Smart Billing in Kirmas

Mrs.M. Ramani1, T. Vasantha Kumar2, G. S. Nareshkumar3, P. Mohankumar4, S. Abilayan5
Bachelor of Technology, Department of Electronics and Communication Engineering,[1],[2],[3],[4]
Assistant Professor, Department of Electronics and Communication Engineering,[5]
Sri Manakula Vinayagar Engineering College, Puducherry.

Abstract: In this rapid world, time and accuracy are the two foremost things of our life. But we spend most of our time in terms of billing in the billing counters of the retail shop. There are many methods obtained for this determination. All these methods are also dawdling the time because the customers have to make a line to make their billing in the counter. This effort defines the well-organized system that detects the purchased products of the customer. This billing is made by using a web camera attached in the bill counter that is endlessly capturing images of Purchased products, identify the products in images and equate the detected products with the database and update it in the bill. By this proposed idea, we can reduce the time in billing process and can also increase the accuracy. This module captures the image and detects the purchased items by processing it and produces the bill as output. So, the customer need not wait in long tiring queue for the billing process. This process improves system performance and provides time management.

Key Words: TensorFlow, Object detection, RCNN and Faster RCNN.

I. INTRODUCTION

People tend to overshoot their scheduled time when they are shopping at big shopping center. Moreover, they end up with long queue at the end of their shopping, waiting for the products to be scanned and billed. There is lot of methods available for reducing the time spent in the bill counter and to increase the accuracy of the billing. During festival time large crowd can be seen in the market for shopping. In such scenario, it is difficult to manage such huge crowd in billing.

The existing systems use the RFID Tag for each and every product but the cost of RFID is high when compared to the price of some small products, so this technology is cost inefficient and it much expensive for small shop. Next method is there, where the barcode is used for the billing process and it may require to paste the barcode sticker on surface of each product, for billing process in the bill counter, the cashier need to show the barcode of each product on the barcode reader. Thus, this method consumes lot of time waste. Analogues to all of these, Amazon GO uses "Just Walk Out Shopping". In that, if the product is taken from the shelf by the customer, then the price of that product is directly taken from the customer account and if the customer again replaced that product, then the cost of the product will be returned to the customer account. Here the customer account is directly linked to the shopping. So, there may be the chance, that our information being stolen by the hackers.

In this proposed system, we use TensorFlow for object Detection. Here the customer purchases the products and comes to the billing counter. In the billing counter all the purchased items are placed in front of the camera unit so that it can detect the objects which are in the purchased list. The captured image is first passed through the Convolution Neural Network then the image will go under series of the activation filter in order to find the Region of Interest and to form the boundary box. Finally, the detected object will be listed in the form of bill.

II. RELATED WORKS

There are various new systems that are up-coming in the field of shopping. We have discussed a few methodologies that have been proposed so far in the shopping sector. W. U. L. J. R. Perera, M. S. Karunarathne, Enhancing and Speeding-Up Real-Time-Shopping Using an Indoor Map, Intelligent Suggestions and Calculations, built upon a Smart Phone Application, describes the idea which uses Indoor Map, Intelligent suggestions and calculations which were built on a smart phone application. The system may include three sub

system as follows as Shelf Locator Sub- System, Intelligent Agent Sub-System and Calculation Sub-System. The Self Locator Sub- System locates the location of the object on indoor map using Co-ordination system and with RFID. SQ Lite is being used as the database to store the product information. Intelligent Agent Sub-System takes care of the suggestion based on interest of customer on product and location of the customer in x-direction. Calculation Sub-System is for computing and calculating of the total amount of the purchased items but the customer is requested for the quantity of each items. And also, the customer should have smart phone and it should have the capability to connect with the RFID tags.

You-Chiun Wang and Chang-Chen Yang, 3S-cart: A Lightweight, Interactive Sensor-based Cart for Smart Shopping in Supermarkets, the paper proposes a sensor-based smart shopping cart (3S-cart) system by using the context-aware ability of sensors to detect the behavior of customers and respond to them in real time application. In the sales-promotion application, each cart checks if its customer has interest in some product and shows information regarding such type of products to increase the purchasing desire. In the product-navigation application, a customer asks the system to find an unhindered shortest path to comfortably obtain the desired product. 3S-cart system has three design goals. It has to offer a lightweight solution to construct the system. Second, it should be simple to use the system. Third, it can support cooperation with other systems. 3S-cart architecture, which consists of wireless routers, shopping carts (with 3S-cart modules), and a control server. Wireless router is deployed on each shelf. Once a router detects the coming of a customer (via his cart), we could know what products the customer is looking for. The control server acts as the decision center and gives customer information regarding such products that he may desire to buy in a user application.

