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Section Information

This section focuses on industrial smart and sustainable technologies and processes oriented towards practical applications.

It focuses on smart industrial systems, and related environmental and sustainability research and practice. Through our published articles, we aim at helping societies become more sustainable. It has the aims of waste valorization and increasing efficiencies in the uses of energy, water, and resources, within an industrial symbiosis and circular economy perspective, with special focus on the use of modern techniques aligned with the Industry 4.0 strategy.

The section publishes original papers, review articles, technical notes, and letters to the editor.



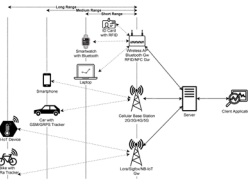
Featured Papers

DOI:10.3390/app11073176

Security Vulnerabilities in LPWANs—An Attack Vector Analysis for the IoT Ecosystem

Authors: Fotis Kitsios, Maria Kamariotou, Panagiotis Karanikolas and Evangelos Grigoroudis

Abstract: Big data analytics provides many opportunities to develop new avenues for understanding hospitality management and to support decision making in this field. User-generated content (UGC) provides benefits for hotel managers to gain feedback from customers and enhance specific product attributes or service characteristics in order to increase business value and support marketing activities. Many scholars have provided significant findings about the determinants of customers' satisfaction in hospitality. However, most researchers primarily used research methodologies such as customer surveys, interviews, or focus groups to examine the determinants of customers' satisfaction. Thus, more studies must explore how to use UGC to bridge the gap between guest satisfaction and online reviews. This paper examines and compares the aspects of satisfaction and dissatisfaction of Greek hotels' guests. Text analytics was implemented to deconstruct hotel guest reviews and then examine their relationship with hotel satisfaction. This paper helps hotel managers determine specific product attributes or service characteristics that impact guest satisfaction and dissatisfaction and how hotel guests' attitudes to those characteristics are affected by hotels' market positioning and strategies.

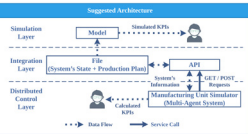


DOI:10.3390/app11052202

Application of a Simulation-Based Digital Twin for Predicting Distributed Manufacturing Control System Performance

Authors: Gonçalo Roque Rolo, Andre Dionisio Rocha, João Tripa and Jose Barata

Abstract: During the last years, several research activities and studies have presented the possibility to perform manufacturing control using distributed approaches. Although these new approaches aim to deliver more flexibility and adaptability to the shop floor, they are not being readily adopted and utilised by the manufacturers. One of the main challenges is the unpredictability of the proposed solutions and the uncertainty associated with these approaches. Hence, the proposed research aims to explore the utilisation of Digital Twins (DTs) to predict and understand the execution of these systems in runtime. The Fourth Industrial Revolution is leading to the emergence of new concepts amongst which DT stand out. Given their early stage, however, the already existing implementations are far from standardised, meaning that each practical case has to be analysed on its own and solutions are often created from scratch. Taking the aforementioned into account, the authors suggest an architecture that enables the integration between a previously designed and developed agent-based distributed control system and its DT, whose implementation is also provided in detail. Furthermore, the digital model's calibration is described jointly with the careful validation process carried out. Thanks to the latter, several conclusions and guidelines for future implementations were possible to derive as well.



Featured Papers

DOI:10.3390/app11031097

Developing a Digital Twin and Digital Thread Framework for an 'Industry 4.0' Shipyard

Authors: Toh Yen Pang, Juan D. Pelaez Restrepo, Chi-Tsun Cheng, Alim Yasin, Hailey Lim and Miro Miletic

Abstract: This paper provides an overview of the current state-of-the-art digital twin and digital thread technology in industrial operations. Both are transformational technologies that have the advantage of improving the efficiency of current design and manufacturing. Digital twin is an important element of the Industry 4.0 digitalization process; however, the huge amount of data that are generated and collected by a digital twin offer challenges in handling, processing and storage. The paper aims to report on the development of a new framework that combines the digital twin and digital thread for better data management in order to drive innovation, improve the production process and performance and ensure continuity and traceability of information. The digital twin/thread framework incorporates behavior simulation and physical control components, in which these two components rely on the connectivity between the twin and thread for information flow and exchange to drive innovation. The twin/thread framework encompasses specifications that include organizational architecture layout, security, user access, databases and hardware and software requirements. It is envisaged that the framework will be applicable to enhancing the optimization of operational processes and traceability of information in the physical world, especially in an Industry Shipyard 4.0.



DOI:10.3390/app11062606

An Improved VGG19 Transfer Learning Strip Steel Surface Defect Recognition Deep Neural Network Based on Few Samples and Imbalanced Datasets

Authors: Xiang Wan, Xiangyu Zhang and Lilan Liu

Abstract: The surface defects' region of strip steel is small, and has various defect types and, complex gray structures. There tend to be a large number of false defects and edge light interference, which lead traditional machine vision algorithms to be unable to detect defects for various types of strip steel. Image detection techniques based on deep learning require a large number of images to train a network. However, for a dataset with few samples with category imbalanced defects, common deep learning neural network training tasks cannot be carried out. Based on rapid image preprocessing algorithms (improved gray projection algorithm, ROI image augmentation algorithm) and transfer learning theory, this paper proposes a set of processes for complete strip steel defect detection. These methods achieved surface rapid screening, defect feature extraction, sample dataset's category balance, data augmentation, defect detection, and classification. Through verification of the mixed dataset, composed of the NEU surface dataset and dataset in this paper, the recognition accuracy of the improved VGG19 network in this paper reached 97.8%. The improved VGG19 network performs slightly better than the baseline VGG19 in six types of defects, but the improved VGG19 performs significantly better in the surface seams defects. The convergence speed and accuracy of the improved VGG19 network were taken into account, and the detection rate was greatly improved with few samples and imbalanced datasets. This paper also has practical value in terms of extending its method of strip steel defect detection to other products.

