding comfort, tire stiffness, and durability performance. This work also shows the relative importance of material damage parameters like strain energy density (SED), maximum principal strain, and maximum octahedral shear strain. The FEM model is validated with experimental vertical stifness results available in the literature of 12N16.5 (Commercial NPT-Tweel) with around 97% accuracy.	
5	Втома м'язів шиї / плеч у водіїв військових транспортних засобів, що піддаються впливу вібрації всього тіла на польовій дорозі	Neck/Shoulder Muscle Fatigue of Military Vehicle Drivers Exposed to Whole-Body Vibration on Field Terrain Road. Park, DJ; Lee, JW; Park, JH; Song, JT; Ahn, SJ; Jeong, WB. INTERNATIONAL JOURNAL OF AUTOMOTIVE TECHNOLOGY. 2020. Volume 21. Issue 1. Page 115-121.	A driver of a military vehicle is exposed to whole-body vibration when driving in field terrain conditions, and the driver's muscles become tired. Muscle fatigue occurs most strongly near both shoulders, which must be used to steer the vehicle in the target direction. The degree of a muscle fatigue is predicted to correlate with the exposure amount of the human body to vibration. In this study, the vibration driving a military vehicle on a field terrain test road was simulated using a 6-degree-of-freedom (DOF) exciter, and the muscle fatigue was analyzed by measuring electromyography (EMG) signals from subjects before and after the vibration exposure. Surface EMG (sEMG) measurements were taken at the deltoid and trapezius muscles of subjects for the muscle fatigue analysis. Before and after the vibration exposure, the Maximal Voluntary Contraction (MVC) state was determined. The change of the median frequency of the sEMG signal was measured in this state and analyzed. The output values of the sEMG signal at MVC decreased after the vibration exposure, suggesting reduced muscle activation. The change of the median frequency value after the vibration exposure was sharply reduced, which means that the muscles are fatigued more rapidly with the same load.	https://www.webofscience.com/wos/woscc/full-record/WOS:000511932400012
Матеріалознавство				
1	3D-друк волокноармованих пластикових композитів з використанням моделювання методом наплавлення: огляд стану	3D Printing of Fiber-Reinforced Plastic Composites Using Fused Deposition Modeling: A Status Review.	Composite materials are a combination of two or more types of materials used to enhance the mechanical and structural properties of engineering products. When fibers are mixed in the polymeric matrix, the composite material is known as fiber-reinforced polymer (FRP).	https://www.webofscience.com/wos/woscc/full-record/WOS:000689349500001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		Pervaiz, S.; Qureshi, TA; Kashwani, G.; Kannan, S. MATERIALS. 2021. Volume 14. Issue 16, 4520.	FRP materials are widely used in structural applications related to defense, automotive, aerospace, and sports-based industries. These materials are used in producing lightweight components with high tensile strength and rigidity. The fiber component in fiber-reinforced polymers provides the desired strength-to-weight ratio; however, the polymer portion costs less, and the process of making the matrix is quite straightforward. There is a high demand in industrial sectors, such as defense and military, aerospace, automotive, biomedical and sports, to manufacture these fiber-reinforced polymers using 3D printing and additive manufacturing technologies. FRP composites are used in diversified applications such as military vehicles, shelters, war fighting safety equipment, fighter aircrafts, naval ships, and submarine structures. Techniques to fabricate composite materials, degrade the weight-to-strength ratio and the tensile strength of the components, and they can play a critical role towards the service life of the components. Fused deposition modeling (FDM) is a technique for 3D printing that allows layered fabrication of parts using thermoplastic composites. Complex shape and geometry with enhanced mechanical properties can be obtained using this technique. This paper highlights the limitations in the development of FRPs and challenges associated with their mechanical properties. The future prospects of carbon fiber (CF) and polymeric matrixes are also mentioned in this study. The study also highlights different areas requiring further investigation in FDM-assisted 3D printing. The available literature on FRP composites is focused only on describing the properties of the product and the potential applications for it. It has been observed that scientific knowledge has gaps when it comes to predicting the performance of FRP composite parts fabricated under 3D printing (FDM) techniques. The mechanical properties of 3D-printed FRPs were studied so that a correlation between the 3D printing method could be established. This review paper will be helpful for researchers, scientists, manufacturers, etc., working in the area of FDM-assisted 3D printing of FRPs.	
2	Огляд високотемпературних керамічних радіаторів	High temperature ceramic radomes (HTCR)-A review. Nag, A.; Rao, RR; Panda, PK. CERAMICS INTERNATIONAL. 2021. Volume 47. Issue 15. Page 20793-20806.	An electromagnetically transparent, structurally robust and environmentally resistant enclosure of radar antenna for ground based systems to modern avionics in military aircraft and missiles is called as radome. Radome materials are classified based on: (i) type of function - surface-based or flight-mode and (ii) speed of operation subsonic, supersonic to hypersonic. The desired properties of these materials are low dielectric constant and low loss factor in addition to its capacity to	https://www.webofscience.com/wos/woscc/full-record/WOS:000672633300004

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			withstand the high temperature of operation. Composite laminates of glass or aramid fibre reinforced polymeric resins are radome material candidates for applications in subsonic range. However, ceramics are the only viable option for military aerospace applications such as a fighter jet travelling at Mach 3 or an advanced hypersonic missile speeding up to Mach 5. This review outlines the hand-full of ceramic materials already in application as radome materials like high-purity-alumina, pyroceram, slip-castfused-silica, their processing technology, electromagnetic and mechanical properties, advantages and disadvantages with respect to advanced military vehicles. Use of silicon nitride based radome materials, that has exceptional mechanical strength and thermal stability up to 1400 x25e6;C is illustrated with respect to reaction bonded silicon nitride, hot pressed silicon nitride, silicon oxynitride, sialon and their composites. Design of new generation radome materials was conceptualized and discussed as applicable to silicon nitride and related ceramics, wherein incorporation of varied degree of porosity improves electromagnetic properties, simultaneously, maintaining the required mechanical strength. Multilayer and graded porosity and its influence on electromagnetic properties were briefly discussed. Si3N4 ceramics having controlled porosity leading to optimum electromagnetic and mechanical properties produced through systematic processing is proposed as the futuristic high temperature radome material for supersonic applications.	
3	Застосування реактивних матеріалів PTFE/Al для двошарового кумулятивного заряду	Application of PTFE/Al Reactive Materials for Double-Layered Liner Shaped Charge. Wang, HF; Guo, HG; Geng, BQ; Yu, QB; Zheng, YF. MATERIALS. 2019. Volume 12. Issue 17, 2768.	The penetration enhancement behaviors of a reactive material double-layered liner (RM-DLL) shaped charge against thick steel targets are investigated. The RM-DLL comprises an inner copper liner, coupled with an outer PTFE (polytetrafluoroethylene)/Al reactive material liner, fabricated via a cold pressing/sintering process. This RM-DLL shaped charge presents a novel defeat mechanism that incorporates the penetration capability of a precursor copper jet and the chemical energy release of a follow-thru reactive material penetrator. Experimental results showed that, compared with the single reactive liner shaped charge jet, a deeper penetration depth was produced by the reactive material-copper jet, whereas the penetration performance and reactive material mass entering the penetrated target strongly depended on the reactive liner thickness and standoff. To further illustrate the penetration enhancement mechanism, numerical simulations based on AUTODYN-2D code were conducted. Numerical results indicated	https://www.webofscience.com/wos/woscc/full-record/WOS:000488880300121

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			that, with increasing reactive liner thickness, the initiation delay time of the reactive materials increased significantly, which caused the penetration depth and the follow-thru reactive material mass to increase for a given standoff. This new RM-DLL shaped charge configuration provides an extremely efficient method to enhance the penetration damage to various potential targets, such as armored fighting vehicles, naval vessels, and concrete targets.	
4	Комплексний огляд методів інтеграції GNSS/INS для наземних та повітряних транспортних засобів	A Comprehensive Review of GNSS/INS Integration Techniques for Land and Air Vehicle Applications. Boguspayev, N.; Akhmedov, D.; Raskaliyev, A.; Kim, A.; Sukhenko, A. APPLIED SCIENCES-BASEL. 2023. Volume 13. Issue 8, 4819.	Navigation systems are of interest for applications in both civilian and military vehicles. Satellite navigation systems and inertial navigation systems are the most applied in this area. They have complementary properties, which has led to a trend of integrating these systems. At present, there are several approaches to GNSS/INS integration: loosely coupled, tightly coupled and deeply coupled and many approaches to their modifications in dependence of application and arising problems with measurements, such as lack of GNSS measurements or poor quality of GNSS and INS measurements. This article presents an extensive review of the available modern approaches and their modifications for integrating INS and GNSS measurements, arranging them and highlights the main problems arising for the considered type of integration approach. The article includes a review of various integration tools based on the Kalman filter and intelligent systems, INS mechanization and features of development of an INS measurement error model that is necessary for integration, the main problems of GNSS/INS integration and a comparative description of the solutions proposed by the authors for solving these problems. The findings of this work are useful for further research in the field of inertial and satellite navigation, as well as for engineers involved in the practical implementation of integrated GNSS/INS systems.	https://www.webofscience.com/wos/woscc/full-record/WOS:000977495000001
5	Стійкість до вибуху в безпосередній близькості великомасштабних ауксетичних рециркулюючих стільникових сендвіч-панелей	Close-in blast resistance of large-scale auxetic re-entrant honeycomb sandwich panels. Kalubadanage, D.; Remennikov, A.; Ngo, T.; Qi, C. JOURNAL OF SANDWICH STRUCTURES & MATERIALS. 2021. Volume 23. Issue 8. Page 4016-4053.	The protection of critical infrastructure, including government buildings, airports, religious buildings, military buildings and military vehicles, which are at risk to blast loads, has become important due to increasing terrorist activities in recent years. Sacrificial cladding systems based on negative Poisson's ratio core topologies have recently received more attention as a protective technology due to its excellent energy absorption capability. In this study, field blast tests were performed on metallic re-entrant honeycomb-cored sacrificial cladding systems as protective structures for steel plate structures. This study focused on the near-field blast loading conditions where liquid	https://www.webofscience.com/wos/woscc/full-record/WOS:000584607700010

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			Nitromethane (NM) spherical charges were detonated in close proximity to the main structure. Two 6 mm thick mild steel plates and two steel plates protected with re-entrant honeycomb-cored sacrificial cladding systems were among the specimens tested. The proposed auxetic cladding system was fabricated from aluminium sheets using a novel in-house built folding machine. Numerical simulations were conducted utilising LS-DYNA software and the Blast Impact Impulse Model (BIIM). The results obtained from the numerical simulations are in good agreement with the experimental results. It was found that the deformation pattern of the sacrificial auxetic cladding system varies with the intensity of the blast loading, and there is a limit at which the proposed protective system ceases to effectively absorb the applied blast loading. The variation of negative Poisson's ratio of the system with blast loading was studied. It was found that the auxetic cladding system could become a solid projectile leading to damage amplification for very close-range blast loads due to rapid densification of the auxetic core. The proposed cladding systems with narrow re-entrant angles performed well under blast loads due to relatively low stiffness of the panels. Finally, the optimisation study was performed for the protective system. Overall, the experimental and numerical results assure that auxetic-based cladding systems are suitable for applications requiring blast protection such as armoured vehicles and critical physical infrastructure but need to be carefully designed for the given blast threat to prevent overloading of the protected structures.	
Механіка				
1	Про позаплощинні балістичні характеристики шестикутних, реентрантних, квадратних, трикутних та круглих стільникових панелей	On the out-of-plane ballistic performances of hexagonal, reentrant, square, triangular and circular honeycomb panels. Wang, YL; Yu, Y.; Wang, CY; Zhou, G.; Karamoozian, A.; Zhao, WZ. INTERNATIONAL JOURNAL OF MECHANICAL SCIENCES, 2020. Volume 173, 105402.	Ballistic penetration is a serious threat to military vehicles. Honeycomb structure is one of the most focused solution to improve the ballistic performance due to its great lightweight design and high resistant against impact. There are lots of honeycomb structure topologies. However, no comprehensive comparison on out-of-plane ballistic performance between common honeycomb types had been conducted to our knowledge. Therefore, hexagonal, reentrant, square, triangle and two circular (CS and CH types) honeycomb structures with identical mass and thickness are developed and modelled in this paper. Their relative densities are firstly calculated. Their numerical models and the Lambert-Jonas ballistic model are established. The ballistic performances of these six cases impacted by a blunt nose cylinder projectile from out-of-plane direction are detailed compared through	https://www.webofscience.com/wos/woscc/full-record/WOS:000531024300003

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			numerical method. Their dynamic response, elastic and plastic deformation, failure mechanism and energy absorption capability are researched. Relations between initial velocity and residual velocity of projectile and the ballistic limit velocities of all cases are also compared. The results indicated that reentrant, square and triangular cases perform worse than hexagonal honeycomb. The fascinating deformation mechanism of CS and CH cases results in a long elastic deformation time and high strength after elastic deformation, which leads to a large decrease in residual velocity. Compared with hexagonal honeycomb, ballistic limit velocities of CS and CH type are improved by 15.2% and 25.0%, respectively. This comparison research provides a useful reference for sandwich honeycomb core design.	
2	Розробка матеріалів та конструкцій для екранування від вибухів та балістичних ударів: детальний огляд	Development of materials and structures for shielding applications against Blast and Ballistic impact: A Detailed Review. Pai, AA; Kini, CR, Shenoy, BS. THIN-WALLED STRUCTURES. 2022. Volume 179, 109664	The development of armaments has brought forth the challenges of protection systems from gunfire and the like, while the advances in high energy explosives and availability, run the risk of intentional explosions like bomb blasts. The military forces, and the civilians worldwide, have suffered severe injuries/fatalities, victimized by attacks due to acts of extremism or warfare. The blast events due to aerial and terrestrial bombings at warzones, are frequent and expected, while those due to ambush attacks of terror are haphazard and unpredictable, which offer extremely tough challenges to the task of protection. The shielding materials for ballistic impacts from projectile weapons have found widespread applications for military vehicles and personnel serving in police and defence sectors. The standard bulletproof vests offer protection for low to medium calibre projectiles, while they are less worthy against explosions, rendering little or no protection to the individual. In the current work, research spanning over the last 70 years has been reviewed, comparing the shielding materials for both blast and ballistic protection, their structural designs and developments including thin and lightweight materials. Beginning with a short introduction to blast theory, the detailed review of the materials employed for protection against different types of blast (open-air, underwater, confined space) as well as ballistic impact are covered. Potential novel materials for future applications have been discussed along with subsequent potential and challenges to aid material designers.	https://www.webofscience.com/wos/woscc/full-record/WOS:000827252700004
3	Балістична ударна поведінка нещодавно розробленої броньової	Ballistic impact behaviour of newly developed armour grade	High strength steel plates are majorly utilized for civil and military vehicles for ballistic protection against various threat levels. In this	https://www.webofscience.com/wos/woscc/full-

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
	сталі: експериментальне та числове дослідження	steel: An experimental and numerical study. Choudhary, S.; Singh, PK; Khare, S.; Kumar, K.; Mahajan, P.; Verma, RK. INTERNATIONAL JOURNAL OF IMPACT ENGINEERING. 2020. Volume 140, 103557.	work, an experimental and numerical study has been conducted on a newly developed armour steel grade. Four different ductile fracture criteria have been used in the numerical simulations, namely Modified Johnson-Cook (MJC), Cockcroft-Latham (CL), Constant failure strain (CFS) and Maximum Shear (MS) stress failure criteria. Suitable experiments were conducted for material model parameter estimation and a simulation study was conducted in LS-DYNA to evaluate its performance in a plate impact simulation. The results were correlated with an actual Impact test done with a plate of dimension 1000 x 1000 x 6 mm with 7.62 x 51 mm NATO ball ammunition for NIJ (National Institute of Justice) Level 3 protection. Modified Johnson-Cook, Cockcroft-Latham and Constant strain failure criteria are in good agreement with experimental results. Maximum Shear stress failure criteria failed to predict the experimental results.	record/WOS:000531096700015
4	Розробка та балістичні характеристики захисних сталебетонних композитних бар'єрів від надшвидкісних ударів вибухоформованих снарядів	The development and ballistic performance of protective steel-concrete composite barriers against hypervelocity impacts by explosively formed projectiles. Remennikov, A.; Gan, ECJ; Ngo, T.; Netherton, MD. COMPOSITE STRUCTURES. 2019. Volume 207. Page 625-644.	Explosively formed projectiles (EFP) are one of the most severe explosive and impact loading threats for civil infrastructure and military vehicles. Currently, there is no effective means of protection for military vehicles and infrastructure facilities from EFPs. This paper presents the experimental results of the hypervelocity impact of EFPs on steel-concrete (SC) barrier systems of finite dimensions. The SC barrier units tested were broadly representative of the type of protective SC units used in the expedient construction of barriers for mitigating improvised explosive device (IED) and EFP threats to critical infrastructure facilities. The response of noncomposite, partially-composite, and fully-composite SC barrier units was studied. All studied protective systems were capable of terminating the high-velocity projectiles effectively through the combined action of the concrete core and steel faceplates. The data gathered from these tests are also intended to further the understanding of impacts on SC composite structures at speeds greater than 1000 m/s and for the calibration of numerical models of EFP interaction with SC targets. 3D numerical simulations were performed to better understand the various stages of EFP interaction with the SC composite barriers and develop recommendations for their design optimisation. No previously published results on the EFP terminal ballistic performance of SC composite structures of finite dimensions have been found in the open literature.	https://www.webofscience.com/wos/woscc/full-record/WOS:000449690600053

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
5	З'єднання сталі Ramor 500 за допомогою дугового зварювання під флюсом (SAW) та його оцінка за допомогою термомеханічного аналізу в програмному забезпеченні пакету ANSYS	Joining of Ramor 500 Steel with SAW (Submerged Arc Welding) and its Evaluation of Thermomechanical Analysis in ANSYS Package Software. Taskaya, S.; Gur, AK; Ozay, C. THERMAL SCIENCE AND ENGINEERING PROGRESS. 2019. Volume 13, 100396.	ANSYS package software; it is a simulation simulation software which is preferred in engineering fields after the modeling stage and before the prototype is produced. Ramor 500 armor steel; it is classified as a high-strength ballistic protection steel with a hardness of 505-590 HV and a thickness of 2-30 mm. In this study, 3mm thick and 65x55mm Ramor 500 steel which is used as the main combat vehicle in armor steel and armed forces in the market, is used with submerged arc welding (SAW) method of 250 fixed amperes, 20, 25, 30 V voltages and 20, 25, 30 cm/min are combined at welding feed rates. The metallographic microstructure, radiographic examination test, SEM-EDS analysis and weld stitch geometry of the structures formed in the intersection after the joining were performed and the thermomechanical analyzes after the joining process were evaluated in the ANSYS package software. In the results of working; radiographic examination test showed that full penetration was achieved in all welded joints and therefore no macro and micro cracks were observed. In the microstructure analysis, a grain structure was observed. In the form of a homogeneous distribution from the weld stitch to the base material. SEM-EDS analysis showed that elemental phase structures were homogeneously distributed. As a result of the effect of welding stitch geometries on the current strength and velocity, welding width increased while welding width increased, while welding speed increased, width decreased. In the thermomechanical analysis results of ANSYS software, heat inputs in welding stresses increased and elastic and mechanical stresses were quite high and replaced by permanent stresses as a result of deformation.	https://www.webofscience.com/wos/woscc/full-record/WOS:000621591200016
Телекомунікації				
1	Інтеграція Інерціальної навігаційної системи/одометра з БПЛА для автономної навігації наземних транспортних засобів	UAV Vision Aided INS/Odometer Integration for Land Vehicle Autonomous Navigation. Dong, J.; Ren, XY; Han, SL; Luo, SL. IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY. 2022. Volume 71. Issue 5. Page 4825-4840.	Autonomous navigation without external GNSS aiding is crucial for some kinds of land vehicle applications, such as military vehicles and unmanned vehicles navigation under GNSS denied environments. A typical solution for autonomous navigation can be achieved by integrating Inertial Navigation System (INS) and odometer, where the odometer can provide velocity aiding for INS. The INS/odometer integration approach can dramatically improve the navigation performances compared with the standalone INS approach, however its positioning error is still gradually accumulating with time because of lacking external position correction. This paper proposes an approach to aid the INS/odometer integration by using vision	https://www.webofscience.com/wos/woscc/full-record/WOS:000799654900028

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			positioning, where a UAV is used to carry the vision camera and helps to realize the positioning of the vehicle by image matching. The UAV vision positioning acts a role like GNSS and provides constant position correction for INS/odometer integration. A dual-rate Kalman filter is proposed and utilized to realize the data fusing of vision, INS and odometer. Simulation and filed tests show that the proposed approach can dramatically improve the autonomous navigation performances for land vehicles.	
2	Розширений підхід Openmax для класифікації радіолокаційних зображень з опцією відхилення	Extended Openmax Approach for the Classification of Radar Images With a Rejection Option. Oveis, AH; Giusti, E.; Ghio, S.; Martorella, M. IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS. 2023. Volume 59. Issue 1. Page 196-208.	The closed-set assumption in conventional classifiers, such as the Softmax, constrains deep networks to select an output from the given known classes. However, the classification in a real-world scenario should account for open sets where a new class of targets, which has not been included in the training phase, can easily confuse the classifier. Therefore, it is necessary to not only correctly classify known classes but also fundamentally deal with unknown ones. In this article, we extend the Openmax approach, which has been introduced for open-set recognition in the optical domain, by offering solutions to its inherent limitations. The motivation behind the work is to propose a more accurate and robust classifier for the open-set recognition problem in synthetic aperture radar (SAR) images, without having any prior knowledge about the incoming unknown data. A number of real-data experiments are conducted to demonstrate the effectiveness of the proposed method on the basis of selected performance metrics. In particular, the Moving and Stationary Target Acquisition and Recognition dataset, which contains SAR images of ten military vehicles, is used for training and inference of a convolutional neural network, with an option to recognize open-set images.	https://www.webofscience.com/wos/woscc/full-record/WOS:000966991300001
3	B-IoMV: Протокол цибулевої маршрутизації на основі блокчейну для зв'язку D2D у середовищі інтернету військових машин поза межами 5G	B-IoMV: Blockchain-based onion routing protocol for D2D communication in an IoMV environment beyond 5G. Gupta, R.; ; Tanwar, S.; Kumar, N. VEHICULAR COMMUNICATIONS. 2022. Volume 33, 100401.	Blockchain technology's popularity in terms of security, privacy, traceability, and trust is being applied in various major applications concerning connected autonomous vehicles. One of the most sensitive applications is military operations. We do not compromise with either security, privacy, trust, or communication latency of connected military vehicles, i.e., Internet of military vehicles (IoMVs). Achieving anonymity along with the security and privacy of sender, receiver, and data path for IoMVS is still an open question. Efforts we have made to address the aforementioned issue by proposing a blockchain-based onion routing protocol for IoMVs, i.e., B-IoMV, to achieve secure, trusted, and anonymous D2D	https://www.webofscience.com/wos/woscc/full-record/WOS:000750907600003

