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NEWSLETTER 07/2023

TALON PROJECT



TALON

Autonomous and self-organised artificial intelligent
orchestrator for a greener industry 5.0

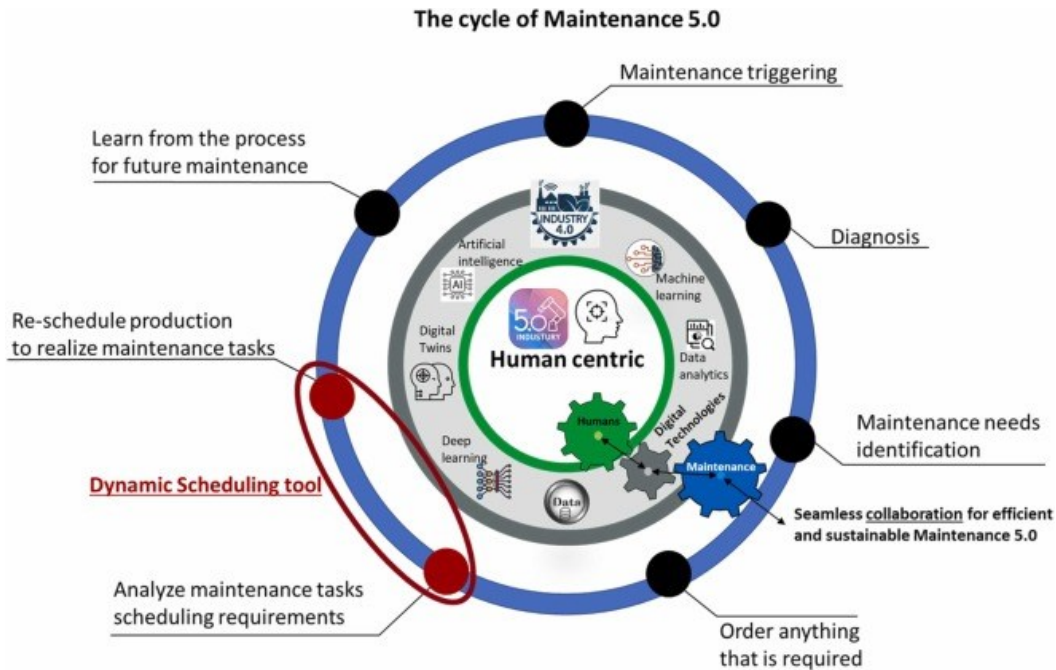
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EDITORIAL

T This newsletter presents a summary of the primary dissemination outcomes of the project, which include journal and conference publications, as well as organization of events. Specifically, one (1) journal was published, three (3) conference papers were successfully accepted, and a workshop was co-organized by the TALON consortium entitled “5th International Workshop on IoT Applications and Industry 5.0”.

Stylios Trevlakis, InnoCube

PAPER PUBLISHED: “ENVISIONING MAINTENANCE 5.0: INSIGHTS FROM A SYSTEMATIC LITERATURE REVIEW OF INDUSTRY 4.0 AND A PROPOSED“

