Abstract
Author keywords
Indexed keywords
SciVal Topics

1 of 1

Download Print Save to PDF Save to list Create bibliography

22nd Industrial Simulation Conference, ISC 2024 • Pages 88 - 92 • 2024 • 22nd Industrial Simulation Conference, ISC 2024 • Valencia • 3 June 2024through 5 June 2024 • Code 315699

Document type
Conference Paper
Source type
Conference Proceedings
ISBN
978-949285930-3
View more

HYBRID NEURAL NETWORK AND GENETIC ALGORITHM COMBINATION FOR RECOGNITION AND AVOIDANCE OF VEHICLE OBSTACLES

Sidenko, Ievgen[a] ✉ ; Atamanyuk, Igor[b, c] ✉ ;
Myroniuk, Oleksandr[a] ✉ ; Kondratenko, Galyna[a] ✉ ;
Poltorak, Anastasiia[d] ✉ ; Kondratenko, Yuriy[e, f] ✉
Save all to author list

[a] Department of Intelligent, Information Systems, Petro Mohyla Black Sea National University, Mykolaiv, Ukraine
[b] Warsaw University of Life Sciences, Warsaw, Poland
[c] Mykolayiv National Agrarian University, Mykolaiv, Ukraine
[d] Department of Management and Marketing, Mykolayiv National Agrarian University, Mykolaiv, Ukraine
View additional affiliations

Full text options Export

Abstract

This paper is devoted to the research and application of a hybrid combination of neural networks and genetic algorithms for the recognition and avoidance of vehicle obstacles. The paper analyzes the current state of the problem of obstacle recognition by self-driving vehicles, the level of training of relevant systems for self-driving, and what risks and dangers it poses for road users. Various variants of recurrent neural network architectures are investigated, their recognition features are analyzed, and the main advantages and disadvantages are determined. A genetic algorithm is applied to determine the optimal parameters of the system for recognition and avoidance of vehicle obstacles. In the developed intelligent system, the mechanics of moving the car were implemented, the road and lanes were created, artificial sensors were designed to detect obstacles, traffic simulation was implemented, a neural network and a genetic algorithm were designed and implemented, and parallelization of objects was carried out to simulate all possible options for avoiding obstacles. Testing the developed system for recognition and avoidance of vehicle obstacles showed its high efficiency when combining a neural network and a genetic algorithm. © 2024, EUROSIS-ETI. All rights reserved.

Author keywords

avoidance; genetic algorithms; Neural networks; recognition; vehicle obstacles

Indexed keywords

SciVal Topics ⓘ

References (42)

View in search results format >

☐ All Export Print E-mail Save to PDF Create bibliography

☐ 1 Atamanyuk, I.P.
Algorithm of extrapolation of a nonlinear random process on the basis of its canonical decomposition
(2005) *Kibernetika i Sistemnyj Analiz*, (2), pp. 131-139. Cited 15 times.

☐ 2 Coelingh, E., Ekmark, J.
Self-driving Vehicles Will Revolutionize the Transportation System
(2019) *ATZ Electron Worldw*, 14, pp. 16-21.

Cited by 0 documents

Inform me when this document is cited in Scopus:

Set citation alert >

Related documents

Neural Technologies for Objects Classification with Mobile Applications
Sidenko, I. , Kondratenko, G. , Heras, O.
(2024) Journal of Mobile Multimedia

Neural Network Architectures for Recognizing Military Objects on Satellite Images
Kovaliv, O. , Kondratenko, Y. , Shevchenko, A.
(2023) Proceedings of the IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, IDAACS

Real-time vehicle detection algorithm based on a lightweight You-Only-Look-Once (YOLOv5n-L) approach
Bie, M. , Liu, Y. , Li, G.
(2023) Expert Systems with Applications

View all related documents based on references

Find more related documents in Scopus based on:

Authors > Keywords >

☐ 3 Derry, A., Krzywinski, M., Altman, N.
Convolutional neural networks

(2023) *Nature Methods*, 20 (9), pp. 1269-1270. Cited 15 times.
https://www.nature.com/nmeth/
doi: 10.1038/s41592-023-01973-1

