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Academic Activities Summary

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The 3rd IEEE International Conference on Digital Twin and Parallel Intelligence

"Digital Twin and Parallel Intelligence is a field of technology that integrates information technologies such as cloud computing, artificial intelligence, blockchain and the industrial internet to provide breakthrough solutions to industrial and social "intelligence" problems. It provides breakthrough solutions to "intelligent" problems in industry and society. The research in this area will drive major changes in smart technologies, industries, and related economic and global governance areas. DTPI 2023, co-organized by the IEEE RFID Committee and the Chinese Society of Automation, will be held under the theme of Monadao, i.e., Digital Artificial People through Smart Contracts in the form of Decentralized Autonomous Organization ("DAO"). DAO form to achieve collaborative operational governance of digital organizations. Personally, I think that this theme can avoid the human intuitive control of the central structure to a certain extent, according to the feedback, information, data provided by each part in order to make voting decisions, under the constraints of smart contracts so as to achieve the optimal solution. However, there may be some problems in the initialization phase, such as how to define the constraints of this smart contract, and how to customize a contract that meets the needs of each part as much as possible without exceeding the total management constraints. The purpose of attending this conference is to investigate and refer to the cutting-edge algorithms and practical applications in the field of artificial intelligence, hoping to be able to obtain the ideas of paper writing and algorithmic innovation theories to a certain extent, so as to improve the personal knowledge base, and whether scheduling algorithms, such as parallel intelligence, can be applied to deep learning, so as to realize a more efficient data preprocessing or model training program.

Most of the papers presented in this conference are on the topic of adopting some deep learning algorithms to realize applications in various fields, among which I am impressed by "PCB Surface Defect Detection Based on TPBAS-YOLOv5". The paper suggests that the use of machine vision for industrial defect detection in industrial manufacturing can effectively improve productivity and production quality. The authors of the paper propose an algorithm model TPBAS-YOLOv5 based on YOLOv5. The model introduces the Transformer module for obtaining the information of global variables to better obtain the information of the overall circuit board features. feature information of the overall board. Secondly, a P2 detection layer is introduced in the neck of the model, which can improve

the accuracy of detecting small targets on the PCB. Finally, they introduce a weighted bi-directional feature pyramid network BiFPN, which is able to add multi-scale features to the model inference process, resulting in better detection of PCB small targets at multiple scales. This addition of the Transformer's module to previous deep learning models is able to compensate for the lack of global information features in the convolutional operations in some network architectures, thus enabling the model to learn image features more comprehensively for machine vision to accomplish relevant machine vision tasks.

In addition to this there are some of the 3D image feature learning, traffic signals car walking prediction and other areas of exploration, but also to see more derived applications of machine vision in the cutting-edge technology, so that I have some novel module innovation in deep learning machine vision model and parallel processing technology. In addition, I have carried out a certain degree of modeling algorithm research on the camera-related parts of the deep learning automatic driving technology, which is the first time to see the bi-directional feature pyramid network, in the automatic driving camera algorithms are more critical is how to identify pedestrians, traffic marking lines, etc., when the target is far away from the camera, these targets are relatively small, and the panoramic segmentation algorithm that I have been studying in this kind of small target detection is relatively tricky. In the panoramic segmentation algorithm I am working on, this kind of small target detection is a bit tricky. TPBAS-YOLOv5, which is known in the conference, provides a method to improve the detection of small targets, which is a novel multi-scale feature learning method, and this method is not only applicable to panoramic segmentation, but also can improve the feature learning ability of the tasks related to small objects and targets in the field of machine vision. However, whether this two-way feature pyramid approach will increase the training cost of the model, and whether the distribution of large and small objects can be grasped in the image task where large and small targets exist at the same time is also a problem, and it is hoped that novel algorithmic models for large and small objects and targets with uniformly high efficiency and accuracy can be proposed in the field in the future.

Industry 5.0 by Parallel Humans of Parallel Intelligence: From Neo-Platonism's Shadows to Karl Popper's Three World

Industry 5.0 represents the next stage of industrial development. Its predecessor, Industry 4.0, was focused on automation, the Internet of Things, artificial intelligence, and data analytics, and while Industry 4.0 emphasized human-machine interaction, Industry 5.0 takes it a step further by focusing on human-centered collaboration.Industry 5.0 goes beyond viewing humans as operators or supervisors to treating humanoids as key partners in decision-making and problem-solving with Industry 5.0 sees humans not just as operators or supervisors, but as key partners with machines in decision-making and problem-solving. "Parallel Intelligence" comes into play here, suggesting that there is a relationship between humans and machine intelligence, working together rather than in isolation. The terms "Parallel Human" and "Parallel Intelligence" may refer to an emerging model in which human and machine intelligence write and work together. Parallel Intelligence may mean that machines can handle repetitive, data-intensive, or computationally complex tasks while humans contribute creativity, emotional intelligence, and ethical decision-making, or it may refer to distributed computational and cognitive tasks in which multiple AI systems or human participants work together to solve problems.

Instead of presenting cutting-edge technologies, the event explored the philosophical and theoretical foundations of Industry 5.0. The conference made bold predictions about Industry 5.0, Parallel Human" and 'Parallel Intelligence' have been proposed for the concept of 'Parallel', moving from 'Human' working with 'Intelligence' to 'Human' working with 'Intelligence'. human" working with 'intelligence' to 'human' and 'intelligence' working together. intelligence" to 'human' and 'intelligence' working together. Some of the repetitive and computationally complex tasks are given to the artificial intelligence or AI for efficient operation to maximize productivity, while humans provide some of the resources or make decisions based on application scenarios and needs to achieve higher yielding results. The "Parallel Human" part involves neuroscience and cognitive science, suggesting that human cognitive processes may be enhanced or extended by AI systems. This opens up new possibilities for cognitive cooperation between humans and machines, and new forms of collective intelligence may emerge. What is more interesting is that the conference was based on Karl Popper's triple world concept: world 1 of the material world (the world of objects and phenomena), world 2 of subjective experiences, thoughts and emotions (the world of the mind), and world 3 of objective

knowledge, scientific theories, art, culture and human creativity (which exists independently of the individual's mind), which is considered by Industry 5.0 to be a combination of human creativity (world 2) and machine capabilities (World 1) combined can facilitate the birth of new knowledge and culture (World 3). For this kind of long-term cooperation between humans and AI, intelligent machines may discuss issues such as autonomy, decision-making and cooperation ethics with human beings, which has to involve the issue of human moral bottom line, therefore, for the development of Industry 5.0 in the future, not only is it filled with the expectation of new technology and new knowledge, but also the fear of the "intellectual crisis". The emergence of the "smart device crisis". To summarize, in the subsequent development and exploration of artificial intelligence and intelligent machines, it is worth discussing whether people need to carry out certain ethical planning for the development route, and whether the development of intelligent technology will lead to huge changes in human beings' clothing, food, housing and transportation, and whether it will adapt to the changes and crises in the global environment. Whether or not the development of such technology promotes higher forms of human interaction, thereby helping people with various congenital disadvantages (e.g., diseased eyes, ears, arms and legs) to have a full life experience.