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Article

Design Features of Grocery Product Recognition Using Deep Learning

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Abstract: At a grocery store, product supply management is critical to its employee's ability to operate productively. To find the right time for updating the item in terms of design/replenishment, real-time data on item availability are required. As a result, the item is consistently accessible on the rack when the client requires it. This study focuses on product display management at a grocery store to determine a particular product and its quantity on the shelves. Deep Learning (DL) is used to determine and identify every item and the store's supervisor compares all identified items with a preconfigured item planning that was done by him earlier. The approach is made in II-phases. Product detection, followed by product recognition. For product detection, we have used You Only Look Once Version 5 (YOLOV5), and for product recognition, we have used both the shape and size features along with the color feature to reduce the false product detection. Experimental results were carried out using the SKU-110 K data set. The analyses show that the proposed approach has improved accuracy, precision, and recall. For product recognition, the inclusion of color feature enables the reduction of error date. It is helpful to distinguish between identical logo which has different colors. We can achieve the accuracy percentage for feature level as 75 and score level as 81.

Keywords: Deep learning; product recognition; YOLOV5; accuracy; grocery store; precision; recall

1 Introduction

In the retail industry, such as grocery shops and departmental stores, to improve the business process, it is necessary to enhance the shopping experience of customers and automate the process. Earlier, Barcode Recognition was probably the most widely utilized technology in retail. It simplified product administration and enabled self-checkout. A barcode on a product placed in any arbitrary position may slow down the purchasing process and give a hectic shopping experience. Furthermore, it does not address supermarkets requiring large human labor to manage inventory and goods. However, current advancements in Artificial Intelligence (AI) and Machine Learning (ML) have made it possible to overcome those issues and improve the entire retail industry. Many visual data have been captured to numerous technological devices fixed in nearly every shop (e.g., Closed-Circuit TeleVision (CCTV) cameras). As a result, Computer Vision (CV) has become a hot topic in the retail industry. Modern image detection techniques that can be used to detect individual objects on shelves and identification algorithms that can be used to classify the identified object have gained much attention.

Human labour is used to handle the goods on racks, shelves, and counters in many grocery stores. Staff manually check product availability, calculate balances, and compare the location using specifications; the entire process proves costly, and there's a good chance of making mistakes. A crucial part of the display is that if products are not correctly displayed, they may result in a drop in sales. To increase the sale of the products, many manufactures make arrangements in the stores by themselves with an attractive display. Every merchandiser wants their product to display