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			communication. We studied the working of onion routing and presented a blockchain and token-based solution to strengthen the security and anonymity of IoMVs. A blockchain-based solution is quite costly and we use InterPlanetary File System (IPFS) to make the proposed B-IoMV system cost-effective. Finally, results show that the proposed B-IoMV system achieved better communication latency, data storage cost, and network bandwidth utilization.	
4	Огляд та аналіз векторів атак на комунікаційну шину MIL-STD-1553	A Review and Analysis of Attack Vectors on MIL-STD-1553 Communication Bus. Lounis, K.; Mansour, Z.; Wrana, M.; Elsayed, MA.; Ding, SHH; Zulkernine, M. IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS. 2022. Volum 58. Issue 6. Page 5586-5606.	MIL-STD-1553 has been used for the past four decades by the military as a standardized, reliable, and fault-tolerant communication bus to provide connectivity between different embedded components in mission-critical military vehicles. The bus was designed with a great focus on reliability, responsiveness, and fault tolerance. However, its security aspects were an afterthought. Indeed, in the early 1970s, the notion of cyberattacks was not ubiquitous as it is today. Attacking computerized systems located at very high altitudes was an inconceivable scenario for many people, including security engineers. With current developments in cybersecurity and telecommunication networks, the security analysis of the MIL-STD-1553 bus reveals that the system is not immune from cyberattacks. The bus is vulnerable to many attacks that could seriously damage the entire system. Rebuilding the security of MIL-STD-1553 from scratch is cost prohibitive and a very complex, not scalable, and inflexible approach. A common alternative to embedding security to the existing system is the development of an intrusion detection system that can be added to the MIL-STD-1553 bus with minimal cost. In this article, we review and discuss some possible attack vectors on the MIL-STD-1553 bus. Then, we analyze the risk and consequences of each attack vector on a fighter jet. This review and analysis will provide security engineers with a holistic overview of possible attacks and their related risk on MIL-STD-1553 to better design an effective intrusion detection system.	https://www.webofscience.com/wos/woscc/full-record/WOS:000895081000053
5	Обізнаність про ситуацію на полі бою та мережева взаємодія на основі розподілених обчислень агентів	Battlefield situation awareness and networking based on agent distributed computing. Dong, J.; Wu, GW; Yang, TT; Jiang, Z. PHYSICAL COMMUNICATION. 2019. Volum 33. Page 178-186.	The battlefield environment is complex and changeable, and there are complex terrain features and bad electromagnetic communication environment. At the present stage, the battlefield reconnaissance and communication network mainly depends on the cooperation of soldiers. With the development of unmanned aerial vehicle and pilotless technology, in the background of information warfare, the use of mobile agents to complete the formation of battlefield communication networks and the battlefield situation awareness has become a new trend. The Unmanned aerial vehicles (UAVs)	https://www.webofscience.com/wos/woscc/full-record/WOS:000461179700020

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			technology is becoming more and more mature, and its distribution, synergy, parallelism, robustness and intelligence provide the basic conditions for the construction of a battlefield self organizing network. In this paper, we use UAVs and unmanned combat vehicles to build a mobile ad hoc network that meets the conditions of the battlefield. The network can solve the problem of slow convergence or non convergence of the traditional self-organizing network without relying on the fixed basic network facilities, which has the characteristics of rapid expansion, strong destruction resistance and no centrality. So it can meet the needs of communication in the battlefield. In this process, we combine the A star algorithm with the ant colony algorithm to realize the real-time path planning in combination with the edge computing power of the agent and the battlefield situation collected by the sensor, and the battlefield aggregation and search task can be completed quickly. And according to the planned route, the route forwarding strategy under known path is used to complete the information transmission. (C) 2019 Elsevier Inc. All rights reserved.	
БРОНЕТРАНСПОРТЕРИ (БТР)				
Інженерія				
1	Огляд технології зменшення опору: зосередження уваги на амфібійних машинах	A review on drag reduction technology: Focusing on amphibious vehicles. Pan, DB; Xu, XJ; Liu, BL; Xu, HJ; Wang, XC. OCEAN ENGINEERING. 2023. Volume 280, 114618.	Amphibious vehicles have the unique ability to maneuver on land and water, due to their distinctive structural characteristics, their hydrodynamic performance differs significantly from that of ships. With the growing de-mand for high-speed navigation of amphibious vehicles, research into resistance and methods to drag reduction has become a hot issue. In this paper, drag reduction technology for amphibious vehicles is reviewed based on a thorough analysis of existing research. Various amphibious vehicles from different countries are introduced, outlining their different movement states on the water and classified based on their drag reduction mechanisms. The article explores the working principle and effects of various drag reduction technology from two perspec-tives: universal technology and amphibious technology. Research indicates that applying fouling and biofouling effect, surface drag reduction, and air injection as universal technology can effectively reduce the sailing resistance of amphibious vehicles. Due to the limitations of universal technology in some special military amphibious vehicles, amphibious technology is discussed as a supplement, such as planing	https://www.webofscience.com/wos/woscc/full-record/WOS:000990024000001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			hull, retractable walking mechanism, and drag reduction accessories. Finally, a summary of drag reduction technology for amphibious vehicles is provided, including pertinent design recommendations and an introduction to potential research areas for future development.	
2	Вплив флангів на стійкість високошвидкісної амфібійної машини	Influence of Flanks on Resistance Performance of High-Speed Amphibious Vehicle. Pan, DB; Xu, XJ; Liu, BL. JOURNAL OF MARINE SCIENCE AND ENGINEERING. 2021. Volume 9. Issue 11, 1260.	In order to reduce the additional resistance of high-speed amphibious vehicles, Flanks are designed on the concave grooves. As a new drag reduction attachment, the principle of Flanks is analyzed and discussed in detail. In this paper, the HSAV model and Flanks coupling resistance tests are performed based on the Reynolds-averaged Navier-Stokes method and SST k-omega model. The accuracy of the numerical approach is verified by a series of towing tests. Results show that with a fixed installation angle and invariable characteristic parameters, Flanks can significantly reduce the total resistance at high speed, with a maximum drag reduction of 16%. In the meantime, Flanks also affect the attitude and flow field of the vehicle, consequently affecting the resistance composition and the sailing condition. A vehicle model self-propulsion test is designed and carried out, and it qualitatively verifies the drag reduction effect of the Flanks at high speed.	https://www.webofscience.com/wos/woscc/full-record/WOS:000725918900001
3	Мережа сенсорних систем транспортних засобів та аналітика даних для системи управління станом та використанням	Vehicular Sensor Network and Data Analytics for a Health and Usage Management System. Ranasinghe, K.; Kapoor, R.; Gardi, A.; Sabatini, R.; Wickramanayake, V.; Ludovici, D. SENSORS. 2020. Volume 20. Issue 20, 5892.	Automated collection of on-vehicle sensor data allows the development of artificial intelligence (AI) techniques for vehicular systems' diagnostic and prognostic processes to better assess the state-of-health, predict faults and evaluate residual life of ground vehicle systems. One of the vital subsystems, in terms of safety and mission criticality, is the power train, (comprising the engine, transmission, and final drives), which provides the driving torque required for vehicle acceleration. In this paper, a novel health and usage monitoring system (HUMS) architecture is presented, together with dedicated diagnosis/prognosis algorithms that utilize data gathered from a sensor network embedded in an armoured personnel carrier (APC) vehicle. To model the drivetrain, a virtual dynamometer is introduced, which estimates the engine torque output for successive comparison with the measured torque values taken from the engine control unit. This virtual dynamometer is also used in conjunction with other sensed variables to determine the maximum torque output of the engine, which is considered to be the primary indicator of engine health. Regression analysis is performed to capture the effect of certain variables such as engine hours, oil temperature, and coolant temperature on the degradation of maximum engine torque. Degradations in the final	https://www.webofscience.com/wos/woscc/full-record/WOS:000585676700001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			drives system were identified using a comparison of the temperature trends between the left-hand and right-hand final drives. This research lays foundations for the development of real-time diagnosis and prognosis functions for an integrated vehicle health management (IVHM) system suitable for safety critical manned and unmanned vehicle applications.	
4	Випробування гідропневматичної підвіски колісного бронетранспортера	Hydropneumatic suspension testing of a wheeled armoured personnel carrier. Hryciów, Z.; Rybak, P.; Wojciechowski, M.; Wachowiak, P.; Kalicki, B. EKSPLOATACJA I NIEZAWODNOSC-MAINTENANCE AND RELIABILITY. 2023. Volume 25. Issue 2, 162497.	The purpose of this study was to determine the effect of gas pressure and temperature on the spring characteristic of a HP strut used in a wheeled armoured personnel carrier. The research was performed based on a simulation model. Data to validate the model were obtained during experimental tests. The results indicate, among other things, that the friction generated in the seals is an important source of resistance force. Comparison of the simulation results with the measured characteristics indicates a proper modelling of the strut operation. Simulation studies have indicated that it is easy to modify the required suspension parameters by adjusting the initial gas pressure. A linear effect of pressure on static deflection can be assumed. Temperature has a strong influence on the spring characteristic. When it changes, significant changes in vehicle height are observed due to the lack of a compensation system. The temperature changes are not only due to changes in ambient temperature, but also by intense heating of the HP struts caused by the vehicle moving over rough terrain.	https://www.webofscience.com/wos/woscc/full-record/WOS:001001106500008
5	Активна підвіска машини з системою подавлення перекидання на основі вдосконаленого контролера режиму ковзання	Active Vehicle Suspension with Anti-Roll System Based on Advanced Sliding Mode Controller. Konieczny, J.; Sibielak, M.; Raczka, W. ENERGIES. 2020. Volume 13. Issue 21, 5560.	In the paper authors consider the active suspension of the wheeled vehicle. The proposed controller consists of a sliding mode controller used to roll reduction and linear regulators with quadratic performance index (LQRs) for struts control was shown. The energy consumption optimization was taken into account at the stage of strut controllers synthesis. The studied system is half of the active vehicle suspension using hydraulic actuators to increase the ride comfort and keeping safety. Instead of installing additional actuators in the form of active anti-roll bars, it has been decided to expand the active suspension control algorithm by adding extra functionality that accounts for the roll. The suggested algorithm synthesis method is based on the object decomposition into two subsystems whose controllers can be synthesized separately. Individual suspension struts are controlled by actuators that use the controllers whose parameters have been calculated with the LQR method. The mathematical model of the actuator applied in the work takes into account its nonlinear nature and	https://www.webofscience.com/wos/woscc/full-record/WOS:000589144600001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			the dynamics of the servovalve. The simulation tests of the built active suspension control system have been performed. In the proposed solution, the vertical displacements caused by uneven road surface are reduced by controllers related directly to suspension strut actuators.	
Інформатика				
1	Частотний аналіз вібрацій з точки зору впливу на людину під час керування військовими бронетранспортерами та транспортними засобами матеріально-технічного забезпечення	Frequency Analysis of Vibrations in Terms of Human Exposure While Driving Military Armoured Personnel Carriers and Logistic Transportation Vehicles. Voicu, D.; Stoica, RM.; Vilau, R.; Marinescu, M.; Digulescu, A.; Despina-Stoian, C.; Popescu, F. ELECTRONICS. 2023. Volume 12. Issue 14, 3152.	Military heavy vehicle drivers experience low-frequency vibrations that are associated with fatigue, drowsiness, and other adverse health effects. The existing research papers focus on performing different types of analysis, but few use advance signal processing tools based on recurrence plot representation; therefore, the main goal of this paper is to assess the whole-body vibration (WBV) and hand-arm vibration (HAV) exposure of a driver, comparing armoured personnel carriers and cargo destined vehicles. For this purpose, the power of a signal distributed over its frequency was analysed using power spectral density (PSD) and diagonal line quantification (DLQ) analysis. According to the results, in the case of the cargo vehicle, the driver experienced vibration dose values of frequency weighted acceleration above the limits during all three experimental tests, with a maximum value of 26.802 m/s(2), whereas the results in the case of the armoured personnel carrier are below the 5 m/s(2) limit imposed by the ISO 5349-2 standard. From the developed tests it was observed that, to protect the driver against the fatigue induced by the vibrations of the vehicle body, it is necessary to provide an elastic and also damping linkage between the vehicle and the driver's seat. This is the only way to ensure the needed protection and it is, by far, the least expensive.	https://www.webofscience.com/wos/woscc/full-record/WOS:000350195000001
2	Управління робочим навантаженням при телеопераціі безпілотних наземних транспортних засобів: вплив допоміжного засобу компенсації затримки на робоче навантаження операторів-людей та продуктивність телеопераціі	Workload Management in Teleoperation of Unmanned Ground Vehicles: Effects of a Delay Compensation Aid on Human Operators' Workload and Teleoperation Performance. Lu, SH; Zhang, MY; Ersal, T.; Yang, XJ. INTERNATIONAL JOURNAL OF HUMAN-COMPUTER INTERACTION. 2019. Volume 35. Issue 19. Page 1820-1830.	Workload management is of critical concern in the teleoperation of unmanned vehicles because teleoperation is often employed in high-risk industries wherein high workload can lead to sub-optimal task performance and can harm human operators' long-term well-being. This study aimed to assess the detrimental effects of time delays in teleoperation on operators' workload and performance, and how a delay compensation aid mitigated such effects. We conducted a human-in-the-loop experiment with 36 participants using a dual-task teleoperation platform, where participants drove a simulated High Mobility Multipurpose Wheeled Vehicle (HMMWV) and performed a one-back memory task under three conditions: the delay condition, the delay with compensation aid condition, and the ideal no delay condition. A model-free predictor was used as the compensation aid.	https://www.webofscience.com/wos/woscc/full-record/WOS:000618802400005

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			Results indicate that with a time delay of 0.8-s participants' workload increased and performance degraded significantly. Moreover, the model-free predictor mitigated the detrimental effects of time delay on workload and task performance. Our findings suggest that participants are more sensitive in their perceived workload compared to the objective and physiological measures of workload. In addition, without any delay compensation algorithms, continuous teleoperation may not be ideal for operations with long time delays.	
3	Інтелектуальні амфібійні наземно-літальні апарати: найсучасніші технології для майбутнього транспорту	Intelligent Amphibious Ground-Aerial Vehicles: State of the Art Technology for Future Transportation. Zhang, XY; Huang, JE; Huang, YH; Huang, KY; Yang, L.; Han, Y.; Wang, L.; Liu, HP; Luo, JX; Li, J. IEEE TRANSACTIONS ON INTELLIGENT VEHICLES. 2023. Volume 8. Issue 1. Page 970-987.	Amphibious ground-aerial vehicles fuse flying and driving modes to enable more flexible air-land mobility and have received growing attention recently. By analyzing the existing amphibious vehicles, we highlight the autonomous fly-driving functionality for the effective uses of amphibious vehicles in complex three-dimensional urban transportation systems. We review and summarize the key enabling technologies for intelligent flying-driving in existing amphibious vehicle designs, identify major technological barriers and propose potential solutions for future research and innovation. This paper aims to serve as a guide for research and development of intelligent amphibious vehicles for urban transportation toward the future.	https://www.webofscience.com/wos/woscc/full-record/WOS:000965862000001
4	Дослідження ударного навантаження екіпажу бронетранспортера	Investigation of Armoured Personnel Carrier Crew Subjected to Impact Load. Hryciów, Z.; Slawinski, G. COMPUTATIONAL TECHNOLOGIES IN ENGINEERING (TKI'2018). 2019. Volume 2078, 020013.	The paper presents a safety problem of soldiers in the line of duty in the missions regions. They are extensively exposed to the opponent's activities while the troop carriers in service more and more frequently do not provide sufficient protection of the crew. Therefore, the paper attempts to evaluate the effects of explosive materials on the safety of armoured personnel carrier (APC) crew. A four-axis APC was adopted for numerical tests. The basic assumptions adopted to build its model were given. The models of a driver's seat and a seat for landing troops were described. There were also given the coefficients for evaluation of an exposure level for combat vehicles occupants. For modelling, LS-DYNA software was applied. The paper contains the selected results of numerical tests of the effect of explosive charges placed on the side of the vehicle.	https://www.webofscience.com/wos/woscc/full-record/WOS:000472949600013
5	Розрахунок траєкторії за допомогою штучного інтелекту та інерційного вимірювального блоку	AI-IMU Dead-Reckoning. Brossard, M.; Barrau, A.; Bonnabel, S. IEEE TRANSACTIONS ON INTELLIGENT VEHICLES.	In this paper, we propose a novel accurate method for dead-reckoning of wheeled vehicles based only on an Inertial Measurement Unit (IMU). In the context of intelligent vehicles, robust and accurate dead-reckoning based on the IMU may prove useful to correlate feeds from imaging sensors, to safely navigate through obstructions, or for safe	https://www.webofscience.com/wos/woscc/full-record/WOS:000725884000006

