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## Development of RFID based Smart Shopping trolley for Supermarket

Anupavidhra M S<sup>1</sup>, Deepika A S<sup>2</sup>, Muniyappan K<sup>3</sup>, Kaviya M<sup>4</sup>, Mr.S.Balamurali<sup>1</sup>

U.G. Student, Department of Electronics and Communication Engineering, KPR Institute of Engineering and  
Technology, Coimbatore, Tamilnadu, India<sup>1</sup>

Assistant Professor, Department of Electronics and Communication Engineering, KPR Institute of Engineering and  
Technology, Coimbatore, Tamilnadu, India<sup>2</sup>

**ABSTRACT:** Despite the presence of E-commerce people tend to buy many products only in supermarkets and malls for the sake of their own satisfaction. Among the difficulties sweet-faced by the shoppers one problem is to follow queue through the asking method. Though their intent is just to buy one or two products, waiting to bill products consumes time and also inconvenient these days as people live in a busy environment. The shopkeeper area unit able to welcome any sensible machines that change the asking method to scale backmen and time consumed for that method. To move the trolley automatically, by using the gyroscope sensor in response to the hand gesture. The product can be identified using the search option in the trolley, which will guide the location of the user. By reading the bar code in the product, the RFID reads the value of the product and continues the billing. The main aim is to satisfy the client and conjointly scale back the time spent on the asking method that is to finish the asking method within the streetcar rather than waiting in an exceedingly queue even for one or 2 merchandise.

**KEYWORDS:** Shopping trolley, Supermarket, RFID, Gyroscope sensor, Raspberry pi 3

### I. INTRODUCTION

Retail marketers are showing interest in cost mechanism to maintain stores. Also the tracking of products in effective manner. As such there are also problems faced by the consumers are like shoplifting, tracking the products and barcode used in retail supermarkets. In this study we propose a low cost robust, passive UHF RFID based shopping trolley system which allows tracing and processing the shopping data in real time

We see these days RFID are widespread and taking role in many advanced projects due to its fast and effective response. RFID are generally tags that are used for unique identification of products by radio waves. In this project we use a new technology gyroscope sensor for the movement of trolley by which moves the vehicle according to the gesture of our hand this module makes the customer to ease the use of trolley. This could be done by shopping trolley installed with RFID reader to scan each product and load it.

We also use an unique module for searching a product which is formatted using a software application. This application allows the customer to search for a product through a display placed in the trolley. The application's user and admin pages are created by the admin management which includes the addition and removal of product from the list. The admin page contains the addition of products and also their cost in it and this would be viewed by the customers after the entering of the admin.

The RFID tag reads all the barcode and calculate the sum amount of the product. When the customer is done with the shopping he could pay his final billing through customer cards or even through ATM card. Our concepts satisfy the expectation of the customers whose basic demand is to ease the ways of purchasing. By regulating the RFID based shopping cart, one should easily bill the products themselves without bothering the presence of workers the overcome of

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the project will not only to facilitate the customers but also the shop owners by eliminating the cashiers and money spent on them.

## II. LITERATURE SURVEY

The automated shopping trolley for supermarket billing system implemented by **Sainath (2014)**, exploited barcode for billing of products, where customer scans the product using barcode technology. The bill will be forwarded to the central billing system where customer will pay them by showing unique id. The limitation of barcode scanning requires line of sight for scanning and it should be fixed within its boundary.

Cash register lines optimization system using RFID technology by **Budic (2014)**, developed a system for shopping using RFID. The RFID is employed for scanning products and the information is stored in the database which could be paid online or in a central bill. It also uses web application to maintain entire shopping details. It requires maintenance of web application server. No necessary steps have been taken for the products that are accidentally dropped into the trolley by the customer.

IOT based intelligent trolley for shopping mall by **Dhavale Shraddha (2016)**, applied RFID technology for billing during purchase in shopping malls and IOT is used for bill management by means of ESP module. The payment details will be sent to the server by which central billing unit will deal with customer's payment. The ESP module will be working as a short distance Wi-Fi chip for wireless communication. But there is a drawback which includes constraints such as distance and interference. Server will be busy if customers are high and internet connectivity should be stable for finishing the process.

## III. RELATED WORK

RFID was re-owned for traceability application and it was introduced to the mainstream. The RFID tags could read multiple tags at one time which increases the reading efficiency and also globally standardized under the ISO 18000 in particular and GSI standards on EPC Global based on its application. Other standards such as GATG and CEPT also found to be relevant in industry deployment. The following requirements are taken into consideration to design and development of smart trolley application.