View at Publisher

☐ 4 Fazi, M.B.
Can a machine think (anything new)? Automation beyond simulation

(2019) *AI and Society*, 34 (4), pp. 813-824. Cited 25 times.
http://www.springer.com/computer/ai/journal/146
doi: 10.1007/s00146-018-0821-0

View at Publisher

☐ 5 Ghosh, R., Kumar, A.
A hybrid deep learning model by combining convolutional neural network and recurrent neural network to detect forest fire (Open Access)

(2022) *Multimedia Tools and Applications*, 81 (27), pp. 38643-38660. Cited 31 times.
https://link.springer.com/journal/11042
doi: 10.1007/s11042-022-13068-8

View at Publisher

☐ 6 Han, J., Cui, M., Lv, Y., Liu, K., Dai, Q., Guo, H.
Moving Horizon path planning for intelligent vehicle oriented to dynamic obstacle avoidance

(2022) *2022 6th CAA International Conference on Vehicular Control and Intelligence, CVCI 2022*. Cited 3 times.
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=9964479
ISBN: 978-166545374-5
doi: 10.1109/CVCI56766.2022.9965184

View at Publisher

☐ 7 Hansson, S.O., Belin, M.-Å., Lundgren, B.
Self-Driving Vehicles—an Ethical Overview

(2021) *Philosophy and Technology*, 34 (4), pp. 1383-1408. Cited 41 times.
http://www.springer.com/philosophy/epistemology+and+philosophy+of+science/journal/13347
doi: 10.1007/s13347-021-00464-5

View at Publisher

☐ 8 Ji, J., Chen, B., Jiang, H.
Fully-connected LSTM–CRF on medical concept extraction

(2020) *International Journal of Machine Learning and Cybernetics*, 11 (9), pp. 1971-1979. Cited 15 times.
http://www.springer.com/engineering/journal/13042
doi: 10.1007/s13042-020-01087-6

View at Publisher

☐ 9 Kolarova, V., Pützschler, M., Stark, K.
Analysis of Risks of Self-driving Vehicles from a Climate Policy Perspective
(2021) *ATZ Worldw*, 123, pp. 56-59.

☐ 10 Kondratenko, Y., Sidenko, I., Kondratenko, G., Petrovych, V., Taranov, M., Sova, I.
Artificial Neural Networks for Recognition of Brain Tumors on MRI Images

(2021) *Communications in Computer and Information Science*, 1308, pp. 119-140. Cited 9 times.
http://www.springer.com/series/7899
ISBN: 978-303077591-9
doi: 10.1007/978-3-030-77592-6_6

View at Publisher

☐ 11 Kondratenko, Y., Sichevskyi, S., Kondratenko, G., Sidenko, I.

Manipulator's Control System with Application of the Machine Learning

(2021) *Proceedings of the 11th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, IDAACS 2021*, 1, pp. 363-368. Cited 3 times.
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=9660827
ISBN: 978-166542605-3
doi: 10.1109/IDAACS53288.2021.9660910

View at Publisher

☐ 12 Kondratenko, Y., Atamanyuk, I., Sidenko, I., Kondratenko, G., Sichevskyi, S.

Machine Learning Techniques for Increasing Efficiency of the Robot's Sensor and Control Information Processing

(2022) *Sensors*, 22 (3), art. no. 1062. Cited 28 times.
https://www.mdpi.com/1424-8220/22/3/1062/pdf
doi: 10.3390/s22031062

View at Publisher

☐ 13 Kovaliv, O., Kondratenko, Y., Shevchenko, A., Sidenko, I., Kondratenko, G.

Neural Network Architectures for Recognizing Military Objects on Satellite Images (Open Access)

(2023) *Proceedings of the IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, IDAACS*, pp. 175-180.
https://ieeexplore.ieee.org/xpl/conhome/10348627/proceeding
ISBN: 979-835035805-6
doi: 10.1109/IDAACS58523.2023.10348905

View at Publisher

☐ 14 Kumar, R.

