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Smart Checkout System for Supermarket

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Abstract: ***A smart checkout system for a supermarket can be designed using a combination of hardware and software solutions to provide an efficient and streamlined checkout experience for customers. Implementing a smart checkout system requires careful planning, testing, and evaluation to ensure it meets the needs of both the supermarket and its customers. However, the benefits of a smart checkout system can include improved efficiency, reduced costs, and increased customer satisfaction. Overall, a smart checkout system can provide significant benefits to supermarkets and their customers, making the shopping experience faster, more convenient, and more enjoyable.***
Keywords: checkout system, supermarket,customer satisfaction, convenient.

I. INTRODUCTION

Supermarket is a place where customers come to buy products for daily use and pay. This project is used to automate the invoicing system in the supermarket and in this cash register system the invoicing is done by webcam which automatically invoicing the product using the database. The camera will take pictures of the goods, it will find the predefined objects and compare with the database, the software will calculate the amount of the invoice. There are two types registered and unregistered customers. If the customer is registered, the amount on the invoice can be debited directly from his account. So, by using by webcam we can bill easily.

A. Motivation

The research motivation for a supermarket billing system using a webcam is to explore the feasibility, accuracy, and efficiency of using computer vision and machine learning algorithms to automate the product scanning and billing process in a supermarket. A webcam-based system has the potential to reduce wait times, increase accuracy, and provide a more seamless and convenient checkout experience for customers.

B. Objective

The objective of a supermarket invoicing system that uses webcams is to automate the scanning and invoicing process for supermarket products, thereby reducing wait times, increasing accuracy, and improving the customer experience. client. Thesystem aims to use machine learning and computer vision algorithms to recognize and identify products in webcam images and to automatically generate itemized invoices for customers.

C. Existing System

Many supermarkets have been using this type of billing system for a decade. Supermarkets use EPOS systems (Electronic Point of Sale) for their billing processes, these systems consist of hardwaresuch as barcode scanners. Existing supermarket payment systems typically involve manually scanning each product's barcode, manually entering product information, and manually processing payments. This process can take some time, especially during peak hours, and can result in longqueues at the counters.

D. Proposed System

The proposed work for supermarket billing using webcam involves the development of a software application that uses a webcam to scan product barcodes and automatically generate a bill for customers. The proposed work will provide a faster, more efficient, and convenient billing experience for customers, reducing wait times and improving overall satisfaction. It will also reduce the workload of supermarket staff, allowing them to focus on other important tasks.

II. LITERATURE SURVEY

A. *Smart Supermarket BillingSystem Using Python*

Unmanned retail stores have become increasingly popular in recent years and have had a tremendous impact on 's traditional shopping habits. Unmanned retail containers play an important role in this; can significantly affect the shopping experience of consumers, while traditional methods based on weight sensors cannot identify what a customer is consuming. Using the image with the aim of determining, it is possible to realize retail without personal purchase Style. A comprehensive classification model trained by was developed to count and detect SKUs from an image dataset under different scenarios with different types of SKUs, and the solution proposed in this study can achieve 97.7 accuracy, if and are counted 98.7dtection accuracy in the test dataset, indicatingthe system is working.

B. *New Object Detection,Tracking, And RecognitionApproaches For Video Surveillance Over Camera Network*

Object detection and tracking are two important tasks in multi-camera surveillance. This article provides a framework for performing these tasks on a non-overlapping network of multiple cameras. A new object detection algorithm using displacement mean (MS) segmentation has been introduced, and occluded objects are further separated by using depth information from stereoscopic vision. The detected objects are then tracked by a new object tracking algorithm using the new Kalman-Bayes filter with Simplified Gaussian Blend (BKF-SGM). It uses a Gaussian Mixture (GM) noise state and density representation and a new forward density simplification algorithm to avoid the exponential increase in complexity of traditional GM Kalman (KF) filters. Combined with the improved MS tracker, you get the new BKF-SGM with the improved MS algorithm with more reliable tracking performance. Additionally, a non-trainingobject detection algorithm is used to aid in object tracking in a non-overlapping network. The experimental results show that: 1) the proposed object detection algorithm provides better segmentation results than traditional object detection methods and 2) the proposed detection algorithm can successfully handle complex scenarios with good performance and low arithmetic complexity. In addition, the performance of both training-based and non- training-based object detection algorithms can be improved by using our detection and tracking results as input.

C. *Image Processing System For Automatic Segmentation And Yield Prediction Of Fruits Using Opencv*

Automatic yield counting becomes a big problem in fruit picking systems. Image processing techniques minimize the manual labor of fruit identification and counting. The document proposes an image processing system for automaticsegmentation and prediction of fruit yield based oncolor and shape traits. First, pre-processing is performed on the input images of the fruit tree. It isthen converted from the RGB color space to the HSV color space in order to recognize the region of the fruit from it background. The color thresholdis used to hide the desired colors. Gaussian filter isused to remove noise. The image is outlined. Theseimages are then processed by an image processingalgorithm. The output shows the number of fruits based on color and shape.

