



JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

IoT Based Social Distance Shopping using RFID and Ultrasonic Sensor

¹Gonigunta Thejeshwini, ²A. Balachandra Reddy

¹PG Scholar, Department of ECE, Sree Rama Engineering College, Tirupati, Andhra Pradesh, India.
email: gonuguntatejareddy@gmail.com

²Associate Professor, Department of ECE, Sree Rama Engineering College, Tirupati, Andhra Pradesh, India
email: balutest@gmail.com

Abstract: We can see a large amount rush at malls and supermarket on holidays and weekends. During the offer time or more discounts then it becomes more often. Now a day's people purchase a variety of items and put them in the trolley with question mark to social distancing. After the completion of the shopping one should approach for the counter for billing process. By using barcode reader the cashier creates the bill which is a time consuming process in the modern technological world. This results in long queues at the billing counters and reduces the social distancing and leads to spreading of diseases from one person to another. This project is done to overcome the above disadvantages or the situation. To achieve this solution all products in the mall should be tagged with RFID tags and all trolleys should be equipped with a RFID reader and LCD screen. When anyone puts any product in the trolley its code will be detected automatically, the item name and cost will be displayed on the LCD, thereby the cost gets added to the total bill. If you taken any unwanted item or you don't want that product then you can take out the product so the amount of the product will be deducted in the total amount and the Wi-Fi module helps to transfer the data via wireless to the central billing unit. Due to the above advantage the customers save their time in the billing counter by paying the bill by means of online payment. IOT will more effective this process. The trolley consists of an Ultrasonic sensor which detect the object Infront of trolley. If the person or object detected less than social distancing it gives beep sound and alert the person who move the trolley. The cart initially checks the status of module whether online or offline. Online communication requires network communication from user and controller will create bridge among the user.

Index Terms – IoT, RFID, Ultrasonic Sensor, Wi-Fi module ESP8266, Touch Sensor switch, Internet of things, ubidots etc.,

1. INTRODUCTION

RFID is an upgrading innovation which has as of late pulled in light of a legitimate concern for the exploration group in view of the more advantages it offers over the other existing recognizable proof and information detecting improvements. RFID is the abbreviated form thus it uses a radio wave for naturally distinguishing the things. RFID is a technology that permits the exchange of information amongst the tag that has a specific labels and the reader. It transfers the information by contactless without the need of viewable pathway over a separation up to a couple of 10 meters relying upon the sort of label engaged. For this framework the radio waves transfer the information and the distinct tags can be scrutinized or collected normally. This part is designed to survey the current technology writing and probe the problems in the existing RFID organization starting from the transformation to yet in its recognition phase. From past the growth of this technology from 1900's, aside to this expressed reliable perspectives, thus innovations have some new affairs or points. Thus a planned

motivation behind part for look at the writing identified with the abovementioned technology additionally develops scholarly analysis with giving an deal into a segment of the outstanding and precious notes where in cases hindering the growth of this alteration. It basically works on the goal to produce a more prominent perceivability and reliability and an enhanced item speed of the RFID innovation. From past 1900's, the evolution of this innovation aside the expressed affirmative viewpoints, thus the existing system has some problems by using the RFID technology. And the anticipated rationale is a part where the writing is related to Radio frequency Identification and further develops scholastic research, and giving a knowledge into a portion of the exceptional information's and urgent issues can block the development of RFID technology. There is emergency need so that the specific end goal to give a more prominent perceivability and an enhanced item speed of the RFID innovation. During world war II, The radio waves are the main utilization for transmitting the signal. when transponder (labels) were put on one plane and it is used to

recognize drawing a other nearer plane so that it Interrogators dispatched a signal to the system of the plane and the signal delivered previously to the plane could be deployed to identify amicable and the hostile flying machine.