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		2020. Volume 5. Issue 4. Page 585-595.	emergency stops in the extreme case of exteroceptive sensors failure. The key components of the method are the Kalman filter and the use of deep neural networks to dynamically adapt the noise parameters of the filter. The method is tested on the KITTI odometry dataset, and our dead-reckoning inertial method based only on the IMU accurately estimates 3D position, velocity, orientation of the vehicle and self-calibrates the IMU biases. We achieve on average a 1.10% translational error and the algorithm competes with top-ranked methods which, by contrast, use LiDAR or stereo vision.	
Системи автоматизованого управління				
1	Прогнозне керування неперервними недоактивними мехатронними системами на основі нейродинаміки	Neurodynamics-Based Model Predictive Control of Continuous-Time Under-Actuated Mechatronic Systems. Wang, JS; Wang, J.; Han, QL. IEEE-ASME TRANSACTIONS ON MECHATRONICS. 2021. Volume 26. Issue 1. Page 311-322.	This article addresses neurodynamics-based model predictive control of continuous-time under-actuated mechatronic systems. The control problem is formulated as a global optimization problem based on sampled data, which is solved by using a collaborative neurodynamic approach. The closed-loop system is proven to be asymptotically stable. Specific applications on control of autonomous surface vehicles and unmanned wheeled vehicles are elaborated to substantiate the efficacy of the approach.	https://www.webofscience.com/wos/woscc/full-record/WOS:000619402600029
2	Адаптивне керування ковзним режимом на основі оптимізації із застосуванням до керування динамікою транспортного засобу	Optimization-based adaptive sliding mode control with application to vehicle dynamics control. Ferrara, A.; Incremona, GP.; Regolin, E. INTERNATIONAL JOURNAL OF ROBUST AND NONLINEAR CONTROL. 2019. Volume 29. Issue 3. Page 550-564.	This paper presents the design of a new adaptive optimization-based second-order sliding mode control algorithm for uncertain nonlinear systems. It is designed on the basis of a second-order sliding mode control with optimal reaching, with the aim of reducing the control effort while maintaining all the positive aspects in terms of finite-time convergence and robustness in front of matched uncertainties. These features are beneficial to guarantee good performance in case of vehicle dynamics control, a crucial topic in the light of the increasing demand of semiautonomous and autonomous driving capabilities in commercial vehicles. The new proposal is theoretically analyzed, as well as verified relying on an extensive comparative study, carried out on a realistic simulator of a 4-wheeled vehicle, in the case of a lateral stability control system.	https://www.webofscience.com/wos/woscc/full-record/WOS:000455519500004
3	Розподіл та оцінка сил для спільного управління транспортом на кількох безпілотних наземних транспортних засобах	Force Distribution and Estimation for Cooperative Transportation Control on Multiple Unmanned Ground Vehicles.	This article presents an effective design of omnidirectional four-mecanum-wheeled vehicles to transport an object and track a predefined trajectory cooperatively. Furthermore, a novel design of the rotary platform is presented for multiple unmanned ground vehicles (m-UGVs) to load objects and provide better maneuverability in confined spaces during cooperative transportation. The number of	https://www.webofscience.com/wos/woscc/full-record/WOS:000732106800001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		Huzaefa, F.; Liu, YC. IEEE TRANSACTIONS ON CYBERNETICS. 2023. Volume 53. Issue 2. Page 1335-1347.	unmanned ground vehicles (UGVs) is adjustable according to the object's weight and size in the proposed framework because transportation is accomplished without physical grippers. Moreover, to minimize the complexity in dealing with the interactive force between the object and UGVs, no force/torque sensor is used in the design of the control algorithm. Instead, an adaptive sliding-mode controller is formulated to cope with the dynamic uncertainties and smoothly transport an object along a desired trajectory. Thus, three external force analyses--gradient projection method, adaptive force estimation, and radial basis function neural network force estimation--are proposed for m-UGVs. In addition, the stability and the performance tracking of the m-UGV system in the presence of dynamic uncertainties using the proposed force estimation are investigated by employing the Lyapunov theory. Finally, experiments on cooperative transportation are presented to demonstrate the efficiency and efficacy of the m-UGV system.	
4	Планування траєкторії руху з віддаленим горизонтом для недостатньо керованих автономних транспортних засобів на основі колаборативної нейродинамічної оптимізації	Receding-Horizon Trajectory Planning for Under-Actuated Autonomous Vehicles Based on Collaborative Neurodynamic Optimization. Wang, JS; Wang, J.; Han, QL. IEEE-CAA JOURNAL OF AUTOMATICA SINICA. 2022. Volume 9. Issue 11. Page 1909-1923.	This paper addresses a major issue in planning the trajectories of under-actuated autonomous vehicles based on neurodynamic optimization. A receding-horizon vehicle trajectory planning task is formulated as a sequential global optimization problem with weighted quadratic navigation functions and obstacle avoidance constraints based on given vehicle goal configurations. The feasibility of the formulated optimization problem is guaranteed under derived conditions. The optimization problem is sequentially solved via collaborative neurodynamic optimization in a neurodynamics-driven trajectory planning method/procedure. Simulation results with under-actuated unmanned wheeled vehicles and autonomous surface vehicles are elaborated to substantiate the efficacy of the neurodynamics-driven trajectory planning method.	https://www.webofscience.com/wos/woscc/full-record/WOS:000866520600006
5	Розробка автономного транспортного засобу для об'їзду перешкод за допомогою стереооцінки глибини та семантичної сегментації на основі штучного інтелекту	Development of an obstacle avoiding autonomous vehicle by using stereo depth estimation and artificial intelligence based semantic segmentation. Ulusoy, U.; Eren, O.; Demirhan, A. ENGINEERING APPLICATIONS OF ARTIFICIAL	In this study, an autonomous vehicle that can avoid obstacles has been developed by using stereo imaging systems and artificial intelligence applications together. An integrated stereo camera module and NVIDIA Jetson Nano developer kit were used as computer vision system. Checkerboard calibration was performed to prevent camera distortions. The images of the cameras were rectified and the difference costs between the left and right image pairs on the same epipolar plane were calculated. These difference costs were passed through the weighted least squares (WLS) filter, thus a depth map of the left camera image was created. The rectified left camera view was also processed	https://www.webofscience.com/wos/woscc/full-record/WOS:001048889000001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		INTELLIGENCE. 2023. Volume 126, 106808.	by artificial intelligence-based semantic segmentation. Segmentation was carried out using a previously trained artificial intelligence network (SegNet). These semantic segmentation outputs were passed through the HSV color mask and a mask image was hereby obtained. Using the mask image; movable ground, obstacle, and background information was extracted. Useful data analysis was performed on the depth map and semantic segmentation outputs of the same frame. This information is transmitted to the 2-wheeled vehicle which is designed based on ROS that provides the movement, and decisions are made within the scope of the avoidance algorithm. This study's novel contribution involves the integration of a passive depth sensing system and artificial intelligence based semantic segmentation, in tandem with a real-time obstacle avoidance algorithm that utilizes these combined technologies. Consequently, the autonomous vehicle is capable of making semantic inferences about its environment while effectively avoiding obstacles.	
Транспорт				
1	Схема адаптивного тактильного спільного керування з урахуванням робочого навантаження для напівавтономного водіння	A workload adaptive haptic shared control scheme for semi-autonomous driving. Luo, RK; Weng, YF; Wang, YF; Jayakumar, P.; Brudnak, MJ; Paul, V.; Desaraju, VR; Stein, JL; Ersal, T.; Yang, XJ. ACCIDENT ANALYSIS AND PREVENTION. 2021. Volume 152, 105968.	Haptic shared control is used to manage the control authority allocation between a human and an autonomous agent in semi-autonomous driving. Existing haptic shared control schemes, however, do not take full consideration of the human agent. To fill this research gap, this study presents a haptic shared control scheme that adapts to a human operator's workload, eyes on road and input torque in real time. We conducted human-in-the-loop experiments with 24 participants. In the experiment, a human operator and an autonomy module for navigation shared the control of a simulated notional High Mobility Multipurpose Wheeled Vehicle (HMMWV) at a fixed speed. At the same time, the human operator performed a target detection task. The autonomy could be either adaptive or non-adaptive to the above-mentioned human factors. Results indicate that the adaptive haptic control scheme resulted in significantly lower workload, higher trust in autonomy, better driving task performance and smaller control effort.	https://www.webofscience.com/wos/woscc/full-record/WOS:000620784500002
2	Оцінка комп'ютерної симуляційної моделі NTVPM для оцінки мобільності військової гусеничної техніки по пересіченій місцевості	Evaluation of the computer simulation model NTVPM for assessing military tracked vehicle cross-country mobility. Wong, JY; Jayakumar, P.; Preston-Thomas, J.	In the United States and some other NATO (North Atlantic Treaty Organization) countries, the NATO Reference Mobility Model is currently used to evaluate military ground vehicle mobility. The module of the NATO Reference Mobility Model for predicting the cross-country performance of military vehicles is empirically based and was developed using test data collected decades ago. The NATO	https://www.webofscience.com/wos/woscc/full-record/WOS:000467252800010

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART D-JOURNAL OF AUTOMOBILE ENGINEERING. 2019. Volume 233. Issue 5. Page 1194-1213.	Reference Mobility Model has inherent limitations, such as the uncertainty whether its empirical relations can be extrapolated beyond the test conditions upon which they were derived or whether it can be used for evaluating new-generation military vehicles. This suggests that there is a need for the development of a physics-based model that takes into account the advancements in terramechanics and modelling/simulation techniques. This paper describes the results of a detailed evaluation of a physics-based model - the Nepean Tracked Vehicle Performance Model - for assessing military tracked vehicle cross-country performance. The performance of a notional tracked vehicle (an armoured personnel carrier) predicted by the latest version of the Nepean Tracked Vehicle Performance Model is compared with test data obtained on sandy terrain, muskeg and snow-covered terrain. The correlations between the predicted and measured performance are evaluated using the coefficient of correlation, coefficient of determination, root mean square deviation and coefficient of variation. The applications of the Nepean Tracked Vehicle Performance Model to predicting the maximum possible vehicle speed (speed-made-good) on a given terrain, the sensitivity of vehicle performance to variations in the values of terrain parameters and the mean maximum pressure are demonstrated. The results of this study indicate that the Nepean Tracked Vehicle Performance Model has potential to form the basis for the development of the next-generation cross-country performance assessment methodology for military tracked vehicles.	
3	Новий клас пристроїв: магнітні зубчасті диференціали для трансмісій транспортних засобів	A New Class of Devices: Magnetic Gear Differentials for Vehicle Drivetrains. Filippini, M.; Torchio, R.; Alotto, P.; Bonisoli, E.; Dimauro, L.; Repetto, M. IEEE TRANSACTIONS ON TRANSPORTATION ELECTRIFICATION. 2023. Volume 9. Issue 2. Page 2382-2397.	Mechanical differentials are essential drivetrain components of automobiles and other wheeled vehicles, allowing the outer drive wheel to rotate faster than the inner drive wheel during turns. This article presents a comprehensive description of a novel and recently patented alternative based on magnetic gears (MGs), which achieves the same functionality while providing distinctive advantages such as reduced maintenance, absence of lubrication, and high efficiency. This article describes the operation principle of such MG differential and two alternative constructive options, provides a dynamic model, which allows the study of the device in driving conditions, presents a description of a prototype, and validates finite-element (FE) simulations with experimental results.	https://www.webofscience.com/wos/woscc/full-record/WOS:001037646700031

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
4	Динамічне моделювання та експериментальна перевірка колісних транспортних засобів з керованими колесами та низькотискними пневматичними шинами на м'якій місцевості	Dynamic modeling and experimental validation of skid-steered wheeled vehicles with low-pressure pneumatic tires on soft terrain. Tang, SX; Yuan, SH; Li, XY; Zhou, JJ. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART D-JOURNAL OF AUTOMOBILE ENGINEERING. 2020. Volume 234. Issue 2-3. Page 840-856.	Wheeled skid-steered technology has an increasing interest in its use for off-road unmanned ground vehicles, because of its great mobility and compact mechanical structure. By integrating multibody dynamics model and semi-empirical tire-terrain model, this paper presents a dynamic modeling approach for skid-steered wheeled vehicles with low-pressure pneumatic tires on soft terrain to predict and investigate its steering performance. The forward dynamics equations are built by spatial vector algebra. The tire-terrain model estimates flexible deformation and sinkage of the tire, and calculates forces and torques exerted on the tire according to relative motions of tire-terrain contact. The combined longitudinal slip and lateral skid of tires, and the vertical coupled deformations of tires and terrain are also considered in tire-terrain model. This approach optimizes the solution procedure and improves the computing efficiency. The simulation results show that the proposed tire-terrain model can predict the effects of rigid and flexible operation modes of tires on mechanical properties of tires and steering performances of the vehicle. The proposed dynamic model is validated on a six-wheeled skid-steered vehicle. The comparisons between experimental results and simulations show that the proposed dynamic model provides a better accuracy of steering performance simulation for skid-steered vehicles.	https://www.webofscience.com/wos/woscc/full-record/WOS:000511536700038
5	Дослідження та аналіз методу редагування спектра навантаження колісної машини на основі короткочасного перетворення Фур'є	Research and analysis of the wheeled vehicle load spectrum editing method based on short-time Fourier transform. Liu, ZK; Peng, C.; Yang, XQ. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART D-JOURNAL OF AUTOMOBILE ENGINEERING. 2019. Volume 233. Issue 14. Page 3671-3683.	The measured uniaxial-head load spectrum in the road simulation test has a large number of useless small loads. When applying the measured load spectrum directly, it will take a lot of time. This paper designs a comprehensive road spectrum measurement system to collect data and proposes a method for editing the uniaxial-head acceleration load spectrum using short-time Fourier transform to speed up the reliability test process and reduce time costs. In this method, the time domain and frequency domain information of the signal is obtained by short-time Fourier transform. The concept of accumulated power spectral density is proposed to identify the reduced load data, and the relative fatigue damage is used as the pass criterion. The length of the edited spectrum is only 66% of the original spectrum through the above-mentioned editing method and retains the relative damage amount of 91%. Finally, through the analysis of time domain, frequency domain, and fatigue statistical parameters, it demonstrates that the short-time Fourier transform-based acceleration load spectrum edition method could achieve a similar fatigue damage to the original spectrum in a shorter time.	https://www.webofscience.com/wos/woscc/full-record/WOS:000496739000008

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
Матеріалознавство				
1	Дослідження коливань корпусу бронетранспортера з використанням методу скінченних елементів	Research of Vibrations of an Armoured Personnel Carrier Hull with FE Implementation. Hryciow, Z.; Malachowski, J. Rybak, P.; Wisniewski, A. MATERIALS. 2021. Volume 14. Issue 22, 6807.	Modern wheeled armoured vehicles can perform a variety of tasks, making the development of weapon systems that can be safely and effectively integrated with the vehicle structure an area of interest. Due to the cost of implementing new models, it is more economical to test potential configurations using numerical methods, such as the finite element method. The numerical model has been validated to confirm the reliability of the obtained results. Modal tests were also performed using four configurations to identify the frequency and mode shape of natural vibrations occurring within the support structure. In an experimental setting, hull vibrations were forced using the modal hammer testing method. The modal assurance criterion (MAC) and the authors' procedure were used to confirm the experimental and numerical test results. Additional testing in the form of impact loads was carried out for turret-containing structures. Structural strain at indicated points and forces transmitted by brackets to the bottom of the hull were compared.	https://www.webofscience.com/wos/woscc/full-record/WOS:000727988000001
2	Експериментальне визначення кривих Менсона-Коффіна для оригінальної нетрадиційної рами транспортного засобу	Experimental Determination of the Manson-Coffin Curves for an Original Unconventional Vehicle Frame. Sága, M.; Blatnicky, M.; Vasko, M.; Dizo, J.; Kopas, P.; Gerlici, J. MATERIALS. 2020. Volume 13. Issue 20, 4675.	This article is divided into two parts-in the first part, authors inform about their testing device that enables the acquisition of results from uniaxial and multiaxial fatigue tests (the bending-torsion combination). We present the approaches used during designing and building the testing device. The direct implementation of the research in the second part will concentrate on implementing the acquired results for the frame design of a vehicle worked out by the authors. The three-wheeled vehicle has the front steered wheel suspended in an unconventional way. This original design can cause an increased load on the vehicle's frame. This can be apparent mainly during driving through curves. Therefore, the fatigue curves of the tested material (EN AW 6063) will be implemented from the point of view of its usability in operation. A vehicle frame is most often loaded by bending and torsion. The authors assess the influence of welding on the fatigue life of this unique unconventional vehicle by determining the fatigue curves of the material for its production. The stresses achieved on the test specimens fully correspond to the load of the frame (in welds) during its operation.	https://www.webofscience.com/wos/woscc/full-record/WOS:000585704500001
3	Застосування легкометалевого сплаву EN AW 6063 у конструкції рами транспортного засобу з	Application of Light Metal Alloy EN AW 6063 to Vehicle Frame	Nowadays the automotive industry is mainly focused on competition, and this fact forces vehicle producers to constantly look for improvements in the areas of quality and reliability. Life-span, flawless	https://www.webofscience.com/wos/woscc/full-

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
	інноваційним механізмом рульового керування	Construction with an Innovated Steering Mechanism. Blatnicky, M.; Sága, M.; Dizo, J.; Bruna, M. MATERIALS. 2020. Volume 13. Issue 4, 817.	operation, and safety are directly interconnected. Therefore, much attention and resources are spent on research factors that affect the stated properties. Significant capital is invested in the optimization of the constructional solutions and innovative material applications related to the safety and durability of the constructions. This paper presents the results obtained while developing a new ecological three-wheeled vehicle. The main research areas were focused on replacing the original material with a light aluminum alloy, while achieving a substantial improvement in drivability for the three-wheeled vehicle by implementing a modified front wheel steering system. The submitted research achieved a weight reduction of the frame by 40 kg by applying light material substitution (EN AW 6063.T66), which will naturally have a positive impact on the range of the designed electric vehicle; furthermore, we implemented an innovative steering mechanism optimized during the experimental operations.	record/WOS:000520419300008
4	Оптимізація частинок яєчної шкаралупи для виробництва екологічно чистих зелених наповнювачів з бамбуковим армуванням в органічних фрикційних матеріалах	Optimization of eggshell particles to produce eco-friendly green fillers with bamboo reinforcement in organic friction materials. Sunardi, S.; Ariawan, D.; Surojo, E.; Prabowo, AR; Akbar, HI; Sudrajad, A.; Seputro, H. REVIEWS ON ADVANCED MATERIALS SCIENCE. 2023. Volume 62. Issue 1, 20230111.	The environment is a very important topic today as well as in the future. One source of air pollution that has the potential to harm health is the wear particles released by vehicle braking systems. If these wear particles come from hazardous materials, they could destroy human health and the environment. Based on these conditions, exploring more environmentally friendly materials to substitute hazardous materials as friction materials is necessary. In this study, brake linings were prepared from bamboo fiber and eggshell (ES) particles with various pre-treatment conditions. The composition of the material frictions consisted of phenolic resin, bamboo fiber, bamboo particles, ES particles, zinc, alumina, and graphite in the following: 35% phenolic resin, 10% graphite, 10% bamboo fiber, 10% alumina powder, 5% zinc powder, and 30% bamboo particles and ESs. This study focused on observing the mechanical and tribological behavior of friction materials when using ES particles as fillers. There are three stages to manufacturing friction material: a cold press, a hot press, and heat treatment. The optimization of the characteristics of ESs as organic brake linings was carried out using the Taguchi method and analyzed using data envelopment analysis-based ranking (DEAR). An interesting finding from this study was that when ES particles were calcined at 900 degrees C for 120 min, the ES particle size was 200 mesh, and the ES volume fraction at 25% resulted in the most optimal brake lining performance. Calcination at 900 degrees C for 120 min	https://www.webofscience.com/wos/woscc/full-record/WOS:001051870400001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			completely changed the CaCO3 phase to CaO. This study also shows that calcined ES particles have the potential to be developed as friction materials for environmentally friendly two-wheeled vehicles in the future. The produced brake linings exhibited hardness, a coefficient of friction, and specific wear rates of 92.82 HR, 0.32, and 4.43 x 10(-6) mm(3)N(-1)m(-1), respectively.	
5	Модель виникнення тріщини в гальмівному барабані	Model of Crack Initiation in a Brake Drum. Askerov, SA. JOURNAL OF FRICTION AND WEAR. 2020. Volume 41. Issue 5. Page 463-469.	In this paper, we perform a theoretical analysis to determine the quantitative relationship between abrasive wear and crack initiation in a brake drum when a wheeled vehicle is braking. Using the model of a rough friction surface, a closed system of algebraic equations that allows one to study cracking in the brake drum depending on the abrasive wear of the friction surface is constructed. The developed model is shown to allow calculating the effect of wear on crack initiation in the brake drum in the design stage.	https://www.webofscience.com/wos/woscc/full-record/WOS:000578445800015
Механіка				
1	Динамічна поведінка композитних листових ресор з в'язкопружними сердечниками	Dynamic behaviors of composite leaf springs with viscoelastic cores. Jolaiy, S.; Yousefi, A.; Mashhadi, MM; Amoozgar, M.; Bodaghi, M. MECHANICS BASED DESIGN OF STRUCTURES AND MACHINES. 2023. Volume 51. Issue 5. Page 2632-2654.	A leaf spring is a simple form of spring commonly used for the suspension in wheeled vehicles. Due to their high strength to weight ratio, high stiffness, and high impact energy absorption, fiber-reinforced composite leaf springs gain considerable interest recently as a potential alternative to conventional leaf springs with relatively high weight. In the present study, a novel composite leaf spring consists of two composite face layers, and a soft and flexible viscoelastic core is proposed. Employing viscoelastic materials in structures reduces undesirable vibrations leading to fatigue and damage of structures. A numerical method is used to design and analyze composite leaf springs with a viscoelastic core using the Abaqus software package. Results are compared with those from well-known analytical methods, finite element methods, and experiments. Results show that the proposed novel composite leaf spring can withstand the stresses caused by static and impact forces, reduce post-impact vibrations, and prevent undesirable system vibrations. The viscoelastic layer increases the strain energy capacity of proposed composite leaf springs compared to conventional composite leaf springs and enhances the composite leaf spring performance against bump impact.	https://www.webofscience.com/wos/woscc/full-record/WOS:000635402100001
2	Чисельний аналіз гідродинамічних характеристик та оптимізація гідрокрилів для амфібійних транспортних засобів	Numerical analysis on hydrodynamic performance and hydrofoil optimization for amphibious vehicles.	A numerical approach is established to study the hydrodynamic performance using an amphibious transport vehicle (ATV) as a research object. Numerical calculation based on the Reynolds average Navier-Stokes method is studied in terms of first layer grid height,	https://www.webofscience.com/wos/woscc/full-record/WOS:001057660000003