III. SYSTEM MODEL

A. *Data Explanation*

The webcam captures images of purchased items that contain visual information about the product such as shape, color, size, and packaging. After the capturing system uses image processing algorithms to extract relevant features from images, such as Barcode, product name and price. This data is then used to identify the product and retrieve its price from the database. Then the system keeps a database of all products sold in the supermarket, containing data such as product name, barcode, price and any discounts or promotions. After each item is scanned and priced, the system creates a record of the transaction including product name, price, quantity, and discounts applied. This data is used to generate the final invoice and to keep records for inventory and accounting purposes and the system may also storecustomer information such as name, address, and payment information to facilitate future purchases and to track customer preferences and behavior. By using this information, the system can generatesales reports based on transaction data such as daily, weekly or monthly sales, top selling productsand revenue by category or department.

B. *Modules*

1) *Add Product Details:* The Add Product Details module is a feature that allows users to add product images and product details to an e-commerce website or any platform that sells products. This module is crucial for online businesses as it provides customers with visual representation of the products andinformation about them. Users can upload productimages to showcase their products in the best possible way. Multiple images can be added to showcase different angles and perspectives of the product and product details such as product name, description, price, size, weight, color, and other relevant details to help

customers make informed decisions about the product. The uploaded images can be edited by resizing, cropping, or rotating them to ensure they are displayed properly. The module can optimize the images to ensure fast loading times, improving the overall user experience of the website or platform which makeseasy for customers to find the products.

2) *Train Model:* Images captured from the webcam, with each image labelled according to the object or action it represents. There are several popular deep learningframeworks, such as TensorFlow, Kera's, and Pytorch and define the structure of your neural network, including the number of layers, the type of activation functions, and the number of neuronsin each layer and feed your prepared data into your model and run it for a number of epochs. Once your model is trained, you would need to evaluate its performance on a validation set of images that ithas not seen before.
3) *Add/Remove Product:* Identify the product when the user clicks on the product image, the application needs to identify the product. This can be done by assigning a unique identifier to each product, such as a product code, SKU number, or product name. Once the product is identified, the application should display the product information in the text area. This can include the product name, price, and quantity. If theuser clicks on the product image again, the application should remove the product from the text area. This can be done by deleting the productinformation from the text area. The application should keep track of the products that have been added to the basket, so that it can display the total cost and allow the user to check out.

C. *Algorithms And TechniquesCnn Algorithm*

Convolutional Neural Network is a type ofartificial neural network commonly used in image and video recognition tasks.
The CNNs are designed to learn spatial featurehierarchies automatically and adaptively frominput images by convolving the input image with aseries of trainable filters, followed by nonlinearactivation functions, and blending transactions.The layers of a typical CNN architecture include.

1) *Convolution Layer:* This layer applies a convolution operation to the input image with a set of learnable filters to extract features.
2) *Activation Layer:* This layer applies a nonlinear activation function to the output of the convolution layer to introduce nonlinearity and improve model representation performance.
3) *Pool Level:* This level down samples the activation level output to reduce the spatial size of feature maps and improve computational performance.
4) *Fully Connected Layer:* This layer connects all neurons from the previous layer to the current layer and produces the final output for classification or regression.

IV. RESULTS AND ANALYSIS

A. *Enter Product SpecificationsAnd Train Model*

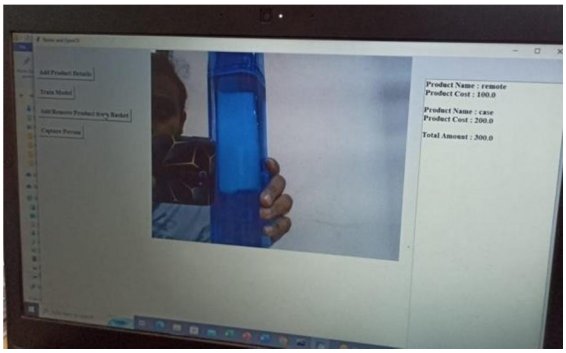
Product specification entry refers to the process ofproviding details about product, such as: B. Size, weight, color, materials and other relevant characteristics. This information is usually enteredinto a database or other system where it is stored and used for a variety of purposes such as product cataloging, inventory management, marketing, to understand what they are buying and to facilitate efficient business operations. This may involvegathering information from various sources such asmanufacturers or product suppliers and arranging itin a standardized format that is easily searchable and retrievable.

After adding the product details, we train the modelbased on the product information and we can also add or remove product from the cart and then we can also capture the images of the person after thatthe products are captured to give the total amount

B. *Total Amount*

The webcam would capture an image of each product as it is scanned, and the computer vision system would analyze the image to identify the product based on its appearance and packaging. Once the product is identified, the computer systemcould look up the price of the product in a databaseand add it to the total bill.

The system could also keep track of the quantity ofeach item being purchased and calculate the subtotal, taxes, and any discounts or promotions applicable to the purchase. When the customer is finished shopping,the system could display the total bill on a screen or print out a paper receipt.