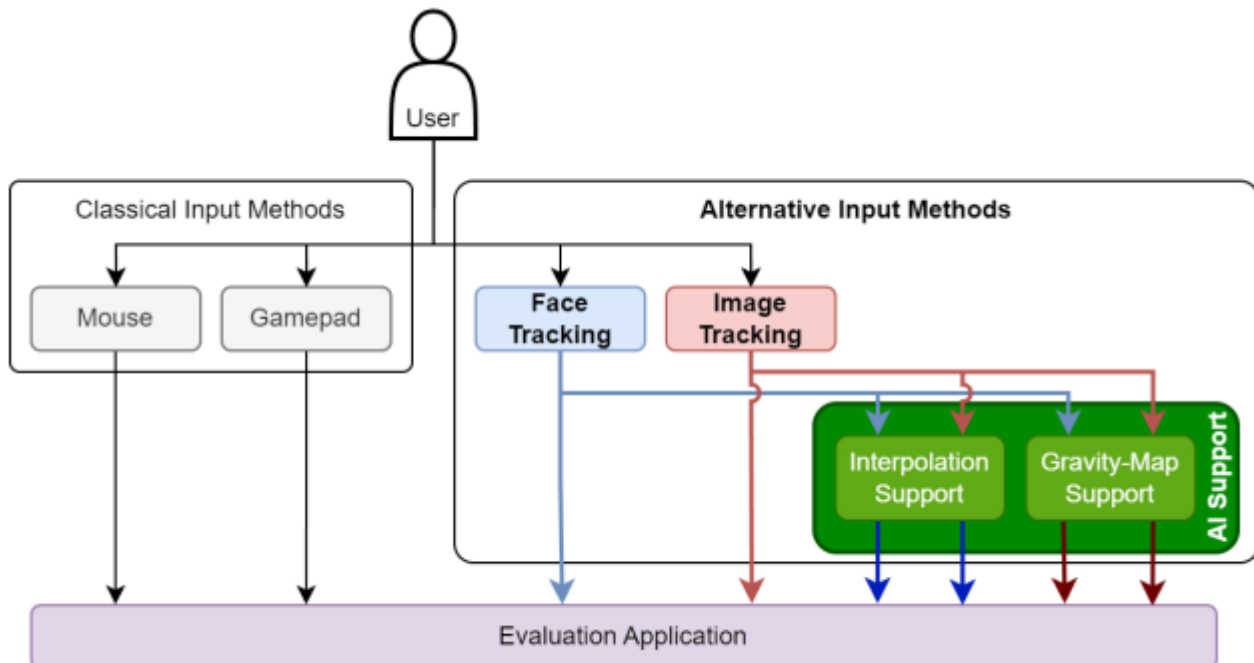


To provide direction and advice for future research on Industry 4.0 maintenance, we conducted a comprehensive analysis of 344 eligible journal papers published between 2013 and 2022. Our systematic literature review identifies key trends in advanced maintenance techniques and the consolidation of traditional maintenance concepts, which are driven by the increasing adoption of Industry 4.0 technologies and the need to optimize manufacturing systems' performance and reliability. In light of our findings, we highlight the importance of addressing sustainability factors, human aspects, and the implementation of environmental KPIs in future research. Building upon these insights, we introduce the Maintenance 5.0 framework, which emphasizes the integration of human-centered and AI-driven strategies for achieving efficient and sustainable maintenance in Zero-Defect Manufacturing (ZDM) systems. We propose a novel framework that links traditional and advanced maintenance policies for small and medium-sized enterprises (SMEs) to facilitate the adoption of Industry 4.0 technologies in the maintenance field. This work underscores the need for future research to bridge the gap between these policies, enabling a seamless transition for SMEs towards Industry 4.0 maintenance practices, while fostering sustainable and socially responsible operations.

You can find more information about this paper [here](#).

You can refer to this paper as: “F. Psarommatis, G. May, and V. Azamfirei, “Envisioning maintenance 5.0: Insights from a systematic literature review of Industry 4.0 and a proposed framework,” *Journal of Manufacturing Systems*, vol. 68, pp. 376–399, Jun. 2023.”

PAPER PUBLISHED: “EVALUATION OF AI-SUPPORTED INPUT METHODS IN AUGMENTED REALITY ENVIRONMENT, IEEE DCOSS-IOT”

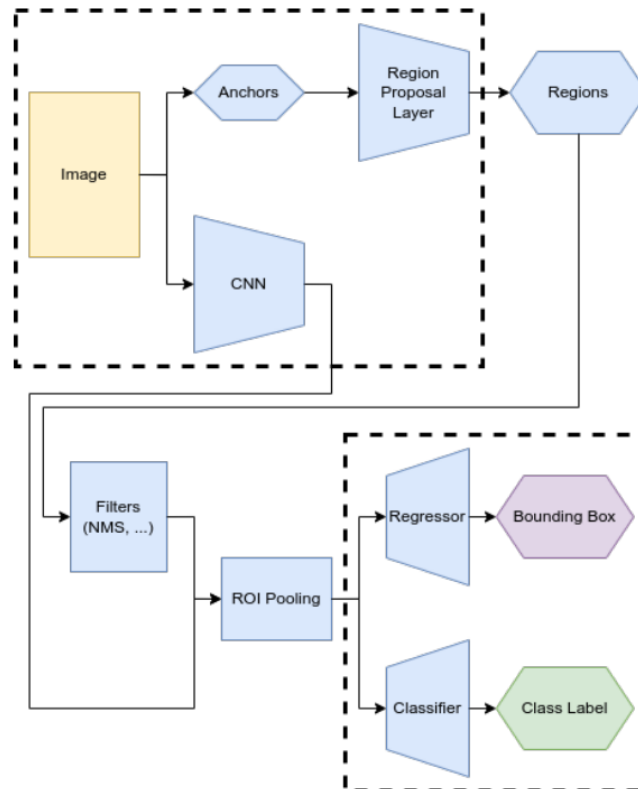


Augmented Reality (AR) solutions are providing tools that could improve applications in the medical and industrial fields. Augmentation can provide additional information in training, visualization, and work scenarios, to increase efficiency, reliability, and safety, while improving communication with other devices and systems on the network. Unfortunately, tasks in these fields often require both hands to execute, reducing the variety of input methods suitable to control AR applications. People with certain physical disabilities, where they are not able to use their hands, are also negatively impacted when using these devices. The goal of this work is to provide novel hand-free interfacing methods, using AR technology, in association with AI support approaches to produce an improved Human-Computer interaction solution.