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		Pan, DB; Xu, XJ; Liu, BL. PHYSICS OF FLUIDS. 2023. Volume 35. Issue 8, 083330.	surface meshing partition scale, and prismatic layer coefficient. Through uncertainty analysis, the correctness and convergence of the numerical approach are verified. Towing tests are conducted to compare the experimental data with the simulation results, which validated the reliability of the numerical approach under all working conditions. Results show that the numerical approach will affect the simulated results, with an average error of 3.91% for the resistance and 4.21% for the trim, meeting the requirements for analysis accuracy. Based on the proposed numerical approach, an optimization design is carried out to improve the hydrodynamic performance of the ATV. Effects of bow plate angle, stern flap angle, and stern flap install height are studied. Latin hypercube is used for sampling in optimization design, and the Kriging method is applied to establish an approximate model. The cross-validation is carried out using the leave-one-out method. Particle swarm optimization is used for parameter optimization, and the optimized configuration is verified using the numerical approach. Results indicate that the combination of bow plate and stern flap shows excellent improvement in the hydrodynamic performance of amphibious vehicles. Numerical error of the approximate model is only 0.292%, which fully verifies its accuracy and effectiveness. The optimized ATV configuration shows the best drag reduction performance of 38.81% compared to the original model.	
3	Покращення слідування за траєкторією руху бойової машини 8x8 з використанням активних стратегій рульового керування задніми осями	Path-following enhancement of an 8 x 8 combat vehicle using active rear axles steering strategies. Ahmed, M.; El-Gindy, Moustafa Lang, Haoxiang. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART K-JOURNAL OF MULTI-BODY DYNAMICS. 2021. Volume 235. Issue 4. Page 539-552.	Active rear steering has been used in many research work to enhance ground vehicles' lateral stability. However, there is a shortage in the published research studies that consider the incorporation of active rear steering for autonomous vehicles applications, especially in case of multi-axle combat vehicles. In this paper, various H infinity controllers are developed to actively steer rear axles of a multi-axle combat vehicle using a linearized bicycle model. The proposed controllers are incorporated with a 22 degrees of Freedom nonlinear Trucksim full vehicle model to study and compare the developed controllers' performance on a hard surface. Moreover, a frequency-domain analysis is conducted to investigate the influence of the active rear steering on the path-following controllers' robustness in terms of stability and performance. Three path-following controllers are designed, where the first controller is applied on the front two axles of the vehicle, while the rear two axles are fixed. The second is applied to all-wheel steering vehicle. The third controller is an integration between the designed front steering path-following controller and a developed lateral	https://www.webofscience.com/wos/woscc/full-record/WOS:000686972100001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			stability active rear steering controller. Eventually, a series of virtual maneuvers are performed to evaluate the effectiveness of the intended controllers to present the advantages and limitations of each controller at different driving conditions.	
4	Оптимізація опору амфібійного транспортного засобу за допомогою нейронних мереж та генетичних алгоритмів	Amphibious vehicle's resistance optimization through neural networks and genetic algorithms. Liu, BL; Zhang, YF; Pan, DB; Xu, XJ; Cai, T. PHYSICS OF FLUIDS. 2024. Volume 36. Issue 6, 065129.	Amphibious vehicles, as a new type of aquatic and terrestrial transport platform, are increasingly involved in the existing transportation system. Resistance is a key factor that affects the efficiency and energy consumption of vehicles in aquatic sailing. Resistance reduction optimization design is a focal point and challenge in the design process of amphibious vehicles. In this paper, a resistance performance optimization method has been proposed based on neural networks and genetic algorithms. First, key parameters for the shape design are extracted based on a thorough understanding of the vehicle's performance. These parameters are used to construct a parameterized design space. Second, a training set is obtained based on the Latin hypercube sampling method and numerical calculation methods, and a test set is randomly generated. To achieve better resistance prediction performance, a method based on the genetic algorithm-optimized backpropagation Neural Network is proposed. Next, the resistance performance of the two operating conditions is optimized through the non-dominated sorting genetic algorithm II, and optimized configuration parameters are obtained, which has a 22.71% energy-saving ratio at cruising speed. Finally, the optimized configuration is analyzed using numerical calculation methods to validate the resistance prediction and optimization methods.	https://www.webofscience.com/wos/woscc/full-record/WOS:001248259100003
5	Нова надійна комбінована система керування для покращення маневреності, поперечної стійкості та запобігання перекиданню транспортного засобу	A new robust combined control system for improving manoeuvrability, lateral stability and rollover prevention of a vehicle. Saeedi, MA. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART K-JOURNAL OF MULTI-BODY DYNAMICS. 2020. Volume 234. Issue 1. Page 198-213.	This paper presents a new effective method in order to achieve an appropriate performance for a four-wheeled vehicle during different conditions. The main goal of the study is focused on the handling improvement and lateral stability increment of the vehicle using a robust combined control system. First, in order to increase the vehicle's manoeuvrability, an active steering control system is proposed based on the sliding mode control method and using the simplified dynamic model. The tracking of the desired values of the yaw rate and lateral velocity of the vehicle is the main purpose for using the controller. Also, in order for verifying the performance of the sliding mode controller, the linearization feedback control method is used to design the active steering control system. Moreover, to improve the directional stability of the vehicle, a new active roll control system is proposed. In this control system, the roll angle is considered as the state variable as	https://www.webofscience.com/wos/woscc/full-record/WOS:000497145200001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			well as the active anti-roll-bar is utilized as an actuator to generate the roll moment. Then, a 14-degrees-of-freedom nonlinear dynamic model of the vehicle validated using CarSim software is utilized. Afterward, the performance of the designed combined control system is investigated at various velocities. The simulation results confirm that the combined control system has an important effect on vehicle's manoeuvrability improvement and its lateral stability increment, especially during severe transient manoeuvre.	
Телекомунікації				
1	Вплив кормових закрилків на характеристики опору гусеничної амфібійної машини	Influence on Stern Flaps in Resistance Performance of a Caterpillar Track Amphibious Vehicle. Sun, CL; Xu, XJ; (Xu, Xiaojun); Wang, WH; Xu, HJ. IEEE ACCESS. 2020. Volume 8. Page 123828-123840.	In order to reduce the resistance and increasing speed for a caterpillar track amphibious vehicle (CTAV), the stern flaps were applied and the influence was researched. Numerical simulations performed by STAR-CCM+ and model towing test reveal that stern flaps have greatly reduced the resistance, trim, and sinkage of the CTAV when the length Froude number is between 0.63 and 1.05. The length and flap angle were optimized by numerical simulation. In addition, the residual resistance plays a dominant role in resistance reduction, which contributes to more than 90% of the total resistance reduction. Installing stern flaps increase the vehicle waterline by 7% and enhance the virtual-length effect. Furthermore, the running attitude becomes steadier, thereby decreasing the trim and sinkage. Therefore the resistance performance of the CTAV can be enhanced by installing stern flaps with a proper length at an optimal flap angle.	https://www.webofscience.com/wos/woscc/full-record/WOS:000554508600001
2	Аналіз кінематики руху безпілотного транспортного засобу адаптивного до рельєфу місцевості, з кінним приводом і чотирма гідравлічними поворотними важелями	Motion Kinematics Analysis of a Horse Inspired Terrain-Adaptive Unmanned Vehicle With Four Hydraulic Swing Arms. Zhou, XY; He, JL; He, QH; Ren, CJ; Bhushan; He, ML. IEEE ACCESS. 2020. Volume 8. Page 194351-194362.	All terrain vehicles (ATV) perform tasks in unstructured environments where the advanced adaptive ability of rigid terrain has become a key factor. In this article, we propose a novel horse inspired all terrain eight-wheeled vehicle with four swing arms for transportation in the mountain battlefield. The mechanism structure and system configuration of the ATV are designed based on the horse leg kinematics analysis. In order to analyze the obstacle surmounting strategy of the ATV, the kinematics model and the center of gravity of the ATV are represented. A model reference adaptive control method is proposed for the hydraulic attitude control system. Then the model for obstacle surmounting is proposed for dynamics performance and geometric kinematics. Additionally, the simulation is executed in Adams to verify the analysis and strategy. Finally, the experiment is demonstrated for climbing a vertical wall, which is a challenging and typical terrain of the mountain battlefield.	https://www.webofscience.com/wos/woscc/full-record/WOS:000587887200001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
3	Статистичне компресійне зондування та вилучення ознак часо-частотного спектру з вузькосмугового радара	Statistical Compressive Sensing and Feature Extraction of Time-Frequency Spectrum From Narrowband Radar. Ren, K.; Du, L.; Wang, BS; Li, Q.; Chen, J. IEEE TRANSACTIONS ON AEROSPACE AND ELECTRONIC SYSTEMS. 2020. Volume 56. Issue 1. Page 326-342.	Aiming at the signal reconstruction problem for the conventional narrowband radar system, we propose a new statistical compressive sensing (SCS) method to achieve the reconstruction of superresolution time-frequency spectrum from the corrupted time-domain measurement. The proposed method assumes that the signal obeys complex Gaussian distribution and develops a hierarchical Bayesian model. Variational Bayesian expectation maximization (VBEM) is used to perform inference for the posterior distributions of the model parameters. In order to fully exploit the superresolution characteristics of reconstructed spectrum, a novel superresolution time-frequency feature vector is extracted for subsequent classification of ground moving targets, i.e., walking person and a moving wheeled vehicle. Experimental results on measured data show that the proposed reconstruction method can obtain good reconstruction results and the superresolution feature has good classification performance for human and vehicle targets.	https://www.webofscience.com/wos/woscc/full-record/WOS:000515747100023
4	Аналіз та оптимізація мінімальної гідравлічної системи гальмування по електропроводці для колісних транспортних засобів на основі теорії масового обслуговування	Analysis and Optimization of Minimum Hydraulic Brake-by-Wire System for Wheeled Vehicles Based on Queueing Theory. Han, W.; Xiong, L.; Yu, ZP. IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY. 2021. Volume 70. Issue 12. Page 12491-12505.	Based on Queueing Theory, this paper conducts the analysis and optimization of a novel hydraulic brake-by-wire system configuration involving electric-mechanical brake actuators + hydraulic control unit (eActuators + HCU). The functional requirement and topological analysis of frictional brakes are stated. The queueing model is built, providing a theoretical basis to the development of the minimum hydraulic brake-by-wire system involving one eActuator + s valves. Based on the minimum hydraulic brake-by-wire system, the equivalent queueing model is proposed and the evaluation index is defined as average waiting time of wheel cylinder pressure (AWT of WCP). The queueing disciplines are designed and optimized. Integrated-electro-hydraulic brake system (IEHB), a scheme on behalf of the minimum hydraulic brake-by-wire system, is developed and modeled. In accordance to the IEHB physical system, the comparison verifications for the proposed queueing disciplines are conducted via simulations and experiments. The correlation analysis and sensitivity analysis are carried out respectively. Several typical pressure-tracking experiments have been carried out to demonstrate the IEHB control system. This work has two original contributions: 1) The topological and conjoint analysis of the novel hydraulic brake-by-wire system configuration (eActuators+valves) is conducted via Queueing Theory. 2) The performance of the minimum hydraulic brake-by-wire system is improved by using the balanced algorithm, compared with the round-	https://www.webofscience.com/wos/woscc/full-record/WOS:000731151400019

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			robin scheduling algorithm and rotary control algorithm proposed in the previous study.	
5	Швидка та експресивна модель динаміки транспортних засобів для застосування в системах управління та навчання з підкріпленням	An Expeditious and Expressive Vehicle Dynamics Model for Applications in Controls and Reinforcement Learning. Unjhawala, H.; Hansen, T.; Zhang, H.; Caldraru, S.; Chatterjee, S.; Bakke, L.; Wu, JL; Serban, R.; Negrut, D. IEEE ACCESS. 2024. Volume 12. Page 33000-33015.	We present a Vehicle Model (VM) that has 17 degrees of freedom and includes nonlinear tire and powertrain subsystems. Implemented as a relatively small piece of C++ code, the model runs vehicle dynamics 2000 times faster than real time at a simulation time step of 1 x10(-3), s on a single core of a commodity CPU. When executed on the GPU, one can perform 300000 vehicle simulations in real-time. These properties make the model a good candidate for reinforcement learning, model predictive control, model predictive path integral control, path planning, state estimation, and traffic simulation tasks. The model is expressive in that it can capture the dynamics of vastly different vehicles. This is demonstrated by first calibrating the model to mimic the dynamics of a 1/ $6<^>{th}$ scale vehicle called the Autonomy Research Testbed (ART) vehicle, which has a mass of approximately 5.8 kg. Subsequently, the model is calibrated to mimic the dynamics of a heavy-duty High Mobility Multipurpose Wheeled Vehicle (HMMWV), which has a mass of 2097 kg. The Bayesian calibration process discussed can (i) handle real-life measurement noise, and (ii) provide model parameter probability distributions. The vehicle model, which is open source and freely available in a public repository, can also be imported into Python owing to SWIG wrapping.	https://www.webofscience.com/wos/woscc/full-record/WOS:001176924700001
БРОНЬОВАНІ АВТОМОБІЛІ				
Інженерія				
1	Механіка руйнування та поширення втомних тріщин у зварних швах броньової сталі	Fracture mechanics and fatigue crack propagation in armor steel welds. Cabrilo, A.; Sedmak, A.; Burzic, Z.; Perkovic, S. ENGINEERING FAILURE ANALYSIS. 2019. Volume 106, 104155.	The welding process of armor steel is a complex process due to possible welding faults appearing in all zones of weld metal joint in the form of cracks and pores, as results of high percentage of carbon in the base metal. Military armored vehicles, are exposed to dynamic and impact loads. Hence, it is important to know the fracture toughness and fatigue crack propagation in all zones of the weld joint. Fatigue crack propagation testing was made on SEN (B) specimens. Fatigue threshold for weld metal is the lowest Delta Kth = 10.1 MPa*m1/2, and for base metal is the highest Delta Kth = 13.4 MPa*m1/2, while the notch values in HAZ is Delta Kth = 12.6 MPa*m1/2. Due to a significant interest in quantification of material resistance to crack initiation and propagation, the fatigue crack growth rate was measured	https://www.sciencedirect.com/science/article/abs/pii/S1350630719305606?via%3Dihub

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			in the base metal, HAZ and welded metal zone. Accordingly, the most important attention should be paid to the zone of the base metal, while the weld metal and HAZ are safe zones.	
2	Нелінійний аналіз динаміки та стійкості демпфера сухого тертя для надкритичного трансмісійного вала	Nonlinear dynamics and stability analysis of dry friction damper for supercritical transmission shaft. Wang, D.; Song, LY; Zhu, RP; Cao, P. NONLINEAR DYNAMICS. 2022. Volume 110. Issue 4. Page 3135-3149.	Supercritical transmission shafts-those which have one or more critical speeds below their operation speeds-are becoming more popular in new armored vehicle and rotorcraft designs. To suppress the excessive transcritical vibration, dry friction damper is a prevailing choice. In this paper, we focus on the nonlinear dynamics, stability and bifurcation mechanism of the dry friction damper for supercritical transmission shaft. The harmonic balance method with alternating frequency-/time-domain technique (HB-AFT) and the numerical path continuation is employed to solve the nonlinear governing equations of the shaft/damper system where the rub-impact and dry friction phenomena are involved. The stability and bifurcation points of the solution branch are further determined with the help of Floquet theory. Besides, the effects of three damper parameters, that is, the clearance, the critical slip force and the circumferential friction coefficient, are investigated. Finally, prototypes of the dry friction damper are designed, manufactured and tested on a high-speed rotor dynamics test rig. The theoretical findings are in general agreement with the experimental results.	https://link.springer.com/article/10.1007/s11071-022-07795-8
3	Покращення характеристик проти відколу обшивки за допомогою інтелектуального застосування рідин	Improvement of spall liner performance with smart fluid applications. Guergen, S.; Kushan, MC. THIN-WALLED STRUCTURES. 2022. Volume 180, 109854	Shear thickening fluid (STF) treated textiles have been widely used in anti-impact structures in recent years. STF treatment provides an enhanced energy absorbing capacity for textiles due to increased yarn interactions within the structures. Adjacent yarns around the impact point contribute to energy distribution to far-fields. STF treated textiles show great efficiency in terms of protection even being hit at single point. From this viewpoint, these structures are expected to exhibit higher efficiencies under multi-point impacts because of their energy dissipation capabilities by the contribution of far-fields. On this basis, STF treated aramid fabrics were adapted to a secondary protective structure, namely spall liner for the first time in this study. Spall liner restrains emission of spalling pieces inside an armored vehicle and being subjected to multi-point impacts when armor is perforated by an impacting threat. In this work, STF rheology was investigated in rheological measurements. Yarn pull-out tests were carried out to investigate the effect of STF treatment on yarn interactions. To increase the yarn coupling in textiles, various amounts of silicon carbide (SiC) particles were also included in the STF treatments. A metal plate,	https://www.sciencedirect.com/science/article/abs/pii/S0263823122005249?via%3Dihub

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			which was impacted by a projectile in ballistic testing, was used in front of the spall liners to produce spalling pieces. The performance of the spall liners was evaluated by measuring the angle of spall emissions at the back face of the spall liners. According to the results, STF treatments enhanced yarn interactions within the spall liners. Carbide additives led to a further increase in this mechanism. For this reason, angle of spall emission was reduced from 16.9? to 10.5? by treating neat textiles with STF. This metric was restricted to 8.8? in the carbide included spall liners. By designing a 90 mm gap between the spall liner and metal plate, emission angle was lowered to 5.7?.	
4	Чисельне дослідження гідродинамічних характеристик амфібійних колісних броньованих автомобілів	Numerical investigation on the hydrodynamic performance of amphibious wheeled armored vehicles. Jang, JY; Liu, TL; Pan, KC; Chu, TW. JOURNAL OF THE CHINESE INSTITUTE OF ENGINEERS. 2019. Volume 42. Issue 8. Page 700-711.	Wheeled armored vehicles (WAVs) are designed for military applications, but they are frequently used in special disaster relief missions during floods caused by severe global climate change. To tackle threats arising from environmental change, developing WAVs with amphibious functions will inevitably become a trend in the future. The purpose of this study is to investigate the hydrodynamic performance of WAVs. An existing WAV model is adopted as a starting point, and computational fluid dynamic (CFD) techniques are used for performing analyses. This study analyzes the relationship between the configuration of a WAV and the sailing resistance. Two computation modes are associated with CFD used for flow simulation around the vehicles: the relative motion and absolute motion computation modes. The results of the simulations obtained through these two modes have been discussed and compared to develop an efficient tool for performing hydrodynamic performance analysis of amphibious wheeled armored vehicles (AWAV).	https://www.tandfonline.com/doi/full/10.1080/02533839.2019.1660225
5	Згорткова нейронна мережа з множинною регресією для оцінки кількох параметрів на основі загальних даних в оберненій задачі теплопередачі	A Multiple Regression Convolutional Neural Network for Estimating Multi-Parameters Based on Overall Data in the Inverse Heat Transfer Problem. Zhu, FD; Chen, JC; Han, YG. JOURNAL OF THERMAL SCIENCE AND ENGINEERING APPLICATIONS. 2022. Volume 14. Issue 5, 051003.	The inverse heat transfer problem (IHTP) is a central task for estimating parameters in heat transfer. It is ill-posedness that is characterized by instability and non-uniqueness of the solution. Recently, novel algorithms using deep learning (DL) and neural networks have been applied to various sparse data in the IHTP. In order to overcome the optimization problem of input nodes under sparse data, we try to use the overall data of the target as the basis for inversion. In this work, we used a multiple regression convolutional neural network (MRCNN) to estimate multi-parameters in the IHTP. Computational fluid dynamics and DL are fused to provide datasets for training of the proposed model. The proposed model was verified by experiments with a cubic cavity. Additionally, the MRCNN model was used to	https://asmedigitalcollection.asme.org/thermalscienceapplication/article-abstract/14/5/051003/1114754/A-Multiple-Regression-Convolutional-Neural-Network?redirectedFrom=fulltext

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			predict the different parameters of the more complex armored vehicle model. The results showed that the model has good prediction accuracy for estimating multi-parameters on different datasets. These attempts of introducing convolutional neural network to the IHTP in the present study were successful and it was significant for the study of the IHTP of estimating multi-parameters.	
Інформатика				
1	Аналіз дерева відмов гідравлічної системи на основі інтервальної моделі з використанням латинської гіперкубічної дискретизації	Fault tree analysis of a hydraulic system based on the interval model using latin hypercube sampling. Zhang, F.; Cheng, L.; Gao, Y.; Xu, XY; Wang, YM. JOURNAL OF INTELLIGENT & FUZZY SYSTEMS. 2019. Volume 37. Issue 6. Page 8345-8355.	There will inevitably be failures during the use of hydraulic systems in armored vehicles because of the detrimental environments in which they operate. In order to improve the reliability of such hydraulic systems, a fault tree model of top event 'hydraulic system failure' is established and analyzed in this study according to the system arrangement and potential fault mechanisms. To properly consider the uncertain probability of each basic failure event in the system, it is necessary to overcome the limitations of the traditional fault tree model. Accordingly, in this study, the importance of the basic event probability interval in describing the failure probability of the top event (hydraulic system failure) was calculated using Latin hypercube sampling through interval modeling. This method offers significant benefits for the reliability assessment of hydraulic systems and can be used to provide guidance for improving system reliability.	https://www.webofscience.com/wos/woscc/full-record/WOS:000504477400097
2	Вибір бронеавтомобілів на колесах для бразильської морської піхоти з використанням PrOPPAGA	Choice of armored vehicles on wheels for the Brazilian Marine Corps using PrOPPAGA. Santos, FB; Santos, M. 8TH INTERNATIONAL CONFERENCE ON INFORMATION TECHNOLOGY AND QUANTITATIVE MANAGEMENT (ITQM 2020 & 2021): DEVELOPING GLOBAL DIGITAL ECONOMY AFTER COVID-19. 2022. Volume 199. Page 301-308	The use of armored vehicles in military operations increases the mobility of the troops, allowing the amphibious combatant to have ensured the application of basic principles of war, such as concentration, offensive, and surprise. This article aims to support the choice of an armored vehicle on wheels for the Brazilian Marine Corps (BMC) by applying the method Priority Observed from the Presumption of Gaussian Attitude of Alternatives (PrOPPAGA) for this. With the application of the method, it was possible to point out one, among four options, as the most appropriate to the wishes of the BMC. Having as contributions to society the structuring of the support for the choice of an operational means that will impact on the Doctrine of Defense of the BMC, ensuring speed and power of shock to the troop that will make use of it. The result was validated by comparing with the results obtained with the application of the methods Analytic Hierarchy Process (AHP) and Preference Ranking Organization Method for Enrichment Evaluations II (PROMETHEE II).	https://www.webofscience.com/wos/woscc/full-record/WOS:000765802100038