- **Every item that goes in and out of the shopping trolley should be detected**-In such a case, antennas should be placed in strategic positions where the radiation patterns able to cover the entire area inside the trolley irrespective of tag orientation.
- **Capability of UHF RFID Reader**-The reader should be able to deal with multiple antennas with different configurations simultaneously. The main aim of this research is to develop a UHF RFID system that works simultaneously with multiple antenna inside a shopping trolley. It connects with the reader and show real time information to the customers.
- **RSSI Measurement** -It plays a significant role in this application as a measurement directional gains that are needed for the antenna development. Therefore CSL486 RFID reader capable of providing derived measurement such as the "Geiger count" which indicates the average RSSI value as a % of transmitted signal power.

$$P_R = \text{RSSI} = -20 \log D + T_x \text{Power}$$

CP antennas have shorter reading range compared to linear polarised (LP) antenna. It has wider beam width with lower gain this helps to scan more items in near field as well as to avoid reading items beyond the trolley. Considering the RFID tags, the antenna gain can be calculated for a given wavelength in order to make the antenna design simpler and cost effective.

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## IV. SYSTEM DEVELOPMENT

This project works on the basic technology of RFID tags which reads the code and calculates the bill using an automated trolley. There are three modules considering the automation:

- **MODULE 1:** The first module consists of a gyroscope sensor that is used for moving the trolley automatically. This sensor helps in moving the trolley front, back, right, and left, which sends the movement of the hand gesture to the receiver of the Raspberry Pi from the RFID transmitter. The Raspberry Pi sends the message to the motor and finally keeps running in accordance with the hand movement. The message command includes the stop option. These commands are viewed through a software application VNC viewer for checking the process of the working.
- **MODULE 2:** Here we use an RFID tag for reading the code in the product, which is read by the RFID tag placed in the trolley which displays the cost of the product. These tags are a combination of a microchip for the storage of a unique number code for each product, which is stored as a database. As soon as the tag comes in the RFID reader coverage range, the reader emits the RF signals which provide power to the passive tags, and it emits the signal with the data of the reader. The purpose of the RFID tag is to uniquely identify the products. The RFID reader continuously emits the RF signal throughout its range, and whenever an RFID tag is inside its range of distance coverage, it retrieves the information stored in the tag. It retrieves the information from the RFID tag.
- **MODULE 3:** In this module, we introduced a new technology of searching a product through a display which has been entered by the shop owners. The owners of the shop should enter the whole content of the product, including the cost, in the admin page. This page contains a number of rows and columns for entering the product details and also the location of the product through the display. This can be identified using the RFID tags, which help us in knowing the data of the product.

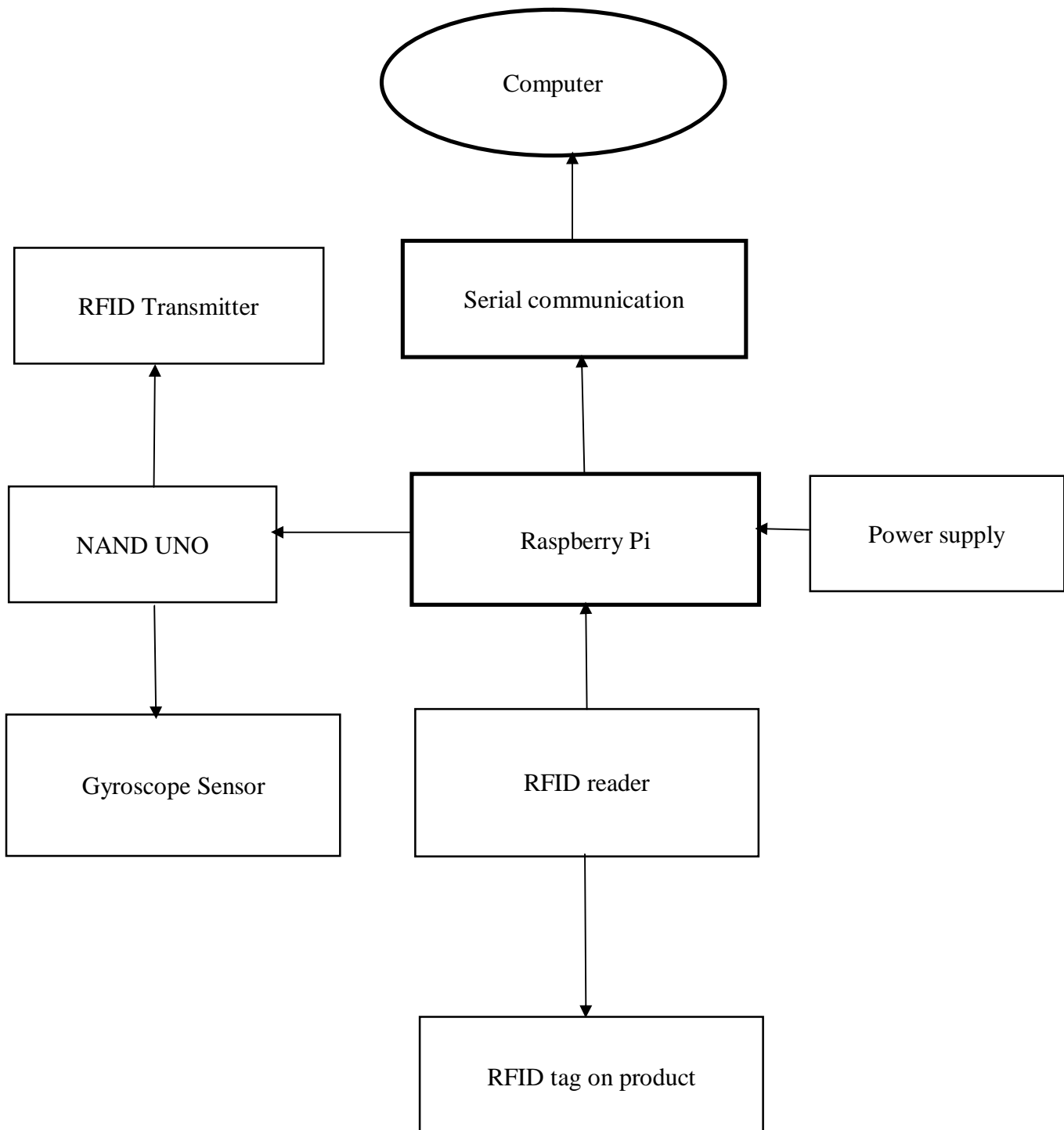
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## IV. BLOCK DIAGRAM



