

Smart Trolley

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CANDIDATE DECLARATION

We hereby declare that the work presented in this project report entitled "**Smart Trolley**", end semester project of 6th Semester of B.Tech (ECE) at Indian Institute of Information Technology, Allahabad, is an authenticated record of our original work under the guidance of DR. SUNEEL YADAV. Due acknowledgment has been made in the text to all other material used.

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This is to certify that the above statement made by the students is correct to the best of my knowledge.

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ABSTRACT

As the technology becomes more and more progressive, machines begin to become smart. A smart machine is a cognitive, contextually aware computing system capable of making decisions without human intervention. The current availability of interactive technologies, such as internet bandwidth, increased processing power and connectivity at affordable prices, gave birth to new concepts for human life. Smart cities, Smart lives and Internet of things are some of the more developed research domains.

This project proposes a Smart Trolley which is mainly featured with a camera to scan QR code which is an emerging marketing trend, a PIR sensor to detect motion inside the trolley, Weight sensor to calculate weight of products inside the trolley and a microcomputer, Raspberry pi. The microcomputer does all the computation and maintains a database of the purchased items of the customer, i.e., the bill, in the main server for each trolley.

The proposed system is user-friendly and is easy to adapt. It has its own advantages over the traditional trolley system in malls since user does the shopping free-mindedly as the budget part is handled by the trolley itself.

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1 | INTRODUCTION

1.1 | Overview

Internet of things is a highly emerging field and is being applied to a wide variety of objects. Smart trolley is one such implementation of IoT. Internet of Things works on the concept that devices when connected to the internet, become more easy to handle and user friendly. The idea is to connect the device with the internet and it can be controlled from a remote area as well. Smart trolley is based on the fact that each trolley is wirelessly connected to the central server and every time user puts an item in the trolley by scanning it at the first place, its data is stored and transferred to the main server. The trolley after accessing the information from the server displays the relevant information like total price to the user.

1.2 | Basic Idea of Work

As we pick the product to put in the trolley, first we scan the QR code of the product using the Web camera. Then it crosses an array of IR sensors so as to keep track of the product whether it has gone inside or out of the trolley. Weight sensor will measure product's weight. Then the details of the item will be sent to the main server via Raspberry pi. After getting the information, Raspberry pi calculates the total price of products and weight present in the basket. The details are then shown on the display screen. As we display the price after each product is added we can keep track of our budget. When we are done with the shopping we can finish this and reach the billing counter where the details are available at the server already. Then counter person will match all product's weight with server data and he will check both are match or not. Hence, it saves time standing in the queue. We can simply collect the bill from the counter and it's done.

1.3 | Motivation

As goes the saying, **Necessity is the mother of invention**. Though this project may not be an invention but an innovation, but the quote appropriately justifies our work. Technology is what we perceive it. People are coming up with new technologies everyday and utilising it to the best for their further innovations. Our project focuses on this very aspect of the technological innovation. Making things more handy and smart is the main focus of our project.

As the countries are developing, they are coming up with supermarkets, malls and other shopping complexes. Also, population factor is increasing at a rapid rate. This increases the need for technological support in various fields. Our focus is on the shopping complexes. Trolleys are readily available in any supermarket which assists the buyer in carrying things inside the market. Now

if we look from the buyer's point of view, while shopping he has some budget constraint in his mind and will always keep on calculating total price of the items he has purchased. The smart trolley will eliminate this need of the buyer. Microcomputer based design has acquired the status of the most happening field in electronics and hence, our smart trolley makes use of a microcomputer, i.e. Raspberry Pi.

2 | OBJECTIVE

2.1 | Problem Definition

Nowadays, shopping in mall requires the use of trolley. Let's say the customer has pre-decided his budget. Now every time he puts an item in the trolley, he has to sum up the price in his head and compare it to his budget. At last, he has to stand in a long queue for the billing process. All this wastes a lot of time of the customer, which could have been used somewhere fruitfully. Also, from the seller point of view, because of so much rush in the mall, the sales of the mall goes down as no one likes to shop in such a mess. And if the number of customers become huge, the mall doesn't have enough counters to manage the crowd.