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
3	Проектування та моделювання автономної системи керування військовими бронеавтомобілями на основі машинного зору та узгодженого підходу до руху	Design and simulation of autonomous military vehicle control system based on machine vision and ensemble movement approach. Ahmadi, KD; Rashidi, AJ; Moghri, AM. JOURNAL OF SUPERCOMPUTING. 2022. Volume 78. Issue 15. Page 17309-17347.	On the battlefield, early detection of armored vehicles can have a positive effect. Because according to this issue, timely and appropriate reactions can be done. The purpose of this study is to achieve the required algorithm in the vehicle control system by considering the car sensor vision, which is necessary to identify and determine the equipment needed to control the military drone based on car sensor vision. Today, the use of wireless networks, especially inter-vehicle wireless networks, in military applications is inevitable. Therefore, in the first step of this research, a new method has been proposed to control and steer unmanned vehicles based on car vision. In the proposed method, two 180-degree panoramic cameras with horizontal vision are used from the recorded images. The simulation results of the proposed method show increased accuracy and reduced implementation cost compared to using LIDAR and RADAR technologies. In the second step, a new approach is introduced to identify four common classes of armored vehicles (tanks, personnel carriers, firing tanks, and military vehicles) that are more likely to be present on battlefields. For this purpose, the latest image processing methods, which is deep learning, have been used. The results of the simulation of the proposed approach show the high accuracy of the proposed approach in detecting armored vehicles in a short time. In the third step of this research, a new method has been proposed to increase the connection of wireless networks. In the proposed method, queue theory is used and the results of the simulation of the proposed method show the high efficiency of the method. As a result, accurate and fast detection with unique features makes the users of the system superior.	https://www.webofscience.com/wos/woscc/full-record/WOS:000796806200001
4	Система оцінки когнітивних здібностей екіпажів бронеавтомобілів в режимі реального часу на основі об'єднання інформації з багатьох джерел	A Real-time Assessment System for Cognitive Performances of Armored Vehicle Crews Based upon the Multi-source Information Fusion. Huang, QY; Guo, MY; Wei, YN; Sun, HJ; Zhang, JY; Xie, F.; Jin, XP. INTERNATIONAL JOURNAL OF HUMAN-COMPUTER INTERACTION.	In the human-machine system of armored vehicles, the cognitive performance state of crews is crucial for the personnel security and combat efficiency. The purpose of this research was to establish a real-time assessment system for cognitive performances of armored vehicle crews, consisting of the data input module, data processing module, data visualization module, and scheduling module. Forty subjects were recruited to cooperate and execute the cross-platform strike task in a virtual simulation platform. The physiological data and operation behavior data was collected during the experiment process. To realize the accurate classification of different cognitive performance states, a multi-source information fusion algorithm was	https://www.webofscience.com/wos/woscc/full-record/WOS:001214730100001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		2024. Volume 41. Issue 2. Page 932-950.	developed based on linear discriminant analysis (LDA) and D-S evidence theory, which included the information collection module, the feature extraction module, and the information fusion module. The results indicated that there existed a significant correlation between the extractive feature indicators (i.e., EOG, ECG, and task performance indicators) and the cognitive performance. The recognition accuracy and the data efficiency of the proposed assessment system were 91.25% and 96.69% respectively by using the complementarity of different evidences, which were higher than the others using partial information sources. This study can provide a reference for the comprehensive assessment of cognitive performance of human operators in military and industrial domains.	
5	Метод розподілу та визначення послідовності завдань екіпажу з урахуванням розподілу робочого навантаження та мінімального часу виконання завдань	A crew task allocation and sequencing method considering workload distribution and minimum task completion time. Sun, JH; Yu, SH; Chu, JJ; Cun, WZ; Wang, HY; Chen, C.; Li, FL; Huang, YX. KYBERNETES. 2024.	PurposeIn situations where the crew is reduced, the optimization of crew task allocation and sequencing (CTAS) can significantly enhance the operational efficiency of the man-machine system by rationally distributing workload and minimizing task completion time. Existing related studies exhibit a limited consideration of workload distribution and involve the violation of precedence constraints in the solution process. This study proposes a CTAS method to address these issues.Design/methodology/approachThe method defines visual, auditory, cognitive and psychomotor (VACP) load balancing objectives and integrates them with workload balancing and minimum task completion time to ensure equitable workload distribution and task execution efficiency, and then a multi-objective optimization model for CTAS is constructed. Subsequently, it designs a population initialization strategy and a repair mechanism to maintain sequence feasibility, and utilizes them to improve the non-dominated sorting genetic algorithm III (NSGA-III) for solving the CTAS model.FindingsThe CTAS method is validated through a numerical example involving a mission with a specific type of armored vehicle. The results demonstrate that the method achieves equitable workload distribution by integrating VACP load balancing and workload balancing. Moreover, the improved NSGA-III maintains sequence feasibility and thus reduces computation time.Originality/valueThe study can achieve equitable workload distribution and enhance the search efficiency of the optimal CTAS scheme. It provides a novel perspective for task planners in objective determination and solution methodologies for CTAS.	https://www.webofscience.com/wos/woscc/full-record/WOS:001236086800001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
Системи автоматизованого управління				
1	Дослідження впливу шуму на розумове навантаження екіпажу під час обробки інформації	Study on the Effects of Noise on Crew's Mental Workload in Information Processing. Zhao, KX; Liu, WP; Fu, BH; Nie, JF. MAN-MACHINE-ENVIRONMENT SYSTEM ENGINEERING. 2019. Volume 527. Page 393-399.	In order to study the effects of noise on the mental workload of armored vehicle crews, the message transmittal task test is conducted with subjective evaluation results and task's error rate as indicators. The experimental results show that during the 60 min exposure to noise, compared with control group, subjective evaluation results of subjects increased with the increase of noise intensity, but the increase of the subjective evaluation results decreased as noise intensity increased; the error rate of control group was lower than that of the noise group, and the error rate increased with the increase of noise intensity. To sum up, noise has a certain impact on crew's mental workload, and mental workload of crew increases with the increase of noise intensity. When noise reaches a certain level, it has no significant influence on crew's mental workload.	https://www.webofscience.com/wos/woscc/full-record/WOS:000465511400045
2	Відчутна віртуальна реальність у багатокористувацькому середовищі	Tangible Virtual Reality in a Multi-User Environment. Bielecki, K.; Bloch, M.; Schmidt, R.; Hernandez, DL; Baltzer, M.; Flemisch, F. 11TH INTERNATIONAL ACM CONFERENCE ON AUTOMOTIVE USER INTERFACES AND INTERACTIVE VEHICULAR APPLICATIONS, AUTOMOTIVEUI 2019. Page 76-80.	Due to more and more recent technologies, better simulations can be developed, which can create a greater fusion between the real and virtual world and thus, also generate a higher degree of immersion. Higher levels of immersion can provide meaningful and realistic results and faster integration and assessment of new concepts (e.g. design-concepts). For this, a tangible VR simulator based on an armored vehicle driver's workplace has been developed. With this simulator, the user can interact not only with the VR (virtual reality) world but also with reality. Changes in reality mean changes in the VR world at the same time. Also, first concepts for an expansion to several workstations, which can interact with each other, are currently being developed.	https://www.webofscience.com/wos/woscc/full-record/WOS:001423002400013
3	Дослідження розробки методу стабілізації повороту для важкого двоосьового карданного підвісу	Study on the Development of Yaw Stabilization Control Technique for Heavy Weight 2-axis Gimbal. Yoon, Y.; Lee, DH; Chung, YH; Oh, S. INTERNATIONAL JOURNAL OF CONTROL AUTOMATION AND SYSTEMS. 2024. Volume 22. Issue 12. Page 3673-3683.	This study develops a stabilization control algorithm for a heavy weight yaw/pitch 2-axis gimbal. First, the 6 degree-of-freedom (DOF) equation of motion is derived and then mechanical constraints are applied to establish the motion equation of the 2-axis gimbal. Second, the stabilization control algorithm is divided into an outer loop and an inner loop. The disturbance observer (DOB) and the adaptive neural network (ANN) are applied to outer loop and inner loop, respectively. The outer loop uses the angular velocity measured by the inertial measurement unit (IMU) sensor, and the inner loop uses the angular velocity measured by the encoder sensor. The angular velocity of the platform on which the 2-axis gimbal is mounted is calculated using the	https://www.webofscience.com/wos/woscc/full-record/WOS:001374439500015

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			angular velocity measured by the IMU sensor and the angular velocity measured by the encoder sensor. The calculated value from the outer loop is converted to angular rate command of inner loop. Finally, the performance of stabilization control algorithm for heavy 2-axis gimbal is confirmed by experiment after mounting a heavy 2-axis gimbal to 6 DOF motion platform. This research is expected to have an impact on the development of turrets used in armored vehicles and tanks.	
4	Дослідження впливу шуму на здатність екіпажу до мислення	Study About the Effects of Noise on Crew's Thinking Ability. Zhao, KX; Liu, WP; Fu, BH; Yang, B. 2019. Volume 527. Page 401-407.	In order to study the effects of noise on the thinking performance of armored vehicle crews, the typical information processing task test is conducted based on the performance indicators of correctness and reaction time. The experimental results show that during the 60-min exposure under noisy condition, the accuracy rate of the subjects did not change significantly compared with the control group, while the reaction time performance and comprehensive performance decreased significantly. The comprehensive performance of subjects decreased with the increase of noise intensity, but the decrease was reduced with the increase of noise intensity. To sum up, noise has a certain impact on crew's thinking performance, and crew's performance decreases with the increase of noise intensity. When noise reaches a certain level, it has no significant effect on crew's performance, indicating that noise has an impact on crew's thinking ability.	https://www.webofscience.com/wos/woscc/full-record/WOS:000465511400046
5	Проектування системи керування для портативного випробувального обладнання для запуску/зупинки на місці	Design of Control System for Portable On-Site Start-Stop Test Equipment. Niu, YT; Yang, B.; Zhao, L. IFAC PAPERSONLINE. 2024. Volume 58. Issue 29. Page 1-6.	The armored vehicle power compartment is an organic complex that includes various components and subsystems that generate, convert, transmit, consume and manage the energy required for the vehicle to travel. Given the large size, heavy weight, and complex structure of the power compartment, and the fact that most armored vehicles operate in remote areas, there is a need for high-efficiency testing in the field of modern special equipment. To address this, this paper focuses on the armored vehicle power compartment and designs a portable in-situ start-stop test tooling control system, tailored to actual engineering needs. The control system, paired with a corresponding power supply and distribution battery cabinet, controls the armored vehicle's power compartment. It employs STM32F407VET6 and SPC560P50L3BEABR as the core microcontrollers. Voltage output from the power supply and distribution battery cabinet is managed via the CAN bus to ensure precise, point-to-point power delivery to the motors in the power compartment. Subsequently, control instructions and test cases are transmitted to the motors using the FlexRay bus.	https://www.webofscience.com/wos/woscc/full-record/WOS:001387828000001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			Real-time data on the power compartment's operating parameters are collected to enable users to analyze any discrepancies between the actual and expected outputs of the power compartment, thus facilitating convenient and efficient performance testing.	
Транспорт				
1	Оптимальне проектування захисних компонентів бронеавтомобілів при вибуховому впливі	Optimal design of armored vehicle protective components under blast impact. Li, MX; Fu, TQ; Wang, XH; Qin, WW; He, JH; Yao, TZ; Sun, XW; Wu, MY. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART D-JOURNAL OF AUTOMOBILE ENGINEERING. 2024. Volume 239. Issue 10-11. Page 4785-4801.	Traditional protective structure optimization design processes do not often consider uncertainty factors, such as structural dimensions. This causes the optimization results to be near the constraint boundaries and leads to insufficient reliability and robustness of the design. In this study, an accurate finite element model was obtained for armored vehicle protective component design through a physical explosion test and a simulation of the whole vehicle. Subsequently, uncertainty optimization, reliability optimization, and robustness optimization were introduced into the optimization process, and the uncertainty optimization results were analyzed and compared for different constraint degrees. The results show that the reliability of the results obtained from traditional deterministic optimization was low. Introducing the reliability optimization and robustness optimization design methods into the protective component design significantly improved the reliability of the protective component results.	https://www.webofscience.com/wos/woscc/full-record/WOS:001318803500001
2	Покращення стабільності куленепробивного автомобіля за допомогою модифікованої системи підвіски	Improving the stability of a bulletproofed vehicle using modified suspension system. Sharaf, AM; Yacoub, MI; Elhefnawy, AA. PROCEEDINGS OF THE ASME INTERNATIONAL DESIGN ENGINEERING TECHNICAL CONFERENCES AND COMPUTERS AND INFORMATION IN ENGINEERING CONFERENCE, 2019, Volume 3.	Bulletproof or high-class protected VIP vehicles are widely produced based on particular types of OEM (Original Equipment Manufacturer) commercial vehicles. The arising implications of increasing the level of protection of such vehicles have reflected several negative consequences on the vehicle directional stability. This is obviously true, since adding extra armored plates will increase both gross vehicle weight and the height of its center of gravity. Additionally, such vehicles are normally driven at higher speeds during critical evasive maneuvers. The proper selection of suitable suspension system in terms of spring, shock absorber and anti-roll bar for front and rear axles will contribute to the overall vehicle stability. This paper presents both theoretical and experimental investigation to upgrade the suspension system of a particular bulletproof vehicle in order to improve its stability during high-speed cornering maneuvers. For this purpose, six kits of nominated suspension systems have been tested in order to measure their stiffness and damping characteristics. Furthermore, for each suspension kit, the considered	https://www.webofscience.com/wos/woscc/full-record/WOS:000518880100002

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			bulletproofed vehicle is fully assessed in CarSim (R) simulation environment. In-order to check the gained simulation results, typical field tests of the fully instrumented vehicle along with the modified suspension kit. From both simulation and field tests, a suitable kit for front and rear suspension system as well as braking system has been recommended not only to carry the additional weight of the heavy armored body but also to maintain the vehicle stability within their allowable limits.	
3	Дослідження щодо покращення акустичних характеристик колісних броньованих командних машин	A Study on the Improvement of Acoustic Characteristics of Wheeled Armored Command Vehicles. Kim, MW; Moon, SM; Kim, HB. INTERNATIONAL JOURNAL OF AUTOMOTIVE TECHNOLOGY. 2024. Volume 25. Issue 5. Page 977-988.	The acoustic characteristics of Wheeled Armored Command Vehicles (WACV), a wheel-driven military combat vehicle, were improved by applying sound absorption materials. An analysis program was developed using index that can objectively evaluate the S&R (Squeak & Rattle) perceived subjectively by passengers, and the improvement of S&R and noise level at each stage of the study was confirmed. After the sound absorption material was selected in the material unit through analytical and experimental method based on Biot theory, the degree of improvement in acoustic characteristics during driving was evaluated while installing it in the vehicle. After installing the sound absorption materials on the partition wall of the engine room in the vehicle hull structure state, the vehicle was assembled and installed in the order of the interior top, side, and driver's cabin, and finally, engine encapsulation was performed to shield the engine surface with sound absorption materials. Through a series of processes, the noise level was improved by 8.76 dBA and S&R level by 9.64, and it was confirmed that the engine cooling performance was not deteriorated by the engine encapsulation through a temperature test using thermocouples.	https://www.webofscience.com/wos/woscc/full-record/WOS:001230120100001
4	Аналіз конструкції та експлуатаційних характеристик нового адаптивного електромагнітного амортизатора легкого ротора для броньованих автомобілів	Design and Performance Analysis of a New Lightweight Rotor Adaptive Electromagnetic Shock Absorber for Armored Vehicles. Zhao, T; Li, DS; Ye, LZ; Guo, BZ; Li, ZQ; Ma, TX. INTERNATIONAL JOURNAL OF AUTOMOTIVE TECHNOLOGY. 2023. Volume 24. Issue 3. Page 643-654.	In order to solve the problem of the large moment of inertia of the existing rotating electromagnetic shock absorber for armored vehicles, a new lightweight rotor adaptive electromagnetic shock absorber (LR-AESA) is proposed in this paper. The LR-AESA consists of the left and right symmetrically distributed stators, a rotor in the middle and excitation coils. Secondly, based on the equivalent magnetic circuit method (EMC) and the Ampere loop theorem, and the interaction of the reaction magnetic fields between adjacent eddy current rings and the nonlinear effect of the interaction between the eddy current field and the original magnetic field are further considered, the air gap magnetic field distribution of the LR-	https://www.webofscience.com/wos/woscc/full-record/WOS:000986416000004

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			AESA of the 10# steel rotor and the copper rotor at different speeds is derived, and the analytical expression of the damping torque is obtained. Finally, the validity of the analytical model was verified by comparison with results from the 3-D finite element method (FEM). The results show that the LR-AESA of the two material rotors can meet the requirements of technical indicators, but in the full speed section (200 similar to 2000 rpm), the copper rotor has the advantage of a wider range of the damping torque adjustment.	
5	Чисельний аналіз покращення захисту від вибуху кабіни броньованого автомобіля за допомогою композитної броні та протиударних сидінь	Numerical Analysis of Blast Protection Improvement of an Armored Vehicle Cab by Composite Armors and Anti-Shock Seats. Dong, YP; Lu, ZH. SAE INTERNATIONAL JOURNAL OF COMMERCIAL VEHICLES. 2019. Volume 12. Issue 1. Page 5-17.	The objective of this article is to evaluate the effects of different blast protective modules to military vehicle structures and occupants. The dynamic responses of the V-shape integral basic armor, the add-on honeycomb sandwich structure module, and the anti-shock seat-dummy system were simulated and analyzed. The improvements of occupant survivability by different protective modules were compared using occupant injury criteria. The integral armored cab can maintain the integrity of the cab body structure. The add-on honeycomb sandwich armor reduces the peak structural deformation and velocity of the cab floor by 34.9% and 47.4%, respectively, compared with the cab with integral armors only. The integral armored cab with the anti-shock seat or the honeycomb sandwich structures reduces the occupant shock responses below the injury criteria. For different blast threat intensities, the selection of appropriate protective modules can meet protection requirements.	https://www.webofscience.com/wos/woscc/full-record/WOS:000467273000001
Матеріалознавство				
1	Динамічна перфорація легкої броні: температурно-залежна пластичність та руйнування алюмінію 7020-T6	Dynamic perforation of lightweight armor: Temperature-dependent plasticity and fracture of aluminum 7020-T6. Roth, CC; Fras, T.; Mohr, D. MECHANICS OF MATERIALS. 2020. Volume 149, 103537.	The design of armored vehicles requires reliable constitutive models that are valid over a wide range of strain rates and temperatures. A comprehensive experimental program is executed to characterize the stress-strain response of high strength aluminum 7020-T6 at temperatures ranging from 20 degrees C to 320 degrees C. It includes tensile experiments on uniaxial, notched, central hole and shear specimens. Aside from low and intermediate strain rate experiments, high strain rate experiments are performed on a Split Hopkinson Pressure Bar (SHPB) system equipped with a load inversion device. Furthermore, hemispherical punch and V-bending experiments are performed to achieve equi-biaxial tension and transverse plane strain conditions. It is found that a Yld2000-3d plasticity model with isotropic strain hardening and thermal softening is suitable to describe the large	https://www.webofscience.com/wos/woscc/full-record/WOS:000567348200001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			deformation response, while a rate- and temperature-independent Hosford-Coulomb model is used to predict fracture. Impact experiments are performed on 4 mm thick targets with blunt, hemispherical and conical steel projectiles of 8 mm diameter and a mass of 13.8 g. The impact velocity is varied such that the full spectrum from the ballistic limit to complete penetration can be characterized. In addition, perpendicular and oblique configurations are considered. Numerical simulations are performed for all experiments confirming the validity of the identified constitutive model and providing unmatched insight into the dynamic penetration failure mechanism.	
2	Ємнісне зондування для виявлення нерівностей плиток у керамічних броньових масивах	Capacitive sensing for the detection of tile misalignment in ceramic armor arrays. Genest, M.; Krys, D.; Mandache, C. NDT & E INTERNATIONAL. 2020. Volume 112, 102261.	The capacitive nondestructive technique uses a planar, two- or multi-terminal device to detect dielectric changes in its proximity. The technique has the advantages of being non-contact and requiring single-side access to the inspected test-piece. In this work, it is employed to determine the misalignment of ceramic tiles in two-dimensional array arrangements, as used for armored vehicles. Ceramic materials provide protection against projectile penetration in military and security applications. Tile assemblies are manufactured as protective add-on layers to armored vehicles. To provide effective protection, arrangements of rectangular or hexagonal tiles have to minimize potential misalignment, such as inter-tile gaps and out-of-plane mismatch. In this study, three planar capacitive probes with triangle-shaped terminals are used for the investigation of linear arrays of rectangular alumina tiles. Numerical simulations were employed to understand the probe's design parameters, as well as coupling aspects. It was found that the size of the capacitive probe and the separation between terminals provide a balance between spatial resolution, penetrability, and sensitivity to dielectric changes. Inter-tile gaps down to at least 0.5 mm, as well as out-of-plane tile misalignment as small as 0.25 mm were successfully discriminated.	https://www.webofscience.com/wos/woscc/full-record/WOS:000524367000003
3	Удосконалені системи композитного броньового захисту для військових автомобілів: методологія проектування, балістичні випробування та порівняння	Advanced composite armor protection systems for military vehicles: Design methodology, ballistic testing, and comparison. Tsirogiannis, EC; Daskalakis, E.; Vogiatzis, C.; Psarommatis, F.; Bartolo, P. COMPOSITES SCIENCE AND	This study presents a new methodology for designing, manufacturing, and testing advanced armor protection systems and applied to the development of three different protection solutions suitable for real armored vehicles. The backplate laminates of the presented composite armor protection solutions were composed of three different materials: steel, aluminum AA6082, and aluminum alloy AA2024 reinforced by multi-walled carbon nanotubes (MWCNTs). The frontal laminates remained the same for the three cases. Keeping almost the	https://www.webofscience.com/wos/woscc/full-record/WOS:001222772800001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		TECHNOLOGY. 2024. Volume 251, 110486.	same mass while changing the material of each backplate and adapting the thickness, the three different protection systems were ballistically tested and compared according to Level 4 (Level IV) of the standard AEP-STANAG 4569 (projectile 14.5 mm x 114 mm API B32) with real military tests. Furthermore, the performance of the total laminated structure and the performance of each backplate in the total laminated structure were compared in terms of deformation and ballistic fractures. High-quality images acquired by the high-speed camera were helpful in evaluating and comparing the backplates and the entire protection system. The results show that all three protection configurations present high performance mechanical properties and ballistic characteristics compared to commonly used armor systems. Even the under-developed AA2024-CNTs composite is a promising near-term backplate solution.	
4	Балістичні характеристики однонаправлено орієнтованої композитної броні, посиленої вуглецевим волокном, при високошвидкісному ударі	Ballistic performance of unidirectionally oriented carbon fiber reinforced composite armor with high-velocity impact. Kacan, YO; Elaldi, F. JOURNAL OF REINFORCED PLASTICS AND COMPOSITES. 2020. Volume 39. Issue 19-20. Page 733-741.	For the last few decades, composite materials have been more popular than other conventional metal materials in the aircraft industry. Having better mechanical properties (strength, fatigue life, impact strength, corrosion resistance, etc.) and being lighter than conventional engineering materials, composites have become very important in defense industry as well. In spite of the fact that some of the composite materials such as aramid-based composites have been effectively used in body protection, they have not been so successful in heavy armored vehicles which are generally equipped with different types of add-on armor blocks for protecting against threats. These add-on armors are mostly composed of armor steels and ceramics. This study specifically aims to investigate high-velocity impact behavior of unidirectionally oriented carbon fiber reinforced/epoxy layer sandwiched with armor steel plates that are exposed to kinetic energy projectile. Carbon fibers are normally very brittle to transverse loading direction, contrarily, to its axial tension or compression direction. This is the reason why it is claimed that this high compression strength property of carbon fibers could be used for manufacturing a layer in order to replace ceramics in add-on multilayer composite armor. In order to prove this hypothesis, an experimental analysis has been carried out by performing impact tests on these manufactured add-on armor test samples. Testing was carried out in accordance with the STANAG 4569 level-4 standard. The results indicated that the multilayer carbon fiber reinforced epoxy composite-armor steel hybrid panels can provide level-4 protection with a lower areal density compared to Rolled Homogenous Armor.	https://www.webofscience.com/wos/woscc/full-record/WOS:000539289700001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
5	Порівняльне дослідження балістичних характеристик та механізмів руйнування високоазотної сталі та катаної гомогенної броньованої сталі проти проникнення важких вольфрамових сплавів	A Comparative Study on the Ballistic Performance and Failure Mechanisms of High-Nitrogen Steel and RHA Steel Against Tungsten Heavy Alloy Penetrators. Singh, BB; Sukumar, G.; Paman, A.; Balaji, G.; Kumar, KS; Madhu, V.; Kumar, RA. JOURNAL OF DYNAMIC BEHAVIOR OF MATERIALS. 2021. Volume 7. Issue 1. Page 60-80.	Traditionally, medium-carbon, low-alloy steels with tempered martensitic microstructures are widely used in structural armor applications. There have been continuous attempts to develop alternative structural armor materials that can provide further weight reduction of armored vehicles. In this context, high-nitrogen steel (HNS) plates with austenitic microstructures were studied against a full-scale tungsten heavy alloy penetrator (500 mm in length and 25 mm in diameter), and the results were compared with those of rolled homogeneous armor steels with tempered martensitic microstructures. The ballistic trials on HNS and RHA steel plates were carried out against a WHA penetrator at velocities of 1630 +/- 20 m/s (at a 0 degrees angle of attack and a distance of 100 m) to determine the depth of penetration. HNS exhibited higher ballistic performance (i.e., a lower normalized depth of penetration) against WHA long-rod projectiles than RHA steel. The ballistic results were analyzed with the help of the initial mechanical properties and operating failure mechanisms. The better ballistic performance of HNS against tungsten heavy alloy can be primarily attributed to its higher dynamic flow stress. Post-ballistic hardness measurements on crater cross sections indicated that a higher volume of material was involved in energy dissipation in the HNS target than in the RHA steel target. Microstructural analysis showed that adiabatic shear band-induced cracking played an important role in the failure of both steel targets.	https://www.webofscience.com/wos/woscc/full-record/WOS:000574469800001
Механіка				
1	Оптимізація конструкції та моделювання структурної цілісності сендвіч-конструкції з пінопласту алюмінію для захисту бронеавтомобілів	Design optimization and structural integrity simulation of aluminum foam sandwich construction for armored vehicle protection. Pratomo, AN; Santosa, SP; Gunawan, L.; Widagdo, D.; Putra, IS. COMPOSITE STRUCTURES. 2021. Volume 276, 114461.	Structural blastworthiness is an ability of a structure to deform with a controlled force and maintain a survival space around the occupants to minimize injury risks during a blast impact incident. A proposed blastworthy aluminum foam sandwich (AFS) construction is designed and optimized for armored vehicle (AV) protection. The proposed AFS structure consists of four main components, namely an occupant side plate (OSP), a struck side plate (SSP), an Al-foam core, and adhesive bonding layers. The blastworthy characteristics of the AFS were analyzed by using a non-linear finite element simulation methodology subjected to blast impact loading. The baseline numerical simulation was correlated to a single plate experimental data. In order to minimize acceleration and structural intrusion during the blast impact incident, the AFS design parameters were optimized by using the design for six sigma (DFSS) methodology to achieve a robust AFS	https://www.webofscience.com/wos/woscc/full-record/WOS:000704417100006

