ABSTRACT

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Study Program   : *Electrical Engineering*

Title   : *Object Sorting System with Machine Vision Technology based on Machine Learning*

The increasing need for a product requires the industrial world to increase production productivity. Industrial automation technology is a solution to speed up the production process and become more effective and efficient. One of the applications of industrial automation technology is in the sorting process which is the process of sorting goods based on an item's properties such as color, mass, or shape. Automation technology that can be applied to the sorting process is Machine Vision. Machine Vision allows the machine to perform image-based analysis so that the machine can perform a control over it. This research was conducted to design, manufacture, and analyze an object sorting system based on shape with Machine Vision technology based on Machine Learning using PLC and Raspberry Pi. The sorting system integrates Raspberry Pi as an object shape detector and PLC as a sorting system control. The method of detecting the shape of objects used is Image classification which utilizes the Machine Learning model with the Neural Network algorithm generated using Teachable Machine through the Transfer Learning process. System testing is done by testing the accuracy of the object shape detection system and the success of the sorter system for sorting objects. Based on the results of testing the shape detection system, the system is able to detect the shape of objects with lighting intensity ranging from 50 lux and optimal at 200 lux with an accuracy rate of 80%. The system can detect objects with the webcam positioned perpendicular and 450 to the object with an accuracy rate of 80% when perpendicular and 47.5% when 450 to the object. The computation time of the detection system is stable with an average computation time of 253.88 ms. The detection system provides output results after the confidence score value or the level of confidence in the detection results with a minimum average value of 0.36. The ability of the sorter system to sort objects according to their place based on the detection results has an accuracy rate of 100%.

Keywords: *Image Classification, Machine Learning, Machine Vision, Neural Network, Transfer Learning*