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# DEVELOPMENT OF AN ANN-BASED DEFECT DETECTION SYSTEM FOR PROCESS QUALITY OPTIMIZATION IN BOTTLING INDUSTRY

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## Abstract

The study focused on a novel method for detecting defects in bottle products using a convolutional neural network (CNN). The convolutional neural network tool was used to capture and analyze defects during the packaging of beverage products. It involved an Internet of Things (IOT) system that contains both a client- and server-side system. The client-side system is a raspberry pi, which captures the bottle sample using its camera and sends it over the Internet of Things (IOT) to the server for processing. The server processes it using the convolutional neural network and then outputs the result to the client side for indication. Two convolutional neural network models were developed. The result showed that the first CNN model detected two states of the bottle, classified as defect and good state. The second detects up to five defects in a bottle. It was observed that the training process of CNN model has a prediction accuracy of 90.165% for the first CNN model and 85% for the second CNN model during live testing. There was observed a positive outcome in the second prediction of labels the CNN model on most parameters used. Thus, in the development of a defect detection algorithm, the outcome of this result can form the basis for developing an integrated vision-based system for tracking defects during the packaging of bottles in the bottling industry. These results provide potential information and guide for industries on the need to improve their automation in terms of product defect tracing, thus, improving productivity.

**Keywords:** Quality, Product, Convolutional Neural Network, Bottle, Raspberry Pi

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