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			structure and to screen the significant design parameters. The optimum design parameters are influenced mainly by the bonding pattern/ strength, OSP and SSP material strength/thickness, and foam strength/thickness. The usage of optimized AFS on an AV shows very promising results for the structural blastworthiness application of a small armored vehicle. These findings will pave the way for a robust design of lightweight and efficient AFS construction for AV protection in the future.	
2	Вплив зварювальних матеріалів на балістичні характеристики з'єднань надміцної броньованої сталі, зварених методом газодугового зварювання	Influence of Welding Consumables on Ballistic Performance of Gas Metal Arc Welded Ultra-high Hard Armor Steel Joints. Subramani, NK; Visvalingam, B.; Sudersanan, M.; Abdur, HR; Vadivel, B. MATERIALS PERFORMANCE AND CHARACTERIZATION. 2021. Volume 10. Issue 1. Page 443-462.	Steels with high strength and high hardness are considered to be the essential criteria for weight reduction in armored fighting vehicles (AFVs). Ultrahigh hard armor (UHA) steels are higher hardness (>500 HV) and higher strength (>1,500 MPa) than the currently used rolled homogenous armor (RHA) steels. The occurrence of both a tempered region in the grain-refined heat-affected zone (HAZ) and hydrogen-induced cracking (HIC) has become the limiting factor in the life extension of weld in high-strength and high-hardness armor grade steels. Hence, an attempt was made to weld UHA steel by gas metal arc welding (GMAW) process using different three filler metals (1) austenitic stainless steel (ASS), (2) duplex stainless steel (DSS), and (3) low-hydrogen ferritic. The ballistic performance of the joints was evaluated based on the area density and depth of penetration. The mechanical properties (transverse tensile, hardness, and impact toughness) and microstructural features of welded joints are correlated with the ballistic performance. All the joints stopped the 7.62 x 51 ball projectile at the weld metal region. However, through-hole (perforation) was observed when tested against the 7.62 x 54 armor piercing projectile. The joints fabricated using ASS filler wire showed superior ballistic resistance, a lesser degree of HAZ softening, and better impact toughness properties due to the higher energy absorption capability of the austenitic phase.	https://www.webofscience.com/wos/woscc/full-record/WOS:000657303200003
3	Дослідження ударної здатності композитів, просочених рідиною для загущення при зсуві	Investigation of Impact Performance of STF Impregnated Composites. Zeka, MB; Aytac, A. MECHANIKA. 2023. Volume 29. Issue 2. Page 88-96.	It is important to achieve high strength, high modulus of elasticity, good energy damping for light-weight armor materials. For this purpose, two or more sim-ilar or different materials are combined at the macro level. In this way, a new structure emerges that we call compo-site material. A composite is a new structure in which the good properties of the components in its structure become evident in the material. Research on the production and mechanical properties of composites that meet the needs of the developing technology	https://www.webofscience.com/wos/woscc/full-record/WOS:000982205700001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			continues. Military personnel, armored vehicles and many security elements are tested in the field with a lot of threats (such as mines, armor pierc-ing ammunition, explosives etc.). Therefore, the armor used by security elements should be strengthened without compromising features such as lightness, cost and long-term use. This study covers the development of Kevlar's ballistic properties by impregnating Shear Thickening Flu-id (STF). STF is composed of silica (AEROSIL 200) and polyethylene glycol (PEG 400). STF-impregnated Kevlar fibers have been subjected to impact testing at low and high speeds. Low-speed tests were carried out with a drop tower. High-speed tests were carried out according to NIJ 0101.06 Level II standards. The mass fraction of silica in the STF was determined as the research parameter. The change in the behavior of the materials with the change of silica ratio was investigated; Although improvements were observed in energy dissipation in low-speed impacts, it was noted that ballistic behavior improved up to a certain point, and then the improvement in behavior decreased.	
4	Дослідження методу діагностики несправностей на основі вдосконаленої згорткової нейронної мережі	Research on Fault Diagnosis Method Based on Improved CNN. Hu, H.; Feng, FZ; Zhu, JZ; Zhou, X.; Jiang, PC; Jiang, F.; Xue, J.; Li, YZ; Sun, GH. SHOCK AND VIBRATION. 2022. Volume 2022, 9312905.	Traditional fault diagnosis methods require complex signal processing and expert experience, and the accuracy of fault identification is low. To solve these problems, a fault diagnosis method based on an improved convolutional neural network (CNN) is proposed. Based on the traditional CNN model, a variety of convolution stride modes were added to extract features of different scales of signals and expand the feature dimension. Firstly, the vibration signals were collected and grouped. Then, the data were divided into a training set and a test set and input into improved CNN for feature extraction and model training to realize fault identification. The proposed model achieved a classification accuracy of 99.3% when testing the vibration data of the armored vehicle. Finally, the proposed model was used to classify different fault types of planetary gearboxes. The gradient-weighted class activation mapping (Grad-CAM) method was used to visualize the classification weight of samples. The results showed that the classification accuracy reaches 98% under various working conditions of the planetary gearbox.	https://www.webofscience.com/wos/woscc/full-record/WOS:000898724700002
5	Прогнозування поведінки броньованих листів під час вибуху міни на неглибокому заглибленні з використанням моделей неповного масштабування	Predicting the behavior of armored plates under shallow-buried landmine explosion using incomplete scaling models. Kang, H.; Guo, XH; Zhang, QM;	Due to the influence of strain rate effect, distorted geometry and surface effect, the dynamic response of high strength steel plates under shallow-buried explosion will not follow the geometry similarity law. Therefore, the corrected relationship between strain-rate effect and specific impulse is derived by dimensional analysis. The exponential	https://www.webofscience.com/wos/woscc/full-record/WOS:000687437500002

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		Cui, HL; Wang, S.; Yan, WM. INTERNATIONAL JOURNAL OF IMPACT ENGINEERING. 2021. Volume 156, 103970.	function presented by Oshiro and Alves is adopted to establish the corrected formula for the distorted thickness model, in which the surface effect is taken into account for alleviating the deviation caused by the manufacturing procedure. Based on the test data, which Rigby measured in the buried explosion, a set of revised empirical formulas for calculating the relationship between the specific impulse and the mass of explosives is determined. Moreover, by these models, one can predict the mid-point deflection of plates subjected to landmine explosion. Given all this, a rapid solution to predict the behavior of the prototype is presented in this paper. Three different shapes of plates subjected to landmine explosion are analyzed to validate this method. It is shown that the corrected incomplete scaling model can accurately predict the response of the prototype, which is helpful to design the incomplete scaled-down model test for mines resistant armored vehicles.	
Телекомунікації				
1	Адаптивна компенсація гнучкої шкірної антени з вбудованою волоконною брегівською ґраткою	Adaptive Compensation of Flexible Skin Antenna With Embedded Fiber Bragg Grating. Zhou, JZ; Kang, L.; Tang, BF; Tang, B.; Huang, J.; Wang, CS. IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION. 2019. Том 67. Volume 7. Page 4385-4396.	Skin antenna can be installed in the structural surface of an aircraft, warship, or armored vehicle. The radiation pattern is inevitably degraded due to the antenna surface deformations caused by external loads in service. This paper proposes a new skin antenna named smart skin antenna that consists of an antenna array, a protective layer (facesheet and honeycomb core), and a sensing layer with fiber Bragg grating (FBG) sensors. The shape of a deformed skin antenna was calculated using a strain-displacement transformation according to the measured strains from limited FBG sensors. Moreover, a strain-electromagnetic coupling model between the phase compensation values and the measured strains was derived for the first time to adaptively compensate the deterioration of radiation patterns caused by various flexible deformations. An 8 x 4 skin antenna prototype at 5.8 GHz was fabricated, and some experiments were carried out. The measured results demonstrate that the proposed compensation method can effectively correct the deterioration of radiation patterns.	https://www.webofscience.com/wos/woscc/full-record/WOS:000474599200008
2	Вибіркова нецільова атака ухилення: приклад змагальної дії, який не буде класифіковано як певні класи уникнення.	Selective Untargeted Evasion Attack: An Adversarial Example That Will Not Be Classified as Certain Avoided Classes.	Deep neural networks (DNNs) have useful applications in machine learning tasks involving recognition and pattern analysis. Despite the favorable applications of DNNs, these systems can be exploited by adversarial examples. An adversarial example, which is created by adding a small amount of noise to an original sample, can cause misclassification by the DNN. Under specific circumstances, it may be	https://www.webofscience.com/wos/woscc/full-record/WOS:000472205800001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		Kwon, H.; Kim, Y.; Yoon, H.; Choi, D. IEEE ACCESS. 2019. Volume 7. Page 73493-73503.	necessary to create a selective untargeted adversarial example that will not be classified as certain avoided classes. Such is the case, for example, if a modified tank cover can cause misclassification by a DNN, but the bandit equipped with the DNN must misclassify the modified tank as a class other than certain avoided classes, such as a tank, armored vehicle, or self-propelled gun. That is, selective untargeted adversarial examples are needed that will not be perceived as certain classes, such as tanks, armored vehicles, or self-propelled guns. In this study, we propose a selective untargeted adversarial example that exhibits 100% attack success with minimum distortions. The proposed scheme creates a selective untargeted adversarial example that will not be classified as certain avoided classes while minimizing distortions in the original sample. To generate untargeted adversarial examples, a transformation is performed to minimize the probability of certain avoided classes and distortions in the original sample. As experimental datasets, we used MNIST and CIFAR-10, including the Tensorflow library. The experimental results demonstrate that the proposed scheme creates a selective untargeted adversarial example that exhibits 100% attack success with minimum distortions (1.325 and 34.762 for MNIST and CIFAR-10, respectively).	
3	Проектування та аналіз нижньої плити для бронеавтомобіля, що піддався вибуху	Designing and analyzing an underbody plate for an armored vehicle subjected to blast. Carrillo, J.; Justice, J.; Kim, T.; Loomis, C.; McMullen, K. PROCEEDINGS OF ASME 2021 INTERNATIONAL MECHANICAL ENGINEERING CONGRESS AND EXPOSITION (IMECE 2021), Volume 12.	The purpose of this project was to design the next generation of additive underbody blast protection plates for military combat vehicles. Buried improvised explosive devices (IEDs) pose a serious threat to armored vehicles causing significant deflection to the underbody. Such deflections can result in potential life-long and life-threatening injuries. The proposed plate is designed to be modular and easily replaceable. The structural design aimed to minimize areal density and depth of the panel, thereby reducing the weight and increasing the ground clearance of the vehicle. Prototypes of the panel designs were additively manufactured from sintered Ti6Al4V, a high strength titanium alloy. The designs were experimentally tested at the Army Research Laboratory in Aberdeen, Maryland under a small-scale buried blast event. Numerical finite element models were created in LS-DYNA to analyze each potential design. The designs used a sacrificial sandwich structure between two monolithic plates. The sandwiched structure was designed to provide optimal stiffness and energy absorption. The final panel design decreased the areal density and thickness of the panel by 14% and 9%, respectively. The	https://www.webofscience.com/wos/woscc/full-record/WOS:000883362400020

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			experimental results were validated by an LS-Dyna numerical model, which projected a maximum deflection of 7.4 mm within 20.7% of the experimental deflection.	
4	Обчислювальна дозиметрія військового екіпажу, що зазнав впливу високочастотної автомобільної антени в умовах ближнього поля	Computational dosimetry on military crew exposed to HF vehicular antenna in near field condition. Colella, M.; Biscarini, M.; Pellegrino, G.; De Meiso, M.; Cavagnaroo, M.; Apollonio, F.; Libertio, M. IEEE. 2024 4TH URSI ATLANTIC RADIO SCIENCE MEETING, AT-RASC 2024.	Within the context of evaluating occupational exposure to Electromagnetic (EM) fields, the military scenario presents interesting and unexplored area of research. In this study, we examined the near-field exposure of military personnel to a vehicular antenna in a realistic setting. The objective was to enhance our understanding of the induced electric (E-) field and Specific Absorption Rate (SAR) within the human body (Duke, ViP, v.3) when positioned partially outside an armored vehicle. This is a crucial aspect to investigate, especially when the E-field intensities radiated by the antenna may overcome the recommended limits, as in the case herein evaluated. The dosimetric analysis was carried out at different frequencies within the antenna working band (i.e., 35.5 MHz and 85.5 MHz).	https://www.webofscience.com/wos/woscc/full-record/WOS:001269451500117
5	Розробка прототипу системи відстеження бронеавтомобілів через платформу LoRaWAN для тактичних операцій	Design of Prototype Armor Vehicle Tracking System via LoRaWAN Platform for Tactical Operations. Sittkul, V.; Sinrungtham, S.; Wongprachan, A.; im, CJ. IEEE. 2024 INTERNATIONAL TECHNICAL CONFERENCE ON CIRCUITS/SYSTEMS, COMPUTERS, AND COMMUNICATIONS, ITC-CSCC 2024.	This paper presents the design of a prototype for tracking the position of armored vehicles in a military unit through the use of Long Range Wide Area Network (LoRaWAN) communication technology. The device is designed to be installed on communication-equipped armored vehicles to report the position of military units in order to support various missions such as movement operations, reconnaissance, or disaster relief, among others. The system operates with a central processing unit that receives and sends data from GPS sensors specifically designed for armored vehicles to the battalion command center via a gateway. This data is then processed and displayed on a situation map, providing a Common Operational Picture (COP) for military operations. Based on test results, the reported coordinate accuracy is within 2.5 meters, enabling accurate command and decision-making, thereby increasing the success rate and reducing losses incurred by military personnel during missions.	https://www.webofscience.com/wos/woscc/full-record/WOS:001327687600051
ТАНКИ				
Інженерія				
1	Адаптивне надійне керування зі зворотним зв'язком для супроводу рухомої цілі для повністю електричного танка з урахуванням невизначеності	Adaptive robust feedback control of moving target tracking for all-Electrical tank with uncertainty.	A moving target tracking control problem for marching tank based on adaptive robust feedback control scheme is addressed. A series of preparations is needed for tank gun before shooting a target, the purpose of this paper is to design a control system to fulfill two requirements in this process: the turretbarrel system of tank needs to be	https://www.webofscience.com/wos/woscc/full-record/WOS:000793693500009

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
		Ma, YZ; Yang, GL; Sun, QQ; Wang, XY; Wang, ZF. DEFENCE TECHNOLOGY, 2022. Volume 18. Issue 4. Page 626-642.	adjusted from off-target position to command position and point to the moving target stably when there are strong uncertainties (modeling error, uncertain disturbance with unknown boundaries and road excitation) in the system. Considering the characteristic of coupled interaction, the first thing we do in this paper is to build a coupled analysis model of turret - barrel system with uncertainty term in state-space form. Second, an adaptive robust feedback control scheme is proposed by adding adaptive law to overcome the uncertainty. Third, multi-body dynamics software is used to establish the mechanical mechanism of the tank, and DC-motor module is established in SIMULINK environment, thus the target information and tracking error of the control system is collected and transferred, the gear-ball screw is derived directly by the output torque of the DC-motor module. Finally, the control system and the 3D model are combined together by means of RecurDyn/SIMULINK co-simulation, the turret-barrel system of tank can approximately track the moving target in a certain range. With the adaptive robust feedback control, the target action is completely followed when the target location is constantly changing.	
2	Нейронне адаптивне керування наведенням рухомої танкової гармати з зосередженими невизначеностями на основі динамічного моделювання	Neural adaptive pointing control of a moving tank gun with lumped uncertainties based on dynamic simulation. Chen, Y.; Cai, YH; Yang, GL; Zhou, HG; Liu, JF. JOURNAL OF MECHANICAL SCIENCE AND TECHNOLOGY. 2022. Volume 36. Issue 6. Page 2709-2720.	This study focuses on the pointing control problem of a moving tank gun. Model uncertainty and foundation vibration, which may be nonlinear, coupled, or time-varying but bounded, are considered. First, the electrohydraulic servo system of a vertical stabilizer is constructed as a nonlinear dynamic system with lumped uncertainties. Second, a neural adaptive controller is proposed to improve the control performance of the vertical stabilizer. A back-propagation neural network is introduced to compensate for the uncertainties, and its weight and threshold values are self-tuned online. Third, a co-simulation model of the moving tank is established. Dynamic simulation verifies that the proposed controller exhibits better performance than typical controllers. Finally, the influence of hull foundation vibration on the proposed controller is analyzed. The pointing accuracy of a moving tank gun is verified to be controlled effectively by the proposed controller under different driving conditions. This work combines control theory with multi-body dynamics to provide a feasible solution for the pointing control problem of a moving tank with model uncertainty and foundation vibration.	https://www.webofscience.com/wos/woscc/full-record/WOS:000813815300004

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
3	Адаптивне робастне керування для потрійного уникнення-зіткнення-наїзду невизначених механічних систем танка	Adaptive robust control for triple avoidance- striking- arrival performance of uncertain tank mechanical systems. Wang, ZF; Yang, GL; Wang, XY; Sun, QQ; Ma, YZ. DEFENCE TECHNOLOGY. 2022. Volume 18. Issue 8. Page 1483-1497.	This paper puts forward an unprecedented avoidance-striking-arrival problem aiming to address the need for tank's uncertain mechanical systems on the intelligent battlefield. The associated system uncertainties (possibly rapid) are time-varying but bounded (possibly unknown). The goal is to design a controller that enables the tank to aim at and attack the enemy tank while keeping itself (out of the enemy fire zone). The tank maintains this condition until reaching the predefined region. In this paper, an approximate constraint following control method is adopted to solve this problem, and the original constraints are creatively divided into two categories: the avoidance -tracking constraint and the striking -arrival constraint. An adaptive robust control method is proposed and consequently verified through simulation experiments. It is proved that the system fully obeys the avoidance -tracking -constraint and strictly obeys the striking -arrival constraint under the control input T. Besides, the control of the tank vehicle running system and tank gun bidirectional stabilization system are unified to deal with the control signal delay caused by complex uncertainties on the battlefield. Overall, this paper reduced the delay of signal transmission in the system while solved the avoidance -striking -arrival problem.	https://www.webofscience.com/wos/woscc/full-record/WOS:000843533300004
4	Моделювання основного бойового танка та проектування контролера LQR для зменшення коливань зброї	Modelling of main battle tank and designing LQR controller to decrease weapon oscillations. Çakir, MF; Bayraktar, M. JOURNAL OF THE FACULTY OF ENGINEERING AND ARCHITECTURE OF GAZI UNIVERSITY. 2020. Volume 35. Issue 4. Page 1861-1876.	Main battle tank has an effective importance on military defence. Strong main battle tank for stiff land conditions and having weapon system focusing on the target are in a fast and correct way provide the army an advantage to win a victory. That is the reason for increasing the researches on main battle tank in recent years. This study includes modelling of main battle tank and designing LQR (Linear Quadratic Regulator) controller in order to decrease weapon oscillations. The main battle tank and weapon system are considered separately. The hull of main battle tank consists of sprung mass and unsprung masses. The weapon system is analyzed as two sections; azimuth dynamics and elevation dynamics that provide the motion on horizontal axis and vertical axis respectively. Time responses of sprung mass and elevation dynamics are obtained by applying APG (Aberdeen Proven Ground) road profile as disturbance effect. It is observed that the weapon system has oscillations on vertical axis as expected. In order to avoid these oscillations, LQR controller is designed. The controller achieves to damp the oscillations and avoid the deviation of the barrel	https://www.webofscience.com/wos/woscc/full-record/WOS:000552077900012