Cerebral LSTM: A Better Alternative for Single- and Multi-Stacked LSTM Cell-Based RNNs (Open Access)

(2020) *SN Computer Science*, 1 (2), art. no. 85. Cited 2 times.
https://www.springer.com/journal/42979
doi: 10.1007/s42979-020-0101-1

View at Publisher

☐ 15 Lamani, M.R., Benadit, P.J., Vaithinathan, K.

Multi-atlas Graph Convolutional Networks and Convolutional Recurrent Neural Networks-Based Ensemble Learning for Classification of Autism Spectrum Disorders

(2023) *SN Computer Science*, 4 (3), art. no. 213. Cited 10 times.
https://www.springer.com/journal/42979
doi: 10.1007/s42979-022-01617-9

View at Publisher

☐ 16 Lee, T.

EMD and LSTM Hybrid Deep Learning Model for Predicting Sunspot Number Time Series with a Cyclic Pattern

(2020) *Solar Physics*, 295 (6), art. no. 82. Cited 45 times.
http://www.kluweronline.com/issn/0038-0938
doi: 10.1007/s11207-020-01653-9

View at Publisher

☐ 17 Leizerovych, R., Kondratenko, G., Sidenko, I., Kondratenko, Y.

IoT-complex for Monitoring and Analysis of Motor Highway Condition Using Artificial Neural Networks

(2020) *Proceedings - 2020 IEEE 11th International Conference on Dependable Systems, Services and Technologies, DESSERT 2020*, art. no. 9125004, pp. 207-212. Cited 15 times.
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=9122248
ISBN: 978-172819957-3
doi: 10.1109/DESSERT50317.2020.9125004

View at Publisher

☐ 18 Li, B., Zhuang, X.

Multiscale computation on feedforward neural network and recurrent neural network

(2020) *Frontiers of Structural and Civil Engineering*, 14 (6), pp. 1285-1298. Cited 28 times.
http://link.springer.com/journal/volumesAndIssues/11709
doi: 10.1007/s11709-020-0691-7

View at Publisher

☐ 19 Li, Z., Yuan, S., Yin, X., Li, X., Tang, S.

Research into Autonomous Vehicles Following and Obstacle Avoidance Based on Deep Reinforcement Learning Method under Map Constraints

(2023) *Sensors*, 23 (2), art. no. 844. Cited 6 times.
http://www.mdpi.com/journal/sensors
doi: 10.3390/s23020844

View at Publisher

☐ 20 Liao, L.I.-Z.

A recurrent neural network for N-Stage optimal control problems

(1999) *Neural Processing Letters*, 10 (3), pp. 195-200. Cited 7 times.
doi: 10.1023/A:1018776323513

View at Publisher

☐ 21 Luthra, J., Sharma, A., Kaushik, S.
Implementation of Genetic Algorithm for Path Estimation in Self Driving Car
(2022) *SN Comput. Sci.*, 3, p. 147.

☐ 22 Om Kumar, C.U., Marappan, S., Murugeshan, B., Rajaselvi Beaulah, P.M.

Correction to: Intrusion Detection Model for IoT Using Recurrent Kernel Convolutional Neural Network (Wireless Personal Communications, (2022), 10.1007/s11277-022-10155-9)

(2023) *Wireless Personal Communications*, 129 (2), p. 813. Cited 3 times.
https://www.springer.com/journal/11277
doi: 10.1007/s11277-023-10167-z

View at Publisher

☐ 23 Pakulich, D.V., Yakimov, S.A., Alyamkin, S.A.

Age Recognition from Facial Images using Convolutional Neural Networks

(2019) *Optoelectronics, Instrumentation and Data Processing*, 55 (3), pp. 255-262. Cited 7 times.
http://www.springerlink.com/content/120683/
doi: 10.3103/S8756699019030075

View at Publisher

☐ 24 Shalamov, V., Filchenkov, A., Shalyto, A.