The merchandising process is the major part of the supplychain management that promotes the products to the consumers and distributors. Shopping is the only thing where all people used to do this thing. There are some supermarkets or shopping malls where it sells the retailers product and it creates a relationship between the consumer and the consumers purchase. Instead of online shopping, people are used to the supermarkets with family or friends to entertain, enjoy and get the quality product with traditional shopping. In current age the supermarkets and malls should reinvent so that in critical situations it can be managed. Shopping malls or supermarkets are the place where small business retailer meets their need to sell their product to the consumer and thus where supermarkets acts as a medium for small group organization. In recent times many people not want to waste their time in the traditional shopping and thus it should be reinvented. In the today's world many of the supermarkets use barcode technology for billing the items. The barcode is nothing but a black vertical strips where the data are stored in terms of barcode technology. Thus we implement smart trolley where the barcode is scanned with the help of the reader we attached to it. Whereas in smart trolley the product can be scanned by the user self-scan by using ultrasonic transducer. RFID system can be used for the contactless information transfer thus it is used in our system. When we refer to RFID technology then we should consider with the reader and the tags which has specific labels. This system uses Arduino microcontroller where it access the input data and it responds with the corresponding output. The innovation must be simple and it should be environmental friendly so that it can be understood by the people. In the recent time due to the pandemic, social distancing is the mantra where we used in every space where we go and thus in the super market it is the main disadvantage that people does not follow social distancing. The sensor ultrasonic transducer is implanted in the smart trolley and it helps to maintain social distancing in between people.

The organizational framework of this study divides the research work in the different sections. The Literature review is presented in section 2. Further, in section 3 shown Concept of Existing System, in section 4 shown the Proposed Method and section 5 shown the implementation work. Experimental Results work is shown in 6. Conclusion and future work are presented by last sections 7.

2. LITERATURE REVIEW

During August 2020, The Haryana government announced that other than the shops which are selling the daily needs all types shops and offices will remain closed in the state every Saturday and Sunday due to COVID-19 pandemic because it may cause increase in crowd. [5-6].

In July 2020, BBC reported that since social distance need to maintained many sectors need to innovate - an they pointed out the grocery shop particularly. Since many customers are standing in long queue to buy their

needs they are waiting in a distance of atleast two metre from each other and they are also stading in a queue with hand sanitisers and masks to prevent them from covid attack. SO some innovations are needed to reduce the queues in a pandemic situation[7].

In september 2020, The Hindu reported that the buying habits of consumers along with how they search for and interact with new business are majorly affected by the Covid -19 pandemic, based on consumers report of crisis and recovery by facebook[8].

The above articles reported by different news providers were published during the covid-19 pandemic situation. Since the disease is spreading from one person to other person through contact also shops, malls and other places which are crowd pullers are closed and government of many countries imposed lockdown to reduce crowd and this mainly affected the people to buy the daily needs. Since shops were closed and even the opened shops were also suggested to maintain atleast two metre distance which will reduce the disease from spreading to the other person [9-10].

Since, the pandemic situation around the world has left us to stay in home in the lockdown and later to make the economy to run government has suggested to open the shops with social distancing, this is the main inspiration for us to help the people in pandemic. So we thought to reduce queue and maintain social distance in shopping malls where crowd is a regular thing to consider.

3. EXISTING SYSTEM

The Existing system has RFID tags to read the product details and LCD is used to display the details of the product. The existing system is capable of doing automatic billing and for such system zigbee is used to store the billing information and later the information is retrieved by cashier by using the zigbee or physical cable [1]. In some other models they have tried to increase the range by using UHF RFID and Circular Polarised Antenna[2].

In some models they have used web camera to monitor the customers to prevent theft[3]. In [4] they have used a server on each product shelves to find in which product customer is interested and also it senses the customer behaviour and assist them with the help by sending information to the store's employee, it mainly focus on analysing customers.

In [5] the product details were read by using RFID and arduino is used as as a micro controller. A Bluetooth module is used to transfer the product information to mobile phone and also to transfer the bill information to the cashier by connecting the mobile phone with the shop's server. Figure 1 depicts the block diagram of the existing shopping cart.