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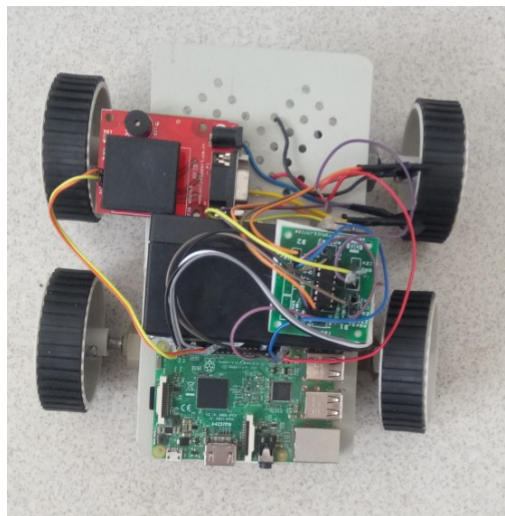
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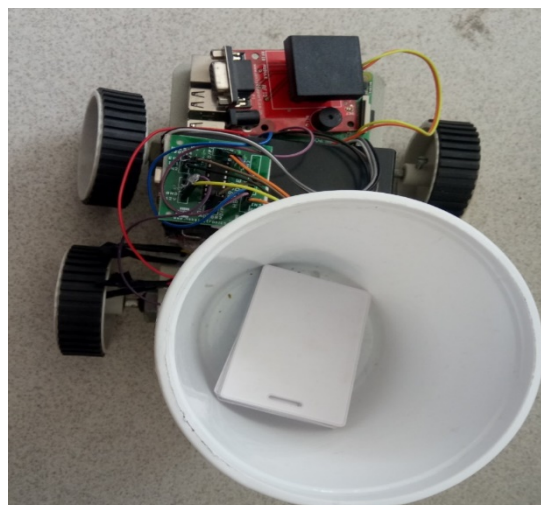
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## V.EXPRIMENTAL RESULT

Figure(a) shows the results of the vehicle that moves automatically using gyroscope sensor and h-bridge.



Figure(b) shows the results of the automatic billing using RFID tag.



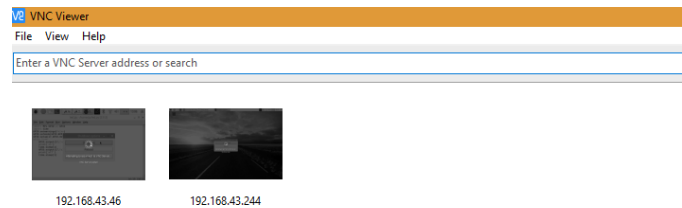
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Figure(c) shows the results of the display of the product



## VII.CONCULSION

In this paper, the successful use of RFID system for smart shopping trolley has been demonstrated. The items can be detected irrespective of its tag orientation, size and shape. These were the drawbacks addressed in previous shopping trolley applications which were overcome in this application. The development of RFID based shopping trolley has reduced the time of shopping and also benefits the shopkeeper by decreasing the employees. Evidently RFID has outsmarted barcodes by its accuracy, fast response and durability. Our concept has erased the traditional ways of shopping, like customers relying on shopkeepers for acquiring about the information of the product. Billing is completely avoided which in turn saves the time of the customer and makes an easy process for the shopkeeper. It reduces the one third of overall investment of the shopkeeper for the billing department.

## VIII.FUTURESCOPE AND RECOMMENDATION

Future advancement is to use enhanced RFID readers that operate in high frequency which can be used through our mobile software application that can be developed to avoid smart cards and GSM. The facility to download a prearranged shopping list. The payment can be done in an online transaction. It can be used in an airport for luggage fetching. Using a GPS module, the trolley moves forward on searching the location of the product through a display in the future.

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