V. CONCLUSION

Therefore, we intend to implement a system using Python to automate the checkout process in supermarkets. This system will support digital India. With this system, customers and management have a better shopping experience. We will use the Python Open CV Libraryprogramming language, the system database. These systems will be helpful and save you time. Future work will focus on improving the algorithm performance and detection rate while reducing the false positive rate. Configure a larger image dataset for multiple SKUs. Since there is no need for workers, i.e., workers, human labour power is reduced and unemployment increases accordingly.But since this system saves time, a lot of work willbe done very quickly. The test results show that thesystem can achieve high counting accuracy and high detection accuracy. In future work we will focus on improving the performance of the algorithm.

VI. FUTURE WORK

One potential future direction is to continue to refine the accuracy of webcam-based billing systems. This could involve using more advanced computer vision algorithms to better detect and classify items, as well as incorporating machine learning techniques to improve recognition of different products and we can also use lstm and vgg
19 algorithms of deep neural network. Another potential area of focus is real-time processing, which would enable customers to see their bill as they shop Another potential area of focus is leveraging webcam-based billing systems to example, the system could track customers' purchases over time and provide recommendationson how to reduce waste by buying more efficiently,or by suggesting alternative products with lower environmental impact. Overall, there are many potential future directions for webcam-based supermarket billing systems, and the technology islikely to continue to evolve and improve in the coming years.

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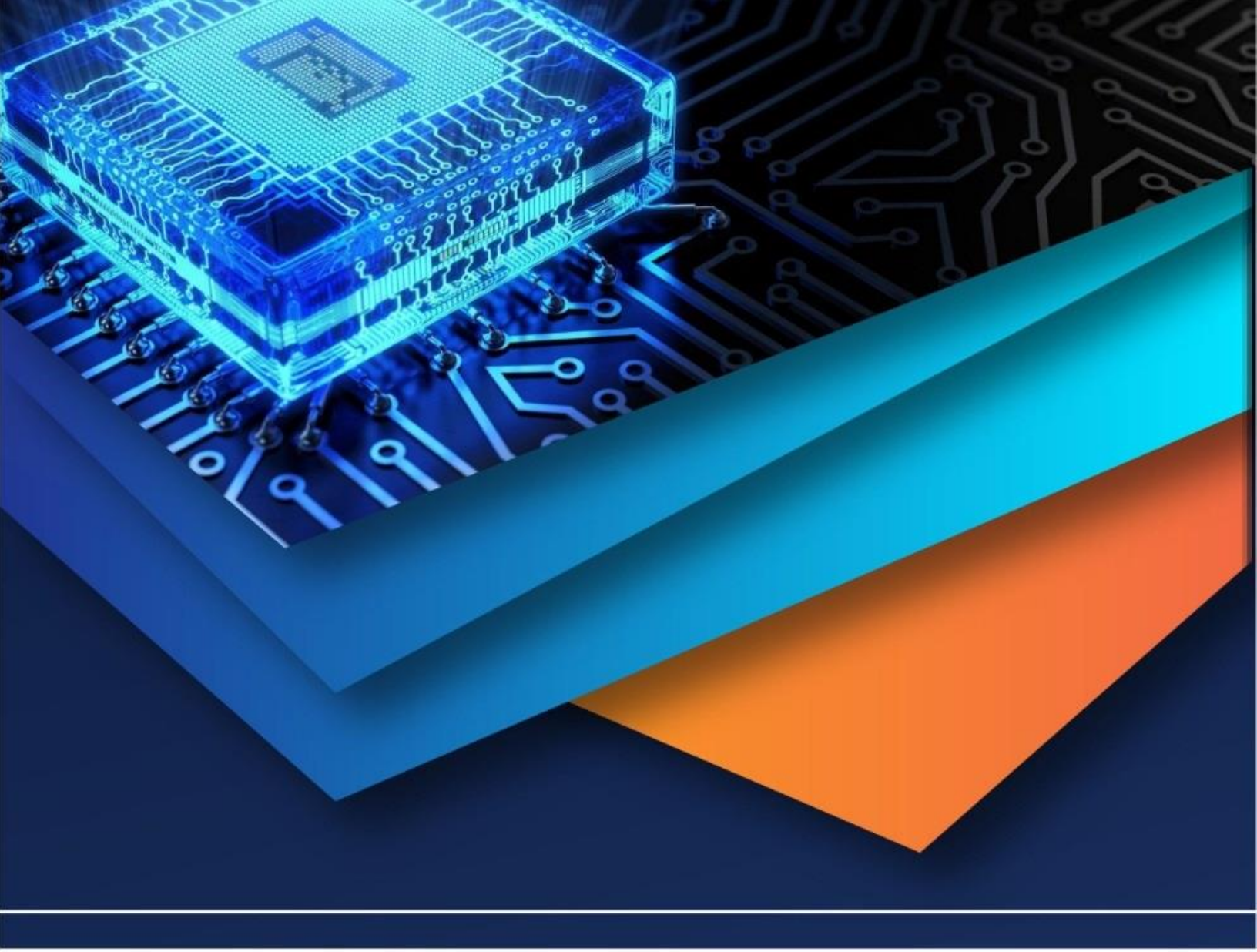

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