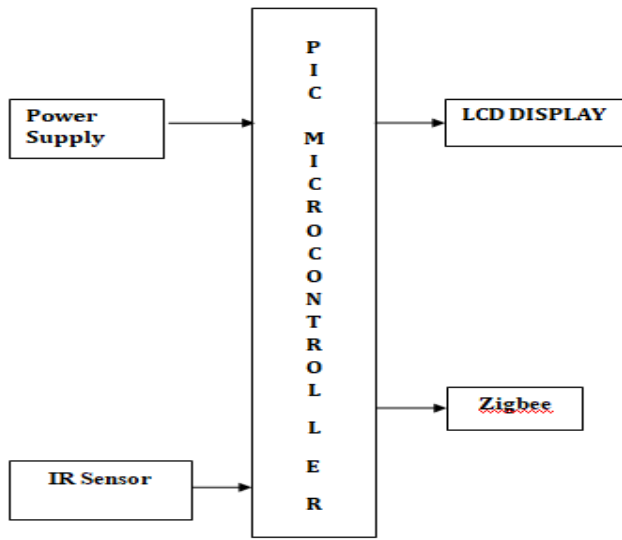


Fig.1 Existing System Block diagram

The drawback of the work proposed in [4] is when two customer are standing near the trolley, there is a chance that the trolley may get interchanged for another customer. It is not possible to attend a single customer at a time and once billing is done and the value is displayed in LCD for customer reference. Once the billing is done, to pay the bill the customer need to wait in a queue and there is no other way of payment is provided for them [11]. In all these system different mechanisms were used to make the billing easier but those mechanism fails in the feature when it comes to payment people need to wait in queue even if the billing is done in the cart itself. The proposed project reduces the queue not only in billing but also in payment. Moreover to assist the customer in knowing the product details, a handy android app is also developed in this work.

4. PROPOSED METHOD

In the recent systems, the bar codes are printed in the product thus these bar codes are used for scanning so they don't want waste their time in queue for paying the amount. At times in the billing counter the bar code of some product can be damaged thus it too take long time for scanning manually. In order to solve the problems identified and to save the customers time and to win the loyalty with the clients by the retailers. In the proposed system each product will have a passive radio frequency ID tag which represents the unique electronic product code. Thus the electronic product code gives the information about the product details (i.e) name and price. When the customer puts the product in the shopping cart, the RFID scanner scans the tag and the electronic product code is generated. The radio frequency ID reader passes the electronic product code the microcontroller. The name and price of the product is processed by the controller and gets displayed on the LCD screen of the smart trolley. Where the customer can see their product details. To store the price of the amount and the billing data information can be stored in the microcontroller memory. The LCD acts as the interface with the microcontroller.

Where in the LCD display the customer can see that whether the product us been added or removed from the cart

and it also shows the amount of bill the customer should pay. The amount can be payed through the online interface. As we conducted some test so that we infer that when putting an item into the smart cart or expelling a item from the cart is able to precisely read it. In the proposed system, the ultrasonic transducer is implanted so that in shopping malls or the supermarkets social distancing is followed. Thus the block diagram of the proposed system is shown in fig.1.

5. IMPLEMENTATION

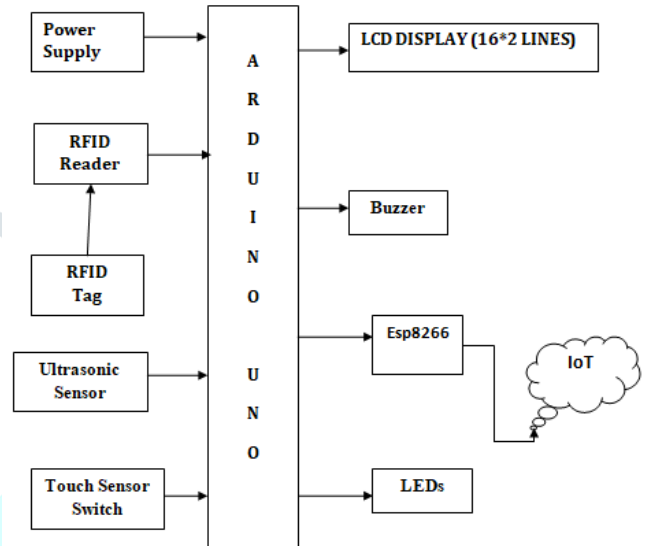


Fig.2 Proposed System Block diagram

Fig 2 shows the proposed system. To make a farmer understand the working of big labor machines and tech-devices we valuable and realistic technology for monitoring. The working flow of the proposed system shown in figure 3.