Genetic search of pickup and delivery problem solutions for self-driving taxi routing

(2016) *IFIP Advances in Information and Communication Technology*, 475, pp. 348-355. Cited 4 times.
http://www.springer.com/series/6102
ISBN: 978-331944943-2
doi: 10.1007/978-3-319-44944-9_30

View at Publisher

☐ 25 Shapovalova, S., Moskalenko, Y., Baranichenko, O.

Increasing the Receptive Field of Neurons in Convolutional Neural Networks
(Open Access)

(2023) *Cybernetics and Systems Analysis*, 59 (2), pp. 339-345.
https://www.springer.com/journal/10559
doi: 10.1007/s10559-023-00568-0

View at Publisher

☐ 26 Sheremet, A., Kondratenko, Y., Sidenko, I., Kondratenko, G.

Diagnosis of Lung Disease Based on Medical Images Using Artificial Neural Networks

(2021) *2021 IEEE 3rd Ukraine Conference on Electrical and Computer Engineering, UKRCON 2021 - Proceedings*, pp. 561-566. Cited 11 times.
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=9575129
ISBN: 978-166540094-7
doi: 10.1109/UKRCON53503.2021.9575961

View at Publisher

☐ 27 Sidenko, I., Kondratenko, G., Petrovych, V.

Neural network technologies for diagnosing heart disease

(2020) *CEUR Workshop Proceedings*, 2762, pp. 162-176. Cited 6 times.
http://ceur-ws.org/

☐ 28 Sidenko, I., Trukhov, A., Kondratenko, G., Zhukov, Y., Kondratenko, Y.

Machine Learning for Unmanned Aerial Vehicle Routing on Rough Terrain

(2023) *Lecture Notes on Data Engineering and Communications Technologies*, 181, pp. 626-635. Cited 4 times.
https://www.springer.com/series/15362
doi: 10.1007/978-3-031-36118-0_56

View at Publisher

☐ 29 Silva, C.E., César, T.S., Gomes, I.P., Silva, J.A.R., Wolf, D.F., Alves, R., Souza, J.R.

Scheduling System for Multiple Self-driving Cars Using K-Means and Bio-inspired Optimization Algorithms

(2023) *SN Computer Science*, 4 (5), art. no. 647. Cited 3 times.
https://www.springer.com/journal/42979
doi: 10.1007/s42979-023-02053-z

View at Publisher

☐ 30 Sokoliuk, A., Kondratenko, G., Sidenko, I., Kondratenko, Y., Khomchenko, A., Atamanyuk, I.

Machine Learning Algorithms for Binary Classification of Liver Disease

(2021) *2020 IEEE International Conference on Problems of Infocommunications Science and Technology, PIC S and T 2020 - Proceedings*, art. no. 9468051, pp. 417-421. Cited 17 times.
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=9467832
ISBN: 978-172819177-5
doi: 10.1109/PICST51311.2020.9468051

View at Publisher

☐ 31 Sova, I., Sidenko, I., Kondratenko, Y.

Machine learning technology for neoplasm segmentation on brain mri scans

(2020) *CEUR Workshop Proceedings*, 2791, pp. 50-59. Cited 15 times.
http://ceur-ws.org/

☐ 32 Terapaptommakol, W., Phaoharuhansa, D., Koowattanasuchat, P., Rajruangrabin, J.

Design of Obstacle Avoidance for Autonomous Vehicle Using Deep Q-Network and CARLA Simulator (Open Access)

(2022) *World Electric Vehicle Journal*, 13 (12), art. no. 239. Cited 10 times.
https://www.mdpi.com/journal/wevj
doi: 10.3390/wevj13120239

View at Publisher

☐ 33 Tijani, A.
Obstacle Avoidance Path Design for Autonomous Vehicles-A Review
(2022) *Technium J.*, 3, pp. 64-81. Cited 3 times.

☐ 34 Tu, J., Mei, G., Piccialli, F.