You can find more information about this paper [here](#).

You can refer to this paper as: “Akos Nagy, Thomas Lagkas, Panagiotis Sarigiannidis and Vasileios Argyriou, Evaluation of AI-Supported Input Methods in Augmented Reality Environment, IEEE DCOSS-IoT, “1st International Workshop on Next Generation IoT and AI systems for Trusted, Human-Centered Intelligence”, June, 2023.”

PAPER PUBLISHED: “EVALUATION OF ENVIRONMENTAL CONDITIONS ON OBJECT DETECTION USING ORIENTED BOUNDING BOXES FOR AR APPLICATIONS”



The objective of augmented reality (AR) is to add digital content to natural images and videos to create an interactive experience between the user and the environment. Scene analysis and object recognition play a crucial role in AR, as they must be performed quickly and accurately. In this study, a new approach is proposed that involves using oriented bounding boxes with a detection and recognition deep network to improve performance and processing time. The approach is evaluated using two datasets: a real image dataset (DOTA dataset) commonly used for computer vision tasks, and a synthetic dataset that simulates different environmental, lighting, and acquisition conditions. The focus of the evaluation is on small objects, which are difficult to detect and recognise. The results indicate that the proposed approach tends to produce better Average Precision and greater accuracy for small objects in most of the tested conditions.

You can find more information about this paper [here](#).

You can refer to the preprint as: “Vladislav Li, Barbara Villarini, Jean-Christophe Nebel, Thomas Lagkas, Panagiotis Sarigiannidis and Vasileios Argyriou, Evaluation of Environmental Conditions on Object Detection using Oriented Bounding Boxes for AR Applications, IEEE DCOSS-IoT, “5th International Workshop on IoT Applications and Industry 5.0”, June, 2023.”

PAPER PUBLISHED: “A MODULAR DEEP LEARNING FRAMEWORK FOR SCENE UNDERSTANDING IN AUGMENTED REALITY APPLICATIONS”

Taking as input natural images and videos augmented reality (AR) applications aim to enhance the real world with superimposed digital contents enabling interaction between the user and the environment. One important step in this process is automatic scene analysis and understanding that should be performed both in real time and with a good level of object recognition accuracy. In this work an end-to-end framework based on the combination of a Super Resolution network with a detection and recognition deep network has been proposed to increase performance and lower processing time. This novel approach has been evaluated on two different datasets: the popular COCO dataset whose real images are used for benchmarking many different computer vision tasks, and a generated dataset with synthetic images recreating a variety of environmental, lighting and acquisition conditions. The evaluation analysis is focused on small objects, which are more challenging to be correctly detected and recognised. The results show that the Average Precision is higher for smaller and low resolution objects for the proposed end-to-end approach in most of the selected conditions.

You can find more information about this paper [here](#).

You can refer to this paper as: “Vladislav Li, Barbara Villarini, Jean-Christophe Nebel and Vasileios Argyriou, A Modular Deep Learning Framework for Scene Understanding in Augmented Reality Applications, IEEE IAICT, “The IEEE International Conference on Industry 4.0, Artificial Intelligence, and Communications Technology”, July, 2023.”

IOTI5 2023 - 5TH INTERNATIONAL WORKSHOP ON IOT APPLICATIONS AND INDUSTRY 5.0

The IoTI5 2023 workshop has been organized under the support of the TALON project. The 5th International Workshop on IoT Applications and Industry 5.0 was held in Coral Bay, Pafos, Cyprus between the 19th and 21st of June 2023 in conjunction with IEEE DCOSS-IoT 2023.

Scope: It is evident that IoT is entering multiple fields of everyday life. The proliferation of IoT devices as well as the numerous use cases reveal the very promising potentials of IoT in revolutionizing several aspects of common activities as well as business processes. The vision of interconnecting billions of devices in a holistic network, where machines communicate along with traditional human communications is now being realized, towards the formation of the Internet of Everything (as called by Cisco). The workshop focuses on Industrial Internet of Things systems and applications, which represent the highest value segment of the IoT market. The heavy research endeavors of last years have provided efficient solutions and enhanced technologies that enable the creation of such a network, overcoming several challenges stemming from the special attributes of device-to-device communications, embedded devices, and big data management.

The new challenge is to identify efficient ways of integrating IoT technologies in contemporary applications exploiting the potentials of real-time monitoring, interactive control, self-management, and data analytics towards “smart” behavior and enhanced performance.

The main scope of the “IoT Applications and Industry 5.0” (IoTI5) workshop is to identify and promote new techniques for the realization of promising IoT applications in various areas, including Industry 5.0 scenarios.

The workshop is also supported by the EU Horizon projects: ELECTRON, TALON, AI4CYBER, and DYNABIC.



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