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			from the target. Finally, it is defined that the controller forces are applicable.	
5	Динамічний аналіз системи керування гарматою основного бойового танка	Dynamic analysis of gun control system of main battle tank. Shukla, J. INTERNATIONAL JOURNAL OF HEAVY VEHICLE SYSTEMS. 2021. Volume 28. Issue 2. Page 158-183.	The primary aim of the military tank is to hit on the target efficiently in moving condition on off-track. The battle tank is an assembly of suspension system; mobility drives of fire gun such as elevation drive, azimuth drive; ballistic system and firing system etc. These aforesaid assemble systems are mainly responsible for disturbance in stability of main gun. The track used for battle tank also plays the major role in vibrations. Hence, the stability of gun is only possible when vibrations caused by mobility drives get reduced on dynamic tank gun. Mathematical model of weapon control system is modelled in SIMULINK, all kinds of weapon drives are coupled, using a collective framework of cantilever beam to develop the gun model. The passive dynamic responses of main gun can be observed by these mathematical models. The responses of SIMULINK are validated by a model developed in ADAMS.	https://www.webofscience.com/wos/woscc/full-record/WOS:000663085800002
Інформатика				
1	Адаптивне керування, що спрацьовує за подіями для систем керування танковою гарматою	Event-Triggered Adaptive Control for Tank Gun Control Systems. Cai, JP; Yu, R.; Yan, QZ; Mei, CL; Wang, BR; Shen, LJ. IEEE ACCESS. 2019. Volume 7. Page 17517-17523.	In this paper, an event-triggered adaptive control scheme is proposed for the gun control system of a tank subject to not only external disturbances but also uncertain modeling errors and unknown parameters. Compared with the existing results, the upper bound function of modeling errors is unknown. Therefore, the traditional event-triggered control method cannot be applied directly to handle the effect caused by the modeling errors. To solve this problem, a smooth function sg(.) is introduced to estimate the bound of modeling errors, such that their effects on system stability are successfully compensated. The simulation results are provided to illustrate the effectiveness of the proposed control scheme.	https://www.webofscience.com/wos/woscc/full-record/WOS:000459163200001
2	Ітеративне навчання на основі нейронної мережі з відстеженням помилок для систем керування танковою гарматою з довільними початковими станами	Neural Network-Based Error-Tracking Iterative Learning Control for Tank Gun Control Systems With Arbitrary Initial States. Yang, QY; Yan, QZ; Cai, JP; Tian, JH; Guan, XH. IEEE ACCESS. 2020. Volume 8. Page 72179-72187.	In this paper, a novel neural network-based error-track iterative learning control scheme is proposed to tackle trajectory tracking problem for tank gun control systems. Firstly, the system modeling for tank gun control systems is introduced as a preparation of controller design. Then, the reference error trajectory is constructed to deal with the nonzero initial error of iterative learning control. The adaptive iterative learning controller for tank gun control systems is designed by using Lyapunov approach. Adaptive learning neural network is adopted to approximate nonlinear uncertainties, with robust	https://www.webofscience.com/wos/woscc/full-record/WOS:000530816700003

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			control technique being used compensate the approximation error and external disturbances. As the iteration number increases, the system error can follow the desired error trajectory over the whole time interval, which makes the system state accurately track the reference error trajectory during the predetermined part time interval. Numerical simulations demonstrate the effectiveness of the proposed iterative learning control scheme.	
3	Адаптивне ітеративне навчання керуванню для сервосистем танкової гармати з зоною нечутливості вхідного сигналу	Adaptive Iterative Learning Control for Tank Gun Servo Systems With Input Deadzone. Zhang, YT; Yan, QZ; Cai, JP; Wu, XS. 2020. IEEE ACCESS. Volume 8. Page 63443-63451.	In this paper, an adaptive iterative learning control scheme is proposed to solve the trajectory-tracking problem for tank gun servo systems with input deadzone and arbitrary initial states. A time-varying boundary layer is constructed to deal with the nonzero initial error during the iterative learning controller design. Neural network control and robust control are jointly used to compensate uncertainties and deadzone nonlinearity. The ideal weight of neural network and the upper bound of noncontinuous uncertainties are estimated by using difference learning method. As the iteration number increases, the filtering error can converge to the time-varying boundary layer. All signal are guaranteed to be bounded. A simulation example is presented to verify the effectiveness of the proposed scheme.	https://www.webofscience.com/wos/woscc/full-record/WOS:000530832200069
4	Надійне керування навчанням для сервосистем керування танковою гарматою за умови вирівнювання	Robust Learning Control for Tank Gun Control Servo Systems Under Alignment Condition. Zhu, GM; Wu, XS; Yan, QZ; Cai, JP. IEEE ACCESS. 2019. Volume 7. Page 145524-145531.	This paper proposes an adaptive learning control scheme to solve high-precision velocity tracking problem for tank gun control servo systems. Lyapunov approach is used to design the learning controller, with alignment condition used to cope with initial problem of iterative learning control. Robust control technique and adaptive learning control technique are synthesized to handle nonlinear uncertainties and external disturbances. The unknown parameters are estimated according to the full saturation difference learning strategy. As the iteration number increases, the system state can accurately track the reference signal over the whole time interval, and all signal are guaranteed to be bounded.	https://www.webofscience.com/wos/woscc/full-record/WOS:000498815100002
5	Бар'єрне адаптивне ітеративне навчання систем керування танковою гарматою за умови ненульової початкової помилки	Barrier Adaptive Iterative Learning Control for Tank Gun Control Systems Under Nonzero Initial Error Condition. Zhou, ZM; Wang, W.; Zhang, YT; Yan, QZ; Cai, JP. IEEE ACCESS. 2022. Volume 10. Page 8664-8672.	In this paper, a barrier adaptive iterative learning control scheme is proposed to solve the trajectory-tracking problem for tank gun control systems under nonzero initial error condition. A novel construction method of rectified reference trajectory is presented for dealing with the initial position problem of iterative learning control for tank gun control systems. With a quadratic form barrier Lyapunov function adopted to controller design, the quadratic form of system error is constrained within the preset range during each iteration. Adaptive	https://www.webofscience.com/wos/woscc/full-record/WOS:000796718800001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			iterative learning control technique and robust control technique are jointly used to compensate for the parametric/nonparametric uncertainties and nonsymmetric deadzone nonlinearity. As the iteration number increases, the system state of tank gun control systems may accurately track the rectified reference trajectory, which leads to a excellent tracking performance during the part operation interval of tank gun control systems. Simulation results are presented to verify the effectiveness of the proposed barrier adaptive iterative control scheme.	
Матеріалознавство				
1	Сукупний негативний вплив тиску та автофретажування на втомну довговічність ствола сучасної танкової гармати із зовнішніми тріщинами	The cumulative detrimental impact of pressure and autofrettage on the fatigue life of an externally cracked modern tank gun barrel. Perl, M.; Saley, T. AIMS MATERIALS SCIENCE. 2019. Volume 6. Issue 5. Page 833-851.	The fatigue life of an externally cracked modern tank gun barrel is controlled by the prevailing combined stress intensity factor (SIF) K-IN, which consists of two components: K-IP-the SIF caused by internal pressure; K-IA-the positive SIF due to the tensile residual stresses induced by autofrettage. K-IA values for a single external radial semi-elliptical crack originating at the outer surface of an autofrettaged gun barrel were calculated for a large number of crack configurations by Perl and Saley. In order to assess the combined effect of overstraining and the pressurizing of the barrel during firing, values of K-IP, the SIF caused by internal pressure, and those of K-IN, the combined SIF, are evaluated. The 3D analysis is performed using the finite element method (FEM) employing singular elements along the crack front. The novel realistic overstrain residual stress fields, incorporating the Bauschinger effect, for the three types of autofrettage, Swage, Hydraulic and Hill's, previously developed, are applied to the barrel. The RSFs are simulated in the finit element (FE) analysis using equivalent temperature fields. Values of K-IP and K-IN are evaluated for a typical barrel of radii ratio R-0/R-i = 2, crack depths (a/t = 0.005-0.1), crack ellipticities (a/c = 0.2-1.0), and five levels of the three types of autofrettage, (epsilon = 40%, 60%, 70%, 80%, and 100%). A detailed analysis of the effect of the above parameters on the prevailing SIF is conducted. All three types of autofrettage are found to have a detrimental effect on the barrel's fatigue life. However, the magnitude of life reduction is autofrettage-type dependent. In the case of external cracking, Hydraulic autofrettage is found to be somewhat superior to Swage autofrettage, and Hill's autofrettage is found to be non-realistic. Finally, the results accentuate the importance of the three dimensional analysis and the incorporation of the Bauschinger effect.	https://www.webofscience.com/wos/woscc/full-record/WOS:000488246800014

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
2	Механічні властивості та мікроструктурні характеристики різнорідних з'єднань катаної однорідної броньової сталі та середньовуглецевої сталі, зварених роторним зварюванням	Mechanical properties and microstructural characteristics of rotary friction welded dissimilar joints of rolled homogeneous armor steel and medium carbon steel. Karthick, K.; Malarvizhi, S.; Balasubramanian, V. JOURNAL OF THE MECHANICAL BEHAVIOR OF MATERIALS. 2021. Volume 30. Issue 1. Page 171-178.	Distinct materials are used for the construction of battle tanks used in defense sectors. The hull and turret of the battle tanks are made up of rolled homogeneous armor steel (also known as armor steel). The inner portions like the driver cabin and control room are covered with medium carbon steel. Hence, the dissimilar joint between these materials is unavoidable in the battle tank construction. Conventional fusion welding processes like manual metal arc welding, gas metal arc welding, and gas tungsten arc welding are preferred to join the dissimilar metals. However, the high heat input nature of these processes will create hydrogen induced cracking, high residual tensile strain, and HAZ softening, etc. To minimize these issues, solid state welding processes were adopted. In the present study, mechanical properties and microstructural characteristics of rotary friction welded dissimilar joint of armor steel and medium carbon steel was analyzed. The ultimate tensile strength of the dissimilar joint is around 775 MPa and the failure occurred at the medium carbon steel side. The impact toughness value of dissimilar joints is higher than medium carbon steel and lower than armor steel. The microstructure across the dissimilar joint has distinct features and a complex pattern was observed at the weld interface.	https://www.webofscience.com/wos/woscc/full-record/WOS:000713306400001
3	Механізм руйнування плати центрального процесора комп'ютера керування вогнем всередині танка під впливом перехідних ударних навантажень: моделювання методом скінченних елементів та експериментальні дослідження	Failure Mechanism of the Fire Control Computer CPU Board inside the Tank under Transient Shock: Finite Element Simulations and Experimental Studies. Li, XR; Wang, GH; Chen, YK; Zhao, B.; Xiao, JG. MATERIALS. 2022. Volume 15. Issue 14, 5070.	The electronic components inside a main battle tank (MBT) are the key components for the tank to exert its combat effectiveness. However, breakdown of the inner electronic components can easily occur inside the MBT due to the strong transient shock and large vibration during artillery fire. As a typical key electronic component inside an MBT, the fault mechanism and fault patterns of the CPU board of the fire control computer (FCC) are discussed through numerical simulation and experimental research. An explicit nonlinear dynamic analysis is performed to study the vibration features and fault mechanism under instantaneous shock load. By using finite element modal analysis, the first six nature frequencies of the CPU board are calculated. Meanwhile, curves of stress-frequency and strain-frequency of the CPU board under different harmonic loads are obtained, which are applied to further identify the peak response of the structure. Validation of the finite element model and simulation results are performed by comparing those obtained from the modal with experiments. Based on the dynamic simulation and experimental analysis, fault patterns of CPU board are discussed, and some optimization suggestions were proposed. The results shown in this	https://www.webofscience.com/wos/woscc/full-record/WOS:000832062400001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			work can provide a potential technical basis and reference for the optimization design of the electronic components that are commonly used in the modern weapon equipment and wartime support.	
4	Моделювання подвійного одновимірного двофазного потоку одношарового пороху внутрішньої балістичної системи	Simulation of Double One-dimensional Two-phase Flow of Single Coated Propellant Internal Ballistic. Yin, JH; Du, P.; Nan, FQ; Liu, DY. 5TH INTERNATIONAL CONFERENCE ON MATERIALS SCIENCE, ENERGY TECHNOLOGY AND ENVIRONMENTAL ENGINEERING. 2020. Volume 571, 012105.	In this paper, based on the one-dimensional two-phase flow model, we established a model of a single coated propellant and wrote the corresponding software. Using software to simulate the internal ballistic process of a 105mm tank gun, the calculation results are compared with the experimental results of the actual coated propellant. The results show that the calculated values are in good agreement with the experimental values.	https://www.webofscience.com/wos/woscc/full-record/WOS:000647473300105
5	Розробка спеціальної шовкової нитки методом зворотного проектування та геометрії пряжі для використання в двигунах бойових танків	Development of special purpose silk thread through reverse engineering and yarn geometry for use in engines of battle tanks. Mohammed, AKK; Kandasamy, J.; Naik, SV; Kumar, M; Sundar, SR. JOURNAL OF THE TEXTILE INSTITUTE. 2022. Volume 113. Issue 5. Page 718-724.	One of the Engine factories in India is manufacturing three types of engines that power various types of battle tanks. While operating the tanks, the crank shaft main journals and pins need lubrication for smooth running with minimum friction and to dissipate the heat produced. In order to prevent the leakage in the lubricating system, special purpose silk thread is wound around the threaded portion of the bolt before tightening the nut with gasket and washer that has to withstand the oil pressure of 14 kg/cm(2) at a temperature of 140 degrees C. The expected life of the engine is 10 years approx. (500 h of actual running), so the special purpose silk thread should have self-life of more than the engine life. Earlier, the special purpose silk thread of 77.2 Tex (maximum) that would have a breaking load of 2 kgf (minimum) with 18% elongation at rupture (minimum) was sourced from Japan indirectly. Due to decline in the silk production in Japan, the supply chain broke and ceased to exist. The technical know-how on yarn manufacturing was unknown but details of eight thread characteristics were available. CSTRI, Bangalore, with the data, manufactured the special purpose silk thread through reverse engineering by designing the yarn geometry using indigenously produced multivoltine raw silk reeled on multiend reeling machine. Subsequently, the special purpose thread was produced in commercial scale and supplied to the Engine factory, Avadi that is being used as oil seal in the engines of battle tanks after getting the performance test report from the Defence quality control agency. This research paper	https://www.webofscience.com/wos/woscc/full-record/WOS:000632344400001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			deals with process of reverse engineering and design of yarn geometry in achieving the desired characteristics of the special purpose silk thread.	
Транспорт				
1	Адаптивне робастне керування супроводом рухомої цілі для маршируючого танка на основі дотримання обмежень	Adaptive robust control of moving-target tracking for marching tank based on constraint following. Ma, YZ; Yang, GL; Sun, QQ; Wang, XY; Sun, QZ. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART D-JOURNAL OF AUTOMOBILE ENGINEERING. 2022. Volume 236. Issue 9. Page 2087-2102.	This paper is devoted to the constraint-following scheme for the moving-target tracking control problem of tank on move. The mission of tank on the battlefield is to find and shoot the armored vehicle, both conditions are required to accomplish this task: complete the process from finding a moving target (time-varying constraints) to pointing to it; keep the barrel stable under highly nonlinear disturbance (which is caused by the battlefield environment). Considering modeling uncertainty and initial condition deviation, an adaptive robust strategy based on Udwadia-Kalaba scheme is presented to solve the matters of target tracking and stable following. Considering the limitation of the analytical model, a tracking system model and a target movement model are built in virtual prototyping environment, complicated road condition, and real target motion state are restored by this method. The model-based control system and the three-dimensional model are combined to verify the feasibility of the control algorithm by the method of RecurDyn/Matlab. By this way, the barrel responds and follows the movement of the target stably within 1 . 5 s under the action of the stabilization system, and the constraints are approximately satisfied under complex perturbations.	https://www.webofscience.com/wos/woscc/full-record/WOS:000712100400001
2	Динамічний аналіз системи керування гарматою основного бойового танка	Dynamic analysis of gun control system of main battle tank. Shukla, J. INTERNATIONAL JOURNAL OF HEAVY VEHICLE SYSTEMS. 2021. Volume 28. Issue 2. Page 158-183.	The primary aim of the military tank is to hit on the target efficiently in moving condition on off-track. The battle tank is an assembly of suspension system; mobility drives of fire gun such as elevation drive, azimuth drive; ballistic system and firing system etc. These aforesaid assemble systems are mainly responsible for disturbance in stability of main gun. The track used for battle tank also plays the major role in vibrations. Hence, the stability of gun is only possible when vibrations caused by mobility drives get reduced on dynamic tank gun. Mathematical model of weapon control system is modelled in SIMULINK, all kinds of weapon drives are coupled, using a collective framework of cantilever beam to develop the gun model. The passive dynamic responses of main gun can be observed by these mathematical models. The responses of SIMULINK are validated by a model developed in ADAMS.	https://www.webofscience.com/wos/woscc/full-record/WOS:000663085800002

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
3	Аспекти реалізації електричної трансмісії на бойовому танку	Aspects of electric transmission implementation on a battle tank. Ilie, CO; Marinescu, M.; Barothi, L., Marinescu, M.; Giurgiu, IT. XXXI-ST SIAR INTERNATIONAL CONGRESS OF AUTOMOTIVE AND TRANSPORT ENGINEERING AUTOMOTIVE AND INTEGRATED TRANSPORT SYSTEMS, AITS 2021. 2022. Volume 1220.	In the paper, a high performance electric transmission designed for heavy military vehicles is presented. The power source is a 1300 hp gas turbine and a 200 hp supercharged diesel engine. Both engines drive a synchronous generator. The electric current supplied by the generator is rectified. Each sprocket is mounted on the output shaft of a gearbox driven by an asynchronous electric motor. An Insulated Gate Bipolar Transistors (IGBTs) inverter control AC motors in a separate way to achieve dynamic performance. Diesel engine alone is used for driving on paved roads with speeds of up to 15 km/h with low fuel consumption. Gas turbine and diesel engine are automatically coupled to the generator to reach the maximum torque and dynamic performances. The tank can thus reach a maximum speed of 70 km/h.	https://www.webofscience.com/wos/woscc/full-record/WOS:000154522170 0017
4	Аналіз характеристик вібрації коробки передач під впливом випадкового торсійного збудження дороги	Analysis of transmission box vibration characteristics under random road torsional excitation. Fu, SP; Luo, SM; Huang, HL. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART D-JOURNAL OF AUTOMOBILE ENGINEERING. 2022. Volume 236. Issue 12. Page 2582-2597.	Random road torsional excitation is a key excitation condition for transmission box vibration of tracked vehicles. In order to accurately analyze influences of random road torsional excitation on the vibration characteristics of the transmission box, a calculation method of this excitation for tracked vehicle is proposed based on the random expression of the roughness of standard road surface. Furthermore, random road torsional excitations under different road grades and vehicle speeds are simulated. With the finite element method and modal superposition method, the box body is discretized, and the elastic characteristics of the box body are characterized to explore the dynamics coupling mechanism of gear shafting and the box body. By considering bending-torsional coupling vibration of gear shafting under multi-source excitations, such as the fluctuated torque of engine and dynamic meshing stiffness of gears, dynamic coupling model of gear shafting and box body under random road torsional excitation is established. The dynamic response of the gearbox under random road torsion excitation is obtained by co-simulation with the variable step length Runge-Kutta method. Influences of different road grades, track preload and vehicle speeds on dynamic response characteristics of the gearbox are analyzed. Real vehicle road test scheme is designed to obtain surface acceleration response of the box body at different speeds on the cement road surface. Both test and simulation results are compared and analyzed to verify the accuracy of the simulation method, which provides a theoretical reference for dynamic optimization of the transmission box.	https://www.webofscience.com/wos/woscc/full-record/WOS:00073185860 0001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
5	Чисельний аналіз евакуаційного люка броньованої бойової машини, що піддається мінно-вибуховому навантаженню, з використанням зв'язаного методу Ейлера-Лагранжа	Numerical Analysis of Armored Fighting Vehicle Escape Hatch Subjected to Mine Blast Loading Using Coupled Eulerian-Lagrangian Technique. Parthasarathy, S.; Kumar, JR. SAE INTERNATIONAL JOURNAL OF MATERIALS AND MANUFACTURING. 2023. Volume 16. Issue 3. Page 229-244.	This article describes the research work taken to compare the effect of air blast and surface-buried mine blast loading on an armored fighting vehicle (AFV) escape hatch, using the coupled Eulerian-Lagrangian (CEL) technique. Two types of escape hatch were considered for the study, namely, the flat plate version and double-side curved-plate version. To evaluate the research methodology used in this investigation, initially, a published experimental work on a circular plate subjected to air blast was chosen and a benchmark simulation was carried out using the CEL technique to establish the simulation procedure. Then the established procedure was utilized for further analysis. It was observed that the variation in the deformation between the published literature and the simulation work was well within the acceptable engineering limits. After that, numerical studies were conducted on the flat and double-side curved hatch by subjecting it to both air blast and surface-buried mine blast loading using the previously established CEL technique. The results of the peak central deflection of the hatch and the transmitted impulse to the base structure were compared for each type of loading case. It was systematically established that the double-side curved hatch gives better protection to the crew against both air blast loading and surface-buried mine blast loading situations.	https://www.webofscience.com/wos/woscc/full-record/WOS:001063237700002
Телекомунікації				
1	Проблема відстеження в системах керування танковою гарматою з періодичними опорними сигналами	The Tracking Problem in Tank Gun Control Systems With Periodic Reference Signals. Tian, JH; Yan, QZ; Cai, JP; Guan, XH. IEEE ACCESS. 2020. Volume 8. Page 132086-132094.	In this paper, the position tracking control for tank gun control systems with periodic reference signal is studied. On the basis of corresponding system modeling, a novel repetitive controller is developed by using Lyapunov synthesis. During the controller design, signal replacement mechanism is used to deal with the nonparametric uncertainties under Lipschitz-like continuous condition, and repetitive learning laws are developed to estimate the unknown periodic parameters. Meanwhile, robust learning approach is used to compensate the sum of random disturbances, whose upper bound is estimated according repetitive learning mechanism. Hyperbolic tangent function, rather than sign function, is applied to design a robust feedback term to release the occurrence of chattering phenomenon. Numerical simulations demonstrate the effectiveness of the proposed repetitive control scheme.	https://www.webofscience.com/wos/woscc/full-record/WOS:000552981900001
2	Бар'єрний нейроадаптивний підхід до динамічного поверхневого	A Barrier Neuroadaptive Dynamic Surface Control	In harsh battlefield environments, tanks have to encounter some nonlinear characteristics including frictional moment, gear backlash	https://www.webofscience.com/wos/woscc/full-