An Efficient Deep Learning Approach Using Improved Generative Adversarial Networks for Incomplete Information Completion of Self-driving Vehicles

(2022) *Journal of Grid Computing*, 20 (3), art. no. 21. Cited 2 times.
http://www.kluweronline.com/issn/1570-7873
doi: 10.1007/s10723-022-09610-5

View at Publisher

☐ 35 Wang, P., Yang, J., Zhang, Y., Wang, Q., Sun, B., Guo, D.

Obstacle-Avoidance Path-Planning Algorithm for Autonomous Vehicles Based on B-Spline Algorithm

(2022) *World Electric Vehicle Journal*, 13 (12), art. no. 233. Cited 8 times.
https://www.mdpi.com/journal/wevj
doi: 10.3390/wevj13120233

View at Publisher

☐ 36 Wang, R., Shen, M., Wang, X., Cao, W.

RGA-CNNs: convolutional neural networks based on reduced geometric algebra

(2021) *Science China Information Sciences*, 64 (2), art. no. 129101. Cited 14 times.
http://www.springer.com/computer/information+systems+and+applications/journal/11432
doi: 10.1007/s11432-018-1513-5

View at Publisher

☐ 37 Wang, X., Yu, X., Sun, W.

A Path Planning and Tracking Control for Autonomous Vehicle with Obstacle Avoidance

(2020) *Proceedings - 2020 Chinese Automation Congress, CAC 2020*, art. no. 9327065, pp. 2973-2978. Cited 6 times.
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=9326315
ISBN: 978-172817687-1
doi: 10.1109/CAC51589.2020.9327065

View at Publisher

☐ 38 Werners, B., Kondratenko, Y.

Alternative fuzzy approaches for efficiently solving the capacitated vehicle routing problem in conditions of uncertain demands (Open Access)

(2018) *Studies in Systems, Decision and Control*, 125, pp. 521-543. Cited 22 times.
www.springer.com/series/13304
doi: 10.1007/978-3-319-69989-9_31

View at Publisher

☐ 39 Yang, S.M., Lin, Y.A.

Development of an improved rapidly exploring random trees algorithm for static obstacle avoidance in autonomous vehicles

(2021) *Sensors*, 21 (6), art. no. 2244. Cited 21 times.
https://www.mdpi.com/1424-8220/21/6/2244/pdf
doi: 10.3390/s21062244

View at Publisher

☐ 40 Yu Zhang, Zeng, J., LI, Y., Chen, D.

Convolutional Neural Network-Gated Recurrent Unit Neural Network with Feature Fusion for Environmental Sound Classification (Open Access)

(2021) *Automatic Control and Computer Sciences*, 55 (4), pp. 311-318. Cited 10 times.
http://www.springerlink.com/content/0146-4116
doi: 10.3103/S0146411621040106

View at Publisher

☐ 41 Zhukov, D.O., Akimov, D.A., Red'kin, O.K., Los', V.P.

Application of convolutional neural networks for preventing information leakage in open internet resources

(2017) *Automatic Control and Computer Sciences*, 51 (8), pp. 888-893. Cited 3 times.

http://www.springerlink.com/content/0146-4116
doi: 10.3103/S0146411617080314

View at Publisher

☐ 42 Zinchenko, V., Kondratenko, G., Sidenko, I., Kondratenko, Y.

Computer vision in control and optimization of road traffic (Open Access)

(2020) *Proceedings of the 2020 IEEE 3rd International Conference on Data Stream Mining and Processing, DSMP 2020*, art. no. 9204329, pp. 249-254. Cited 22 times.
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=9200828
ISBN: 978-172813214-3
doi: 10.1109/DSMP47368.2020.9204329

View at Publisher

© Copyright 2024 Elsevier B.V., All rights reserved.

1 of 1

^ Top of page

All content on this site: Copyright © 2024 Elsevier B.V. ↗, its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the Creative Commons licensing terms apply.
We use cookies to help provide and enhance our service and tailor content.By continuing, you agree to the use of cookies ↗.