Akshay Kumar, Abhinav Gupta, S Balamurugan, S Balaji1 and Marimuthu R, Smart Shopping Cart describes the use of Xbee and Arduino UNO in a cart to reduce the wastage of time in the billing counter. It uses Arduino UNO, RFID reader and RFID tag, LCD display, Xbee and a Database to perform this described function. The Arduino UNO is used to control the overall system to perform a task. The RFID has a unique number which is present in the tag is being read and with the help of Xbee technology it updates the Database. Thus, the price, quantity of the product is being displayed LCD along with the location of the product using GPS. But the cost of RFID, Xbee and Arduino in the cart and its maintenance is tedious.

Mr. P. Chandrasekar, Ms. T. Sangeetha, Smart Shopping Cart with Automatic Billing System through RFID and Zigbee, this proposed idea creates an automated central bill system for supermarkets and mall. Each cart is attached with product identification device (PID), through ZigBee communication PID sends its information to central automated billing system, where the net price is being calculated for the purchased products. Customer can get their billing information at the packing section according to their Cart Identification Number. Using PID, customers no need to wait near cash counters for their bill payment. Since their purchased product information is transferred to central billing system. Customers can pay their bill through credit/debit cards. The 8- microcontroller used here has the capability of receiving 8-bit data from RFID reader.

III. EXISTING SYSTEM AND ISSUES

In the existing system which uses Arduino and Xbee, a particular system is developed which displays the total price of the purchased product. Each product cost is added and total cost is displayed but the customer has to enter manually. In the Existing method, all the items contain barcode stickers which are scanned by barcode scanners and the product details are entered. All items should possess RFID tag and the price of the items is a bit higher than the original price. Amazon Go brought up a new idea according to which the price of the item will be deducted as soon as it has been taken from its respective place in the shopping mall. 3S system consists of sensor network which is called as WSN (Wireless Sensor Network). Sales promotion and product navigation are the two streams in 3S systems. Information, interaction and movement from the customer is collected to promote a product and navigation of a particular item.

IV. PROPOSED SYSTEM

In the existing manual billing system, the customer who enter into the billing process after purchasing the products, they ought to wait in a long queue for the billing and packaging. If the people are large then the customers need to wait for long time and in such scenario, there may be chance for inaccuracy billing due to manual

computation or due to other reasons. But in the proposed system, customer need not wait in the queue since all the product are kept in the billing counter the proposed module will detect each product then all the purchased items are get listed in the form of bill. Thus, by the shops can prevent overcrowding in the bill counter and can also increase the accuracy.

Working:

In our system, Real Time Object Detection module is used for detecting the products and it is processed. In the process of Object detection real-world objects, such as faces, buildings, and bicycle in images or videos is detected. Here, the Object detection algorithms typically uses learning algorithms and extracted features to recognize instances of an object category.

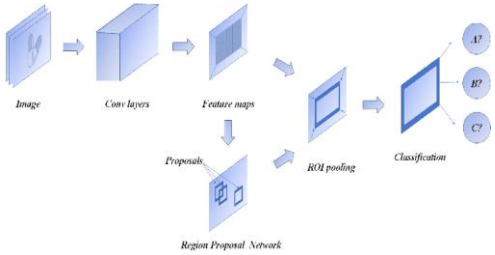

Fig. 4.1 Image Recognition Flow

The processing stage may include two main things as follow as:

i. TensorFlow
ii. OpenCV

TensorFlow:

TensorFlow is an Open Source Machine Learning Framework for dataflow programming across a range of tasks or operations. It is one of the Google products. Google product uses machine learning in all of its products to improve the search engine, translation, image captioning or recommendations.

We can experience a faster and more refined the search in Google with AI. If the user types a keyword the search bar, Google provides a recommendation about what could be the next word.

TensorFlow hardware, and software requirements can be classified into

i. Development Phase
ii. Run Phase or Inference Phase

3.6.1 Development Phase:

The Development Phase is the training phase of the model. In this phase the model is trained with the use of dataset. Training is usually done on Desktop or laptop.

3.6.2 Run Phase or Inference Phase:

Once training is finished during the development phase, the TensorFlow can be run on many different platforms such as Desktop (running Windows, macOS or Linux), Cloud (as a web service) and Mobile devices like iOS and Android. The training of the model can be carried on GPUs as well as CPUs and can be used on both as well. A significant feature of TensorFlow is the TensorBoard. The TensorBoard is used to monitor the working of TensorFlow graphically and visually.

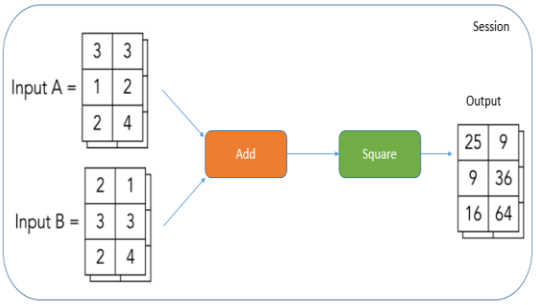

Fig. 4.1 Multi-dimensional array representation of TensorFlow

Nodes in the graph typify mathematical functions, while the graph edges represent the multi-dimensional data arrays (tensors) communicated between them.

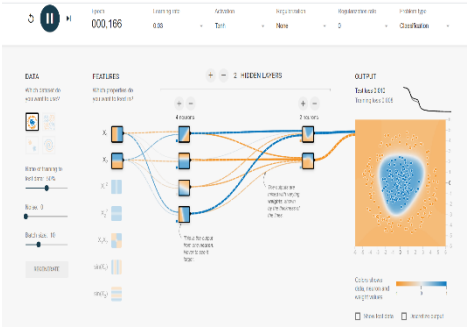

Fig. 4.2TensorFlow Playground

TensorFlow's Object Detection API is a robust tool which enables to create own powerful Image Classifiers. An image is passed to the network, which is so what called as Convolution Neural Network (CNN). In that, the image is then sent through various convolutions and pooling layers (active filters). Finally, we get the output in the form of the object's class.

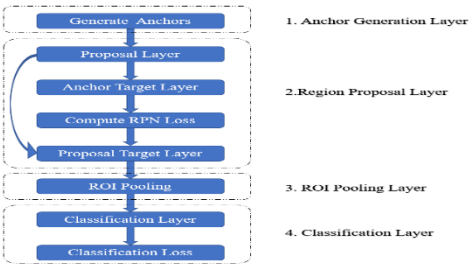

Fig. 4.3 Flow Chart for Object Detection

For each input image, we get an equivalent class as an output. This technique can be used to detect various objects in an image using CNN. But it takes more time for detecting and training so we go for Faster RCNN.

The RCNN uses a selective search to pull out these boxes from an image (these boxes are called regions). Selective search recognizes these patterns in the image and based on that, it will offer various regions. Faster RCNN takes the place of the selective search method with a region proposal network which made the algorithm much faster. The major difference between them is that Fast RCNN uses selective search for generating Regions of Interest, while Faster RCNN uses "Region Proposal Network", also known as RPN. RPN takes image feature maps as an input and give rise to a set of object proposals, each with an objectness score as output.

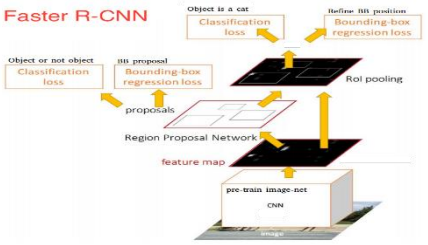

Fig. 4.4 Faster R- CNN

OpenCV:

OpenCV is a cross-platform library which can be used for developing a real-time computer vision application. It mainly works on image processing, video capture and analysis including features like face detection and object detection.

In our system it is used for real time object detection with the use of a web cam. OpenCV necessitate an extra configuration file to import object detection models from TensorFlow. It is based on a text version of the same serialized graph in protocol buffers format (protobuf).

DEGREE OF ADVANTAGES:

Reduce the time spent in the bill counters,

Increase the accuracy of the billing,

Ease in checkout

V. EXPECTED OUTPUT

With use of TensorFlow which is used for the Object Detection. The detected real time object detection model is shown Fig 5.1.

Fig. 5.1 Detected Output

The expected output is to be as like the normal bill in the retail shop. The bill may include all shop captions and other details such as serial number, name of the product, quantity of the product, and price of the product etc. The resultant output is in desktop interface form of bill is shown as in Fig. 5.2.