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
	керування для систем керування танковою гарматою з вхідним насиченням	Approach for Tank Gun Control Systems With Input Saturation. Zhu, GM; Wu, XS; Cai, JP; Yan, QZ; Gao, SY. IEEE ACCESS. 2023. Volume 11. Page 43536-43545.	and parameter drifts, etc. The existence of such nonlinear characteristics makes the controller design of tank gun control systems (TGCSs) challenging. In this paper, a barrier neuroadaptive control approach is proposed to handle the uncertainties and nonlinearities, so as to achieve satisfactory tracking performance for TGCSs. With a time-varying barrier Lyapunov function employed in controller design, the output error of TGCS is restricted within the preset bound during the control process. A radial basis function (RBF) neural network is built to approximate the uncertainties in tank gun control systems. An anti-windup control strategy is developed to deal with the input saturation nonlinearity, with a Nussbaum function used to compensate for the nonlinear term arising from input saturation. By reasonably applying filtering error into output-constrained adaptive backstepping control design, the three steps in the traditional backstepping control design are reduced to two steps. The asymptotic stability of the closed-loop TGCSs is proven by Lyapunov theory. Finally, a simulation example is presented to verify the effectiveness of the proposed control scheme.	record/WOS:000986537900001
3	Нечітке системне ітеративне навчання відстеження позиції для систем керування танковою гарматою з обмеженнями на помилки	Fuzzy System-Based Position Tracking Iterative Learning Control for Tank Gun Control Systems With Error Constraints. Hong, Z.; Yan, QZ; Wu, XS; Cai, JP. IEEE ACCESS. 2022. Volume 10. Page 52462-52471.	In order to get accurate position tracking and effective system constraint together for tank gun control systems, a fuzzy system-based barrier adaptive iterative learning control scheme is proposed. Firstly, the error tracking strategy is applied to solve the initial position problem of tank gun iterative learning control systems. Then, a barrier Lyapunov function is adopted to controller design for the system constraint. In addition, a fuzzy system is used as an approximator to compensate for the nonparametric uncertainties, and difference learning learning approach is used to estimate the optimal parameters of fuzzy systems. It is shown that the system constraints are guaranteed and position tracking error converges to a tunable residual set as the iteration number increases.	https://www.webofscience.com/wos/woscc/full-record/WOS:000801999800001
4	Адаптивне робустне керування стійкістю повністю електричної танкової гармати з компенсацією за допомогою радіально-базисної нейронної мережі	Adaptive Robust Stability Control of All-Electrical Tank Gun Compensated by Radial Basis Neural Network. Wang, YM; Yuan, SS; Sun, QZ; Wang, XY; Yang, GL. IEEE ACCESS. 2023. Volume 11. Page 115968-115985.	Stability control of the tank gun has emerged as a pivotal issue for moving tank gun control systems (TGCS). As a complex electromechanical integrated system, TGCS of moving tank inevitably possesses significant parametric uncertainties and uncertain nonlinearities. To effectively enhance the stabilization control performance of TGCS, in this study, we introduce an adaptive robust control (ARC) strategy based on radial basis function neural network (RBFNN) compensation. The adaptive technique is employed to	https://www.webofscience.com/wos/woscc/full-record/WOS:001091425000001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			address the parametric uncertainties, while the RBFNN is constructed to approximate the uncertain nonlinearities and realize feedforward compensation. Subsequently, to suppress the residual uncertainties, a nonlinear robust feedback control rate is devised to strengthen the robustness of the developed controller. Lyapunov analysis shows that the proposed controller achieves uniform ultimate bounded stability. Extensive simulation and electromechanical experimental results confirm the effectiveness of the proposed controller, which shows outstanding performance in handling strong parametric uncertainties and uncertain nonlinearities.	
5	Виявлення цілей танків і бронетехніки на основі вдосконалених YOLOv5	Tank Armored Vehicle Target Detection Based on Improved YOLOv5s. Li, XW; Mao, YX; Yu, JJ; Mao, Z. IEEE. 2024. 4TH INTERNATIONAL CONFERENCE ON COMPUTER COMMUNICATION AND ARTIFICIAL INTELLIGENCE, CCAI. Page 1-6.	For striking enemy armored vehicles from the air or on the ground, it is a necessary to timely mastery enemy tanks and armored vehicles by UAVs on the battlefield. The traditional target detection algorithms have shortcomings such as insufficient accuracy and slow computing speed, which make the monitoring of target armored vehicles still have many problems. In this paper, through a large amount of image data containing armored vehicles, the improved YOLOv5s algorithm is used in the field of deep learning for target detection of armored vehicles. Firstly, the SimAM attention mechanism is combined with the C3 module in the Backbone network to improve the network's ability to process image fine textures. Subsequently, the up-sampling method of the original network is replaced with the CARAFE module. The experimental results show that the detection precision and recall of the improved network model are increased by 1.823% and 6.89%, respectively, which effectively improves the accuracy of UAVs in recognizing tank-armored vehicles.	https://www.webofscience.com/wos/woscc/full-record/WOS:001292787100001
Системи автоматизованого управління				
1	Надійне керування наведенням гармати маршируючого танку з узгодженою та неузгодженою невизначеністю	Robust Pointing Control of Marching Tank Gun With Matched and Mismatched Uncertainty. Sun, QQ; Wang, XY; Yang, GL; Chen, YH; Duan, P. IEEE TRANSACTIONS ON CYBERNETICS. 2022. Volume 52. Issue 8. Page 7303-7318.	This article focuses on a robust control scheme for pointing control of the marching tank gun. Both matched and mismatched uncertainties, which may be nonlinear (possibly fast) time varying but bounded, are considered. First, the pointing control system is constructed as a coupled, nonlinear, and uncertain dynamical system with two interconnected (horizontal and vertical) subsystems. Second, for the horizontal pointing control, robust control is proposed to render the horizontal subsystem to be practically stable. Third, for the vertical pointing control, an uncertainty bound-based state transformation is constructed in a similar way of backstepping to convert the original	https://www.webofscience.com/wos/woscc/full-record/WOS:000732876400001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			mismatched system (i.e., the vertical subsystem) to be locally matched and then robust control is proposed to render the transformed system to be practically stable. Finally, it is proved that when the transformed system is rendered to be practically stable, the original system renders the same performance; therefore, vertical pointing control is achieved. This work should be among the first ever endeavor to cast all the coupling, nonlinearity, and (both matched and mismatched) uncertainty into the pointing control framework of the marching tank gun.	
2	Активне придушення перешкод та адаптивне керування системами керування баштою та гарматою танка	Active Disturbance Rejection Adaptive Control of Tank Turret-gun Control Systems. Yuan, SS; Yao, JY; Deng, WX; Yang, GL; Ma, X. PROCEEDINGS OF THE 39TH CHINESE CONTROL CONFERENCE. 2020. Page 333-339..	Aiming at parametric uncertainties and unmodeled disturbances of tank turret-gun control systems, this paper presents an adaptive control scheme via full state feedback. The basic idea of this control scheme is to combine adaptive control with extended state observer through hack stepping method. The control scheme can effectively improve the stabilization accuracy of the marching tank. Based on the interaxial coupling nonlinear dynamic model of the tank turret-gun systems, an extended state observer is constructed to observe the unmodeled disturbance of the systems in real time to suppress its adverse effects and a parameter adaptive law is designed to learn and compensate the parametric uncertainties of the tank turret-gun control systems. The proposed active disturbance rejection adaptive control algorithm can simultaneously deal with the parametric uncertainties and unmodeled disturbances of the tank gun control systems. As a result, it can avoid the problem of high-gain feedback and improve the servo performance of the tank turret-gun control system. The controller theoretically has asymptotic tracking performance in the presence of parametric uncertainties and constant disturbances. In addition, prescribed transient tracking performance and final tracking accuracy can also he guaranteed when existing time-variant uncertain nonlinearities. A large number of comparative simulation results are obtained to verify the high performance nature of the proposed control strategy.	https://www.webofscience.com/wos/woscc/full-record/WOS:000629243500058
3	Система керування танковою гарматою з нелінійним механізмом зв'язку двигуна та механізму на основі адаптивного радіального базисного функціонального нейронного зв'язку, оптимізованого	Nonlinear motor-mechanism coupling tank gun control system based on adaptive radial basis function neural network optimised computed torque control.	This study investigates the spatial pointing control of a motor-mechanism coupling tank gun. The tank gun control system (TGCS) is driven and stabilised by the motor servo system. However, complicated nonlinearities in the TGCS are inevitable, such as friction, parameter uncertainty, and modelling errors. To solve this problem, the TGCS is regarded as a coupling system composed of mechanical, motor, and	https://www.webofscience.com/wos/woscc/full-record/WOS:000904651500001

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	обчислювальним керуванням крутним моментом	Zheng, HQ; Rui, XT; Zhang, JS; Gu, JJ; Zhang, SJ. ISA TRANSACTIONS. 2022. Volume 131. Page 222-235.	control systems. Accordingly, the mechanical and motor models of the marching tank gun are developed first in this paper. The motor-mechanism coupling dynamics model is established based on the principle of equivalent torque. On this basis, a computed torque controller, whose uncertainty was estimated using a radial basis function neural network (RBFNN), is constructed. A modified adaptive algorithm is used to estimate the weights of the RBFNN, and the estimation error of the uncertain observer is compensated by a compensation controller. Simulation results under different conditions validated the effectiveness of the proposed control system, revealing that the proposed control system has good tracking accuracy, strong adaptability, and robustness. (c) 2022 ISA. Published by Elsevier Ltd. All rights reserved.	
4	3D-реконструкція форми танків з одного RGB-зображення на основі фреймворку глибокого навчання	Deep learning framework-based 3D shape reconstruction of tanks from a single RGB image. Chen, JC; Zhu, FD; Han, YG; Ren, DF. ENGINEERING APPLICATIONS OF ARTIFICIAL INTELLIGENCE. 2023. Volume 123, 106366.	In recent times, complicated three-dimensional shape reconstruction from a single RGB image has become a crucial technology in many industries such as Automotive, Healthcare, and Military. It is particularly challenging to reconstruct the complex shape of a military tank. Former methods infer 3D information from 2D images via shape deformation from ellipsoids, which has the problems of local adhesion, uneven surfaces, and distortion of the structure. This study introduces a new single-view 3D shape reconstruction (SVSR) framework with multi-scale feature extraction that splits shape reconstruction into three tasks-camera parameter prediction, initial shape construction, and deformation prediction. The shape-initialization module provides a variable initial shape by predicting the stretch and displacement parameters of each geometric component based on their topological relationships. The shape-deformation module predicts the directional deformation of each vertex. These two modules are dedicated separately to avoid shape adhesion and improve the local detail performance. Silhouette images of the tank's overall shape and local geometric components are employed to eliminate the impact of component shielding and avoid structural distortion via both pixel loss and perceptual loss. Experiments on the main battle tank dataset demonstrate that our method can predict complicated 3D shapes with a low Chamfer distance value (0.0017). Our approach outperforms the other state-of-the-art methods in terms of Chamfer distance and F-score with at least a 10% improvement, with more realistic overall contours and part details. It has huge application prospects in dealing with other	https://www.webofscience.com/wos/woscc/full-record/WOS:001009854600001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
			complex shape predictions by modifying the shape-initialization module.	
5	Покращення моделювання та активне керування придушенням перешкод у системі керування танковою гарматою	Improved modeling and active disturbance rejection control of tank gun control system. Zheng, HQ; Rui, XT; Zhang, JS; Zhang, SJ; Gu, JJ. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART I-JOURNAL OF SYSTEMS AND CONTROL ENGINEERING. 2022. Volume 236. Issue 9. Page 1649-1666.	In order to improve the stability control performance of the tank barrel at high speed, a new 2-degree-of-freedom nonlinear dynamics model of yaw and pitch bodies is established, taking into account the 6-degree-of-freedom motion of the tank chassis. By analyzing the direction of the tank barrel in space, the barrel stability control scheme for the tank gun control system with the arbitrary motion of the tank chassis in space is realized. The new dynamics equations of the tank gun control system are established by analytical mechanics. It effectively solves the problem of modeling methods for the tank gun control system in azimuth and elevation when considering the 6-degree-of-freedom motion of tank chassis. Then, an improved active disturbance rejection control strategy for tank gun control system is proposed. A smooth nonlinear function f(aln)(center dot) is constructed to avoid the switching problem of the function f(al)(center dot) at the piecewise points. Next, an improved extended state observer is designed based on the deviation principle by means of the deviation between each state variable and its observation. Afterwards, the stability of the system is analyzed by constructing a Lyapunov function. Simulations were carried out with different input signals to verify the reliability of the dynamics model and control algorithm. The improved active disturbance rejection control has a faster response speed and smaller steady state error. The results show that the stability and tracking performance of the tank gun control system has been improved using the proposed method.	https://www.webofscience.com/wos/woscc/full-record/WOS:000821094000001
Механіка				

1	Динаміка витоків у зонах розломів: експериментальне та аналітичне дослідження із застосуванням до зберігання CO_2	Leakage dynamics of fault zones: experimental and analytical study with application to CO_2 storage. KA Gilmore, CK Sahu, GP Benham, JA Neufeld, MJ Bickle. Journal of Fluid Mechanics, 2022. Volume 931, A31.	Fault zones have the potential to act as leakage pathways through low permeability structural seals in geological reservoirs. Faults may facilitate migration of groundwater contaminants and stored anthropogenic carbon dioxide (CO), where the waste fluids would otherwise remain securely trapped. We present an analytical model that describes the dynamics of leakage through a fault zone cutting multiple aquifers and seals. Current analytical models for a buoyant plume in a semi-infinite porous media are combined with models for a leaking gravity current and a new model motivated by experimental observation, to account for increased pressure gradients within the fault due to an increase in Darcy velocity directly above the fault. In contrast to previous analytical fault models, we verify our results using a series of analogous porous medium tank experiments, with good matching of observed leakage rates and fluid distribution. We demonstrate the utility of the model for the assessment of CO storage security, by application to a naturally occurring CO reservoir, showing the dependence of the leakage rates and fluid distribution on the fault/aquifer permeability contrast. The framework developed within this study can be used for quick assessment of fluid leakage through fault zones, given a set of input parameters relating to properties of the fault, aquifer and fluids, and can be incorporated into basin-scale models to improve computational efficiency. The results show the utility of using analytical methods and reduced-order modelling in complex geological systems, as well as the value of laboratory porous medium experiments to verify results.	https://www.webofscience.com/wos/woscc/full-record/WOS:000723214400001

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
2	Аналіз вібраційних характеристик ствола танкової гармати з неоднорідним поперечним перерізом	Vibration characteristics analysis of tank gun barrel with non-uniform cross-section. Wang, X.; Rui, XT; Wang, JH; Zhang, JS; Wu, GY; Gu, JJ. ACTA MECHANICA SINICA. 2022. Volume 38. Issue 6, 521368.	The firing accuracy of a tank gun is affected significantly by the flexural motion of the barrel. For the purpose of satisfying the requirement of efficiently and accurately dynamic analysis and optimization of the tank gun barrel to ensure it has good dynamic characteristics and firing accuracy, the high-fidelity dynamic model of a tank gun barrel is developed according to the transfer matrix method for multibody system which has features of high degree of stylization and high computational speed. The transfer matrix of the non-uniform Euler-Bernoulli beam (NU-EB beam) is deduced from governing differential equations of motion utilizing the differential transform method. The orthogonality of augmented eigenvectors for the NU-EB beam is proven which can be used for its exact dynamics response analysis using the modal method. In allusion to the tank gun barrel with non-uniform cross-section, the barrel is modeled as a combination of several uniform and non-uniform transverse vibrating Euler-Bernoulli beams. The overall transfer equation and matrix of the tank gun barrel are established according to the automatic deduction theorem of the overall transfer equation of multibody system. The present method is proven to be effective by comparing the computational results to those in published literatures. The vibration characteristics of a tank gun barrel with a non-uniform cross-section are analyzed accurately and are verified by the modal test.	https://www.webofscience.com/wos/woscc/full-record/WOS:000811214000014
3	Керування відстеженням точки влучання танкового снаряда на основі зовнішнього балістичного полінома Чебишева: адаптивний підхід із робустним зворотним зв'язком	Hitting point tracking control of tank projectile based on Chebyshev exterior ballistic polynomial: an adaptive robust feedback approach. Ma, YZ; Yang, GL; Sun, QQ; Wang, DR; Wang, XY; Wang, LQ. ACTA MECHANICA SINICA. 2022. Volume 38. Issue 4, 521234.	In this paper, the tracking control problem of the projectile hitting point of the moving tank is studied. First, a multi-body dynamic model with stability systems is established. Second, the nonlinear coupling dynamic equation of turret-barrel pointing system is established. Third, the trajectory equation of exterior ballistic (EB) projectile in six degree-of-freedom is established, and the pointing problem was transformed into a problem of hitting point tracking through coordinate transformation. Forth, an adaptive robust feedback control method is proposed to make the predicted hitting point tracking the expected position accurately. Finally, Chebyshev surrogate model is used to replace the EB differential equation, which effectively reduces the time required by co-simulation. This paper combines the EB process with the tracking control problem, which effectively ensures the first-round chance of hit for the tank gun.	https://www.webofscience.com/wos/woscc/full-record/WOS:000796971800001
4	Багатокорпусне моделювання гусеничної машини з	Multibody simulation of atracked vehicle with	In this paper, the realisation of a multibody model of a tracked machine is described. A new compact modelling of the tracks-soil interaction is	https://www.webofscience.com/wos/woscc/full-

	Назва публікації (укр.)	Дані про публікацію	Анотація (англ.)	Посилання
	деформованою моделлю контакту з ґрунтом	deformable ground contact model. Nicolini, A.; Mocera, F.; Somà, A. PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART K-JOURNAL OF MULTI-BODY DYNAMICS. 2019. Volume 233. Issue 1. Page 152-162.	presented and soil mechanics laws for terrain response are implemented. Tracked vehicles can be used in different fields such as agriculture, military and construction. The conditions of the terrain on which they operate may vary a lot, in terms of soil composition, slope and roughness. For this reason, performance of tracked vehicles is difficult to predict without a great number of field tests. The model is developed in a multibody code that makes it possible to investigate its dynamic and kinematic behaviour in several operating conditions. A specific routine is implemented in the multibody model in order to simulate the behaviour of the tracked vehicle on deformable terrains. The main hypothesis of this paper is that the terrain deformation could be in a narrow zone affected by the vehicle. Thus, the deformation of the soil is kinematically correlated to the vehicle. Soil mechanics equations are implemented on each track portion and solved only for track links in contact with the soil. The latter is modelled as a rigid body and terrain stress or deformation are not directly computed, thus simplifying solution and terrain modelling despite obtaining coherent results in terms of vehicle traction force, slip and sinkage. Results are reported pointing out performance of the tracked machine on different ground conditions.	record/WOS:000461679600011
5	Аналіз динаміки контакту однопальцевої пари зчеплення гусеничної машини	Contact dynamics analysis of the single-pin meshing pair of a tracked vehicle. Wang, PX; Wang, GP; Rui, XT; Yu, HL; Zhang, SJ. NONLINEAR DYNAMICS. 2021. Volume 104. Issue 2. Page 1139-1155.	Single-pin meshing pairs are widely used in light-tracked vehicles. The purpose of this paper is to establish a nonlinear contact algorithm between the sprocket and track for multibody dynamics simulation. Based on the actual configuration, the tooth groove profile is discretized into three cambered surfaces, and the track pin is modeled as a cylinder with a protrusion. A body-fixed frame is introduced for each contact surface to facilitate the geometric contact criteria and contact force evaluation. Then the features of equal-pitch, sub-pitch and extra-pitch meshing are described with multibody dynamics analysis. It indicates that track pitch and sprocket pitch are the critical process parameters. A field test was performed to excavate the cause of chassis vibration. Compared with simulation results, the proposed contact model can effectively simulate the high-frequency excitation applied on a tracked vehicle. To improve its service life, a suggestion for the sprocket and track design is developed to fully use the sub-pitch meshing.	https://www.webofscience.com/wos/woscc/full-record/WOS:000625727900002