2.2 | Solution

Our aim is to build a smart trolley which has technological features which take care of the information of all the items placed inside, keeping updated the customer of the estimated price of the then kept products. Also, the headache for standing in long queues is lowered to a large extent since it can be easily interfaced for verification and bill print out at the billing counter.

3 | SYSTEM MODEL

3.1 | Methodology

The trolley is integrated with a camera and Raspberry pi, which is wirelessly connected to the central server of the mall which contains the database of all the products available inside the mall. The trolley-server can be visualised as a client-server model. When we put any item inside the cart, it will detect the motion of the object with PIR sensor, i.e., either we are putting the object inside the cart or we are removing it from the cart. Each object will have a QR code on the packaging (since QR is cheap, easy to print and faster to read). The camera connected to the Raspberry pi will read the QR code. Raspberry PI shall request the server for the price of the item placed inside the cart, server will return its price and then the price will be added to the previous amount and displayed

on the display screen on the trolley. When customer puts item inside the trolley then Weight sensor will calculate item's weight and weight sensor connected with the Raspberry pi so data will send to server. If a customer puts any item inside the cart without scanning the QR code, Trolley will notify the customer.

3.2 | System Architecture

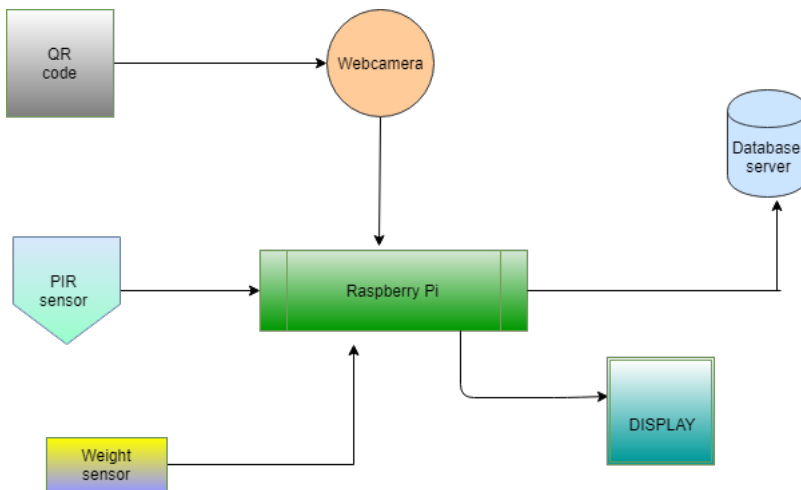


Figure 1: Block Diagram of Smart Trolley System

4 | IMPLEMENTATION

SMART TROLLEY is our project which we had started in the previous semester, and we carried forward in this semester. We had faced various issues in security of the trolley and the display module was not properly synchronizing with the trolley. So, we refined these and some more issues in this semester.

We have worked upon the following sections:

Hardware : We have implemented Smart trolley's basic functions , i.e., addition of an item into the trolley and deletion of it, using Raspberry PI ,Weight sensor and web camera and finally displayed the dynamic bill on the display screen.

Software : Since IOT is a field composed of both Electronics and Information Technology, a number of softwares are also required to be used in the project. We have :

- (a) Created and implemented Database through Sq lite.
- (b) Generated a main server database.
- (c) Used Zbar ,Python library to enable camera to scan Qr-codes .
- (d) Used Flask to connect python script to webpage and display the dynamic bill.

Sensors : (a) PIR sensor for motion detection

(b) Weight sensor for measuring weight of all products.

Display module : The 3.5" LCD -TFT display screens are the latest display modules in the market. Also, they are suited to be used with Raspberry PI. We are already working upon integrating and complementing it with the micro-computer and have replaces the normal display by a touch-screen display which will be more user-friendly.

Current Prototype : The basic Smart Trolley has already been implemented in the previous semester. This semester we have worked on security issues and display module and synchronized display with weight sensor and PIR sensor.



Figure 2: Smart Trolley System

5 | RESULT

We have setup the Smart Trolley for our smart system. Following are the results:

1. Implemented the trolley with the simultaneous help of PIR sensors.
2. Added more features so as to ensure security and safety measures using weight sensor.
3. Making the Smart Trolley System duly connected to internet.
4. Displayed the dynamic bill on the display screen and synchronized it with the whole system.

6 | REFERENCES

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