1. WOKING FLOW

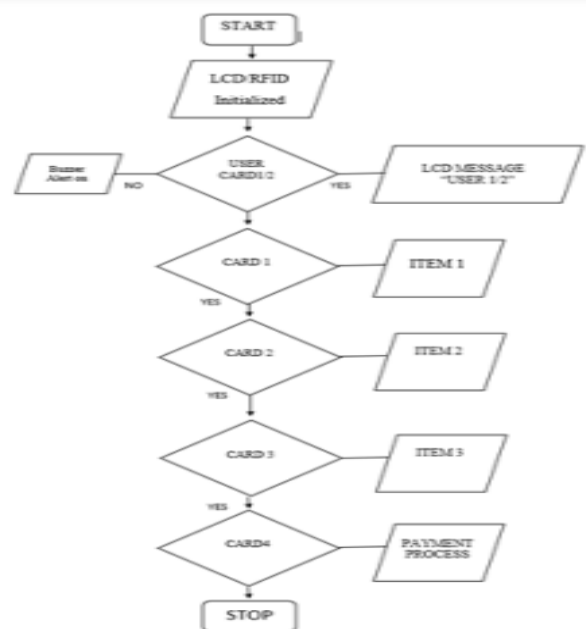


Fig.3: Working Flow Diagram

The RFID tags acts as a product and the RFID reader (RC522) acts as a scanner. When the tags reach the reader it detects the tag and the LCD display (i2c) shows the product details such as the product name and price. If the customer

decides to remove the product from the cart can use the Touch Sensor switch and remove the product from the cart Following each and every product the price will be added After buying the products they will get they total amount by showing the payment card in RFID module and they can pay the amount by pressing the touch sensor switch then it shows the remaining balance amount, customer can also recharge the card if it shows low balance with the help of ATM card from sales executive. An IoT is developed to comfort the customers which shows the details of the product, price of the product, and payment method. Once the shopping is done, the customer can use the smart card to pay the bill or customer can pay the bill using online payments. After paying the bill, customer will get a bill mail alerts to their registered email and if the bill is payed using the smart card then the balance in the card will be intimidated

2. HARDWARE REQUIREMENTS:

A. Arduino Uno:

Arduino Uno shown in figure 4 is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller.



Fig.4 Arduino Microcontroller

B. Esp8266

The ESP8266 Wi-Fi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor



Fig.5: esp8266 module

C. RFID Reader (RC 522)

A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader. RFID is a technology similar in theory to bar codes. However, the RFID tag does not have to be scanned directly, nor does it require line-of-sight to a reader. The RFID tag it must be within the range of an RFID reader, which ranges from 3 to 300 feet, in order to be read.



Fig.6 RFID Reader

D. Ultrasonic Sensor

Ultrasonic transducer is a device which converts some other energy into ultrasonic vibrations. It is made up of an active element, a backing and wear plate. The piezoelectric or single crystal material can be used as an active element which converts the electrical energy into ultrasonic energy. The ultrasonic waves are sound waves whose frequencies are higher than those of waves which are audible to human ear. It sends electrical signals to the object and once when it strikes the object then it reverts to the transducer. In the proposed system it is mainly used for the social distancing in the supermarkets or malls..



Fig.7 Ultrasonic Sensor

E. RFID Tags:

RFID tags are used to store the electronic code Of the product and it also has barcode. The tags consists of the integrated circuit and an antenna which is used to transfer the data to the RFID reader. These tags are unique for all the product in the supermarkets or the shopping malls. It is a typing of tracking system where it uses smart barcodes to identify the items. RFID tags utilize the radio frequency technology. There are two types of tags these are battery operated and passive tags. Shown in figure 8.



Fig.8: RFID Cards used as ATM Card



Fig.9: RFID Cards used as Product items

F. Touch Sensor

Here touch sensor is used as switch. If the customer decides to remove the product from the cart can use the Touch Sensor switch and remove the product from the cart.



Fig.10: Touch sensor used as a switch

H. Buzzer

The buzzer acts as the alarm in the project. The audio signaling device which considers of mechanical or electromechanical or piezoelectