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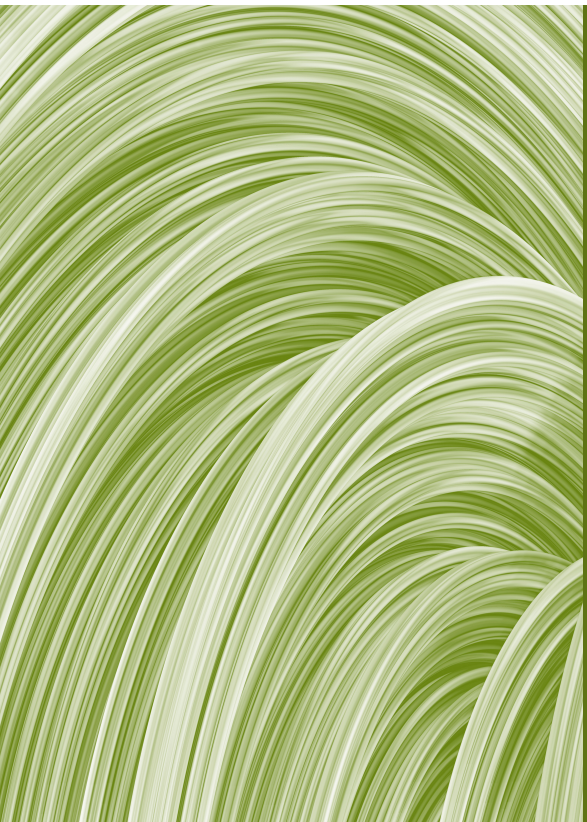
Electronic Multimedia



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Section Information

The Section “Electronic Multimedia” reports on electronic multimedia technology, tools, and applications of electronic multimedia, including but not limited to circuits, networking, signal processing, systems, software, and systems integration.

Section Editor-in-Chief
Prof. Dr. Stefanos Kollias

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Selected Papers

N-DEPTH: Neural Depth Encoding for Compression-Resilient 3D Video Streaming

Authors: Stephen Siemonsma and Tyler Bell

Abstract: This work raises the hypothesis that it is possible to use ferromagnetic carbon nanotubes filled with iron to hyperthermally destroy cancer cells in a radiofrequency electromagnetic field. This paper describes the synthesis process of iron-filled multi-walled carbon nanotubes (Fe-MWCNTs) and presents a study of their magnetic properties. Fe-MWCNTs were synthesized by catalytic chemical vapor deposition (CCVD). Appropriate functionalization properties of the nanoparticles for biomedical applications were used, and their magnetic properties were studied to determine the heat generation efficiency induced by exposure of the particles to an external electromagnetic field. The response of the samples was measured for 45 min of exposure. The results showed an increase in sample temperature that was proportional to concentration. The results of laboratory work were compared to the simulation using COMSOL software.

https://doi.org/10.3390/electronics13132557

Learning by Doing in VR: A User-Centric Evaluation of Lathe Operation Training

Authors: Julian Conesa, Antonio Martínez, Francisco Mula and Manuel Contero

Abstract: This study presents the development and evaluation of an immersive virtual reality (VR) application designed for lathe operation training. The VR application, built using Unity for Oculus Rift headsets, aims to simulate a realistic lathe machining experience, allowing users to interact with the machine's various controls and levers. The experimental analysis involved 20 s-year Mechanical Engineering students who performed machining tasks in the virtual environment. The usability and user experience of the application were assessed using the System Usability Scale (SUS) and a 12-item questionnaire. The SUS results yielded a high mean score of 96.25 (SD = 6.41), indicating excellent usability. The user experience evaluation also showed positive feedback, with high ratings for the sense of presence, realism, and usefulness for training purposes. However, some users reported minor physical discomforts such as dizziness. The study concludes that immersive VR is a valuable tool for enhancing training in lathe operations, offering an engaging and realistic experience that encourages active learning. Future work should focus on reducing physical discomfort and further improving the application's realism and interactivity.

https://doi.org/10.3390/electronics13132549

Design and Development of Multi-Agent Reinforcement Learning Intelligence on the Robotarium Platform for Embedded System Applicationss

Authors: Lorenzo Canese, Gian Carlo Cardarilli, Mohammad Mahdi Dehghan Pir, Luca Di Nunzio and Sergio Spanò

Abstract: This research explores the use of Q-Learning for real-time swarm (Q-RTS) multi-agent reinforcement learning (MARL) algorithm for robotic applications. This study investigates the efficacy of Q-RTS in the reducing convergence time to a satisfactory movement policy through the successful implementation of four and eight trained agents. Q-RTS has been shown to significantly reduce search time in terms of training iterations, from almost a million iterations with one agent to 650,000 iterations with four agents and 500,000 iterations with eight agents. The scalability of the algorithm was addressed by testing it on several agents' configurations. A central focus was placed on the design of a sophisticated reward function, considering various postures of the agents and their critical role in optimizing the Q-learning algorithm. Additionally, this study delved into the robustness of trained agents, revealing their ability to adapt to dynamic environmental changes. The findings have broad implications for improving the efficiency and adaptability of robotic systems in various applications such as IoT and embedded systems.

https://doi.org/10.3390/electronics13101819

A 5K Efficient Low-Light Enhancement Model by Estimating Increment between Dark Image and Transmission Map Based on Local Maximum Color Value Prior

Authors: Qikang Deng, Dongwon Choo, Hyochul Ji and Dohoon Lee

Abstract: Low-light enhancement (LLE) has seen significant advancements over decades, leading to substantial improvements in image quality that even surpass ground truth. However, these advancements have come with a downside as the models grew in size and complexity, losing their lightweight and real-time capabilities crucial for applications like surveillance, autonomous driving, smartphones, and unmanned aerial vehicles (UAVs). To address this challenge, we propose an exceptionally lightweight model with just around 5K parameters, which is capable of delivering high-quality LLE results. Our method focuses on estimating the incremental changes from dark images to transmission maps based on the low maximum color value prior, and we introduce a novel three-channel transmission map to capture more details and information compared to the traditional one-channel transmission map. This innovative design allows for more effective matching of incremental estimation results, enabling distinct transmission adjustments to be applied to the R, G, and B channels of the image.

https://doi.org/10.3390/electronics13101814

Invitation to Submit

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