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Section Artificial Intelligence Circuits and Systems (AICAS)

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Section Editor-in-Chief

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Section Information

During the last decade, there has been increasing use of artificial intelligence tools in almost all areas of human activity. Artificial intelligence (AI) is not only at the heart of the current rise in information technology, but in all areas of life. In this regard, new algorithms and systems with the power of AI are being developed. Therefore, new hardware and computer platforms are needed to support emerging AI algorithms and applications, from cloud servers to circuits. Facing these new challenges and opportunities the Artificial Intelligence Circuits and Systems section has been established to facilitate state-of-the-art research, innovation, and development activities in the areas of artificial intelligence circuits and systems. It serves as the best platform for scholars, technological researchers, and industry professionals to publish their studies and further advance artificial intelligence technologies on circuits and systems.

The Artificial Intelligence Circuits and Systems section is focused on publications that are related to circuits and systems for artificial intelligence. The section covers topics of interest within hardware-based deep learning AI and algorithmic deep learning AI using machine learning. It is dedicated to the publication of articles not only from the listed areas but also from similar or related areas. We encourage the submission of original contributions derived from theoretical and/or application-oriented research studies.

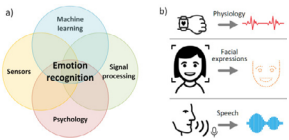
Section Artificial Intelligence Circuits and Systems (AICAS)

Featured Papers

DOI:10.3390/electronics11030496

Bringing Emotion Recognition Out of the Lab into Real Life: Recent Advances in Sensors and Machine Learning

Author: Stanisław Saganowski

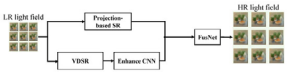


Abstract: Bringing emotion recognition (ER) out of the controlled laboratory setup into everyday life can enable applications targeted at a broader population, e.g., helping people with psychological disorders, assisting kids with autism, monitoring the elderly, and general improvement of well-being. This work reviews progress in sensors and machine learning methods and techniques that have made it possible to move ER from the lab to the field in recent years. In particular, the commercially available sensors collecting physiological data, signal processing techniques, and deep learning architectures used to predict emotions are discussed. A survey on existing systems for recognizing emotions in real-life scenarios—their possibilities, limitations, and identified problems—is also provided. The review is concluded with a debate on what challenges need to be overcome in the domain in the near future.

DOI:10.3390/electronics11121904

Reivew of Light Field Image Super-Resolution

Authors: Li Yu, Yunpeng Ma, Song Hong and Ke Chen



Abstract: Currently, light fields play important roles in industry, including in 3D mapping, virtual reality and other fields. However, as a kind of high-latitude data, light field images are difficult to acquire and store. Thus, the study of light field super-resolution is of great importance. Compared with traditional 2D planar images, 4D light field images contain information from different angles in the scene, and thus the super-resolution of light field images needs to be performed not only in the spatial domain but also in the angular domain. In the early days of light field super-resolution research, many solutions for 2D image super-resolution, such as Gaussian models and sparse representations, were also used in light field super-resolution. With the development of deep learning, light field image super-resolution solutions based on deep-learning techniques are becoming increasingly common and are gradually replacing traditional methods. In this paper, the current research on super-resolution light field images, including traditional methods and deep-learning-based methods, are outlined and discussed separately. This paper also lists publicly available datasets and compares the performance of various methods on these datasets as well as analyses the importance of light field super-resolution research and its future development.

DOI:10.3390/electronics10040514

Relations between Electronics, Artificial Intelligence and Information Society through Information Society Rules

Authors: Matjaž Gams and Tine Kolenik

Abstract: This paper presents relations between information society (IS), electronics and artificial intelligence (AI) mainly through twenty-four IS laws. The laws not only make up a novel collection, currently non-existing in the literature, but they also highlight the core boosting mechanism for the progress of what is called the information society and AI. The laws mainly describe the exponential growth in a particular field, be it the processing, storage or transmission capabilities of electronic devices. Other rules describe the relations to production prices and human interaction. Overall, the IS laws illustrate the most recent and most vibrant part of human history based on the unprecedented growth of device capabilities spurred by human innovation and ingenuity. Although there are signs of stalling, at the same time there are still many ways to prolong the fascinating progress of electronics that stimulates the field of artificial intelligence. There are constant leaps in new areas, such as the perception of real-world signals, where AI is already occasionally exceeding human capabilities and will do so even more in the future. In some areas where AI is presumed to be incapable of performing even at a modest level, such as the production of art or programming software, AI is making progress that can sometimes reflect true human skills. Maybe it is time for AI to boost the progress of electronics in return.

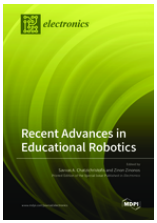
DOI:10.3390/electronics10172182

Implementation of an Award-Winning Invasive Fish Recognition and Separation System

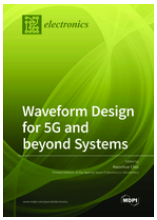
Authors: Jin Chai, Dah-Jye Lee, Beau Tippetts and Kirt Lillywhite

Abstract: The state of Michigan, U.S.A., was awarded USD 1 million in March 2018 for the Great Lakes Invasive Carp Challenge. The challenge sought new and novel technologies to function independently of or in conjunction with those fish deterrents already in place to prevent the movement of invasive carp species into the Great Lakes from the Illinois River through the Chicago Area Waterway System (CAWS). Our team proposed an environmentally friendly, low-cost, vision-based fish recognition and separation system. The proposed solution won fourth place in the challenge out of 353 participants from 27 countries. The proposed solution includes an underwater imaging system that captures the fish images for processing, fish species recognition algorithm that identify invasive carp species, and a mechanical system that guides the fish movement and restrains invasive fish species for removal. We used our evolutionary learning-based algorithm to recognize fish species, which is considered the most challenging task of this solution. The algorithm was tested with a fish dataset consisted of four invasive and four non-invasive fish species. It achieved a remarkable 1.58% error rate, which is more than adequate for the proposed system, and required only a small number of images for training. This paper details the design of this unique solution and the implementation and testing that were accomplished since the challenge.

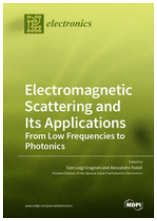
Special Issue Books:



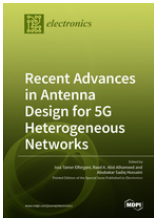
Recent Advances in Educational Robotics



Waveform Design for 5G and beyond Systems

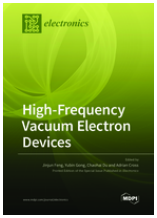


Electromagnetic Scattering and Its Applications: From Low Frequencies to Photonics



Recent Advances in Antenna Design for 5G Heterogeneous Networks”

Multi-Sensory Interaction for Blind and Visually Impaired People



High-Frequency Vacuum Electron Devices

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