

論文内容要約

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機械システム工学 専攻

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論文題目 STUDY ON VISUAL MACHINE LEARNING ON THE OMNIDIRECTIONAL
TRANSPORTING ROBOT

(全方位輸送ロボットの視覚機械学習に関する研究)

Chapter 1 Introduction. Overview on the concept of automated transporting systems in industrial environments. Description of the fundamental concept of the omnidirectional driving gear mechanism as the foundation of the robot structure. Advantages of the implementation of a computer vision system on the mechanism.

Chapter 2 Omnidirectional transporting robot. General description of the functionalities of the omnidirectional transporting robot and prospect implementations. Technical description of the hardware configuration of the mechanism. Design of visual markers. Schematic of the interconnection of components and SPI communication protocol. Description of the software configuration for the suitable operation of the robot.

Chapter 3. Computer vision system. Camera calibration settings. Description on two different visual machine learning approaches: image features detection with SVM (Support Vector Machines) classification and Convolutional Neural Networks implemented on image data. Methodology for building the training data for each visual learning approach. Detailed explanation of the You Only Look Once (YOLO) algorithm for object detection.

Chapter 4 Experimental analysis. Presentation of the experimental methodologies to evaluate the performance of the proposed visual system in terms of supported occlusion over trays, variant external illumination, accuracy of the position measurements in space coordinates and time response of the software implementation. Analysis on data results.

Chapter 5 Conclusions. Brief summary on the capabilities of the new visual system implemented on the omnidirectional transporting robot, its feasibility for implementation, its advantages over existing solutions and prospect implementations in the modern industry.