



# Survey on object detection techniques

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**Abstract:** *Image classification is assigning a class label to an image on the other hand object localization requires drawing a bounding box around one or more objects in an image. Object detection is more difficult and combines these two tasks and draws a bounding box around each object of interest in the image and assigns them a class label. All this is referred to as object recognition. The proposed smart cart allows the customer to shop without any friction. A product that is picked and placed in the cart by the customer is recognized by the cart with help of sensors. Using yolo for product recognition and other sensors the data is fused. The type, quantity and weight is automatically calculated and displayed on the screen present above the cart. Customer can also remove an item from the cart which will be immediately reflected in the virtual cart. Based on the customers shopping history recommendations can be suggested also an instore map is provided. Barcode's don't need to be scanned or searched. By simply picking an item and moving on allows the customer to shop quickly and easily while not worrying about waiting in the checkout lines. After the shopping is complete the bill is generated and paid by the customer using online methods.*

**Keywords:** Yolo, Object Detection

## I. INTRODUCTION

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image.

Several methods of smart shopping carts are currently proposed. Most smart shopping carts recognize customers through face recognition on the user interface and use RFID (Radio-Frequency Identification) tags to automatically detect various products added to the cart and display relevant information on the user interface. However, attaching RFID to all products requires cost and effort.

The proposed smart cart allows the customer to shop without any friction. A product that is picked and placed in the cart by the customer is recognized by the cart with help of sensors. The type, quantity and weight are automatically calculated and displayed on the screen present above the cart. Customer can also remove an item from the cart which will be immediately reflected in the virtual cart. Based on the customers shopping history recommendations can be suggested also an instore map is provided. Barcode's don't need to be scanned or searched. By simply picking an item and moving on allows the customer to shop quickly and easily while not worrying about waiting in the checkout lines. After the shopping is complete the bill is generated and paid by the customer using online methods.

To achieve the above objective, objects are detected using YOLO (You only look once) along with a weight and ultrasonic sensor. The commemoratives of this paper are organized as follows: Section II gives an overview of related work. Section III includes the result and comparison of an existing system. Section IV concludes this survey.

## II. RELATED WORK

Shopping carts are mechanical, passive devices, assisting the movement of goods from their shelves to the checkout station. Even where a LCD display and supporting video hardware have been added in order to display advertisements to the shopper, a shopping cart is still a passive device. Indeed, the merchant runs the risk of alienating his customers by merely adding display hardware to his shopping carts and bombarding his shoppers without providing any benefit to the shoppers. The authors propose equipping the shopping cart with a barcode scanner. While this helps a little every time the user needs to scan a product. Sometimes it won't be scanned properly. Another approach is to add an RFID scanner attached to the cart and every product in the store has a tag. This method is very time consuming since every product in shop must be tagged. A weight sensor is attached to the along with a barcode scanner the scanner can scan the product and total weight can also be tracked. This might be unnecessary if barcode is already scanned. YOLO is a powerful image classification algorithm we are able to recognize products put in the cart using this method. For image processing LSTM is used to memorize the product. As the

data set grow in order to achieve efficiency this method should be used. As collecting data is important labelling tool is explored so that the data which is collected is labelled as quickly and correctly as possible. The detection must be one in real time so retrained CNN is used for real time identification of grocery this is helpful for real time detection. A few different combination are using a barcode scanner the cart is also equipped with LCD display which provides all the necessary information to user. While this is helpful it is slow process. Object needs to detected when in a crowded environment using different technique we can identify small objects for two overlapped object this is helpful when cart is full and there are many product on top of each other.

### III. Literature Table

Based on the above survey we compare some techniques used for detecting multiple object in real time and other ways to make the shopping cart smart. The Overview of various existing techniques and algorithms are described in the following table. The techniques and proposed methods, advantages and disadvantages are included in the below table.

Paper Title and Author name	Proposed Methods	Advantages	Disadvantages	Year of publication
1."Smart Shopping Cart" Author-V.V,P.K.P and C.R.S	Barcode scanner was use for identifying products.	The system was faster than traditional check out. Also easy to implement.	The time required to scan every was an issue.	2018
2. IOT based smart shopping using radio frequency identification. Author- M. Shahroz, M. F. Mushtaq, M. Ahmad, S. Ullah, A. Mehmood and G. S. Choi	Using consists of Radio Frequency Identification (RFID) sensors, Arduino microcontroller, Bluetooth module, and Mobile application.	When products come near to the RFID reader in the shopping cart it is scanned Faster and easier check-out.	Expensive than barcodes.	2020
3. The shopping basket based on IOT applications. Authors- S.Mekruksavanich	Scanning the products using mobile applications before placing it in the cart.	Low Cost implementation and faster checkout.	Not everyone will use the application its time consuming to do so.	2019

4.Real time object detection and classification of small figures in image. Author-Aldo algorry,Arian GillesGarcia	Using yolo and CNN classifier to detect object in small space.	Small objects can be detected easily. Also small object can be spotted.	Sometimes fails to detect similar objects.	2017
5.Toward real time grocery detection for the visually impaired.Author-Eric Christensen,Tess Winlock	Online detection of items in shopping list using selfscanner.	Builds a mosaic using any object detection algorithm.	Needs a lot of data to be trained.	2010

6. Smart Electronic trolley for shopping Mall Author-T.Sarala,K.V Shindu,B N Nithin	Adding a barcode to the shopping cart along with a lcd display.	The barcode scanner helps in scanning the product and lcd display keeps track of the products in the list.	It looks easy by adding and removing of the products and then scanning is tough.	2018
7. Yolo -you only look once Author- Joseph Redmon,Santosh Divvala,Ross Girshick ,Ali Faradhi	Yolo is an object detection algorithm.	YOLO is significantly faster than region-based object detectors. CNN can propose only two automatically detects objects in real time.	Struggles to detect close objects because each grid can propose only two bounding boxes.	2016
8. Smart Shopping cart Author- Akshay Kumar,Abhinav Gupta,S.Balaji,R.Marimuthu	Displaying the total cost of products in cart .	The total cost is displayed on screen which helps the shopper add or remove products.	Sometimes the cost is not displayed correctly.	2017
9. Smart shopping system with an RFID Interface for Human. Author-R.R. Vallabhuni, S.Lakshmanachari,G. Avanthi and V.Vijay	Using an RFID tag for generating a bill.	It is fast compared to the barcode scanner.	Adding rfid to products is an additional time consuming task.	2020
10. Smart trolley Author: Pragati Shrivastava ,Rajan Chauhan,Vaibhav Tyagi	Adding barcode scanner and lcd screen to the cart.	The products details are displayed on the screen.	Scanning every product will take sometime while adding or removing many different products.	2021
11. Innovative shopping cart for smart cities. Authors: Prasiddhi,Dhanashri Gawali	Using product detection to generate a bill.	Has product recommendation system along with automatic billing.	Not easily scalable .	2017

12. Design and implementation of smart basket using near field communication. Authors: D.Mohanapriya,R.mohamed Anas,P.Nandhini,N.M. Deepika	Uses a nfc tag with hole screen to display product information.	NFC sends data over the server bill is generated faster.	Can be hard to implement on a largescale.	2020	
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#### IV. CONCLUSION

We surveyed various techniques and methods used for a smart shopping cart. We compared different techniques as well as methods based on properties such as efficiency, latency and accuracy. This survey focuses primarily on the methods used to detect multiple objects and the techniques used to calculate weight in real time.

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