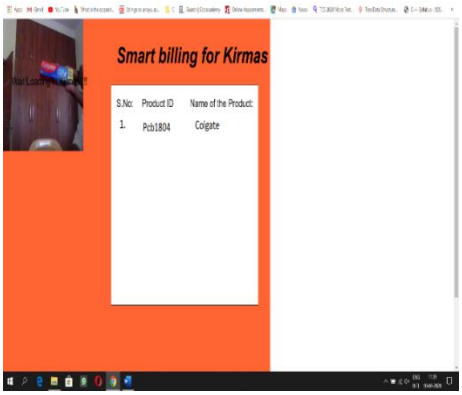

Fig. 5.2 Billing Output

VI. CONCLUSION

The system proposed is a real-time system. It takes input images through web camera continuously. The main camera is placed at the bill counter of the shopping mall. When the customers after finishing their shopping the web cam which is place in the bill counter will takes all the products will taken and listed in the bill automatically. The system could detect the products with best percentage of accuracy. The accuracy depends on clarity. The aim is to make a system that is useful to the

retail shop by reducing time consumption in bill counter. institute. No need for specialized hardware for installing the system the classroom. It can be assembled using a camera and computer. The camera should be connected in a place with good light in the background and free obstacles. This method is accurate enough and reliable. In this paper with the tremendous use of TensorFlow, the object detection is done. And every method has its own advantage and disadvantage. But in this we tried to overcome the existing system problems. When compared to the other system the proposed system has more advantages and secure as we make change only in the billing process.

To improve the recognition performance, there are many things that can be improved here, some of them being easy to implement. You can normally improve the recognition accurately by using more input images that is the dataset, at least 50 per category, by taking more photos of each category, particularly from different angles and lightning conditions. It is important to have a lot of variation of conditions for each person, so that the classifier will be able to recognize the person in different lightning conditions and positions, as an alternative of looking for specific conditions.

REFERENCE

[1] Akshay Kumar1, Abhinav Gupta1, S Balamurugan1, S Balaji1 and Marimuthu R1, "Smart Shopping Cart" 2017 International conference on Microelectronic Devices, Circuits and Systems (ICMDCS), Aug 2017.

[2] Mr. P. Chandrasekar, Ms. T. Sangeetha, "Smart Shopping Cart with Automatic Billing System through RFID and ZigBee" International Conference on Information Communication and Embedded Systems (ICICES2014), Feb 2014.

[3] W. U. L. J. R. Perera, M. S. Karunarathne, "Enhancing and Speeding-Up Real-Time- an Indoor Map, Intelligent Suggestions and Calculations, built upon a Smart Phone Application" 2013 IEEE 8th International Conference on Industrial and Information Systems, Dec 2013.

[4] Yanping Zhang, Zhifeng Xiao, Jianjun Yang, Katerina Wraith, and Patrick Mosca, "A Hybrid Solution for Smart Supermarkets Based on Actuator Networks" 2019 7th International Conference on Information, Communication and Networks (ICICN), April 2019

5] Dr.Suryaprasad J, Praveen Kumar B O, Roopa D & Arjun A K, "A Novel Low-Cost Intelligent Shopping Cart", Dec 2011

[6] Tharindu Athauda, Juan Carlos Lugo Marin, Jonathan Lee, Nemai Karmakar, "Robust low-cost passive UHF RFID based smart shopping trolley" IEEE Journal of Radio Frequency Identification (Volume: 2, Issue: 3, Sept. 2018), Page(s): 134 – 143, Aug 2018

[7] Ms.Neha A Anpat, Ms. Karuna V Belgudri, Ms. Rutuja B Deshmukh, Ms. Mayuri K Shivshette, Mr. Yogesh J Pawar, "Smart Trolley Syste Based on Android", IJSTE - International Journal of Science Technology & Engineering | Volume 3 | Issue 10 | April 2017

[8] Suganya.R , Swarnavalli. N , Vismitha. S , Mrs. G.M. Rajathi "Automated Smart Trolley with Smart Billing Using Arduino", International Journal for Research in Applied Science & Engineering Technology (IJRASET) , Volume 4, Issue III, March 2016

[9] Aniket Wani, Krutika Thakur, Nikhil Vaze, Meeta Vadhel, Rupali Advirkar, "RFID Based Intelligent Trolley System using Zigbee", THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE, Vol 3, Issue 3, March, 2015.

[10] P. Lopez-Iturri et al., "Implementation of wireless sensor network
architecture for interactive shopping carts to enable context-aware
commercial areas," IEEE Sensors J., vol. 16, no. 13, pp. 5416–5425, Jul. 2016.

[11] M. Mathankumar, N.Sugandhi, "A Low Cost Smart hopping Facilitator for Visually Impaired "International Conference on Advances in Computing, Communications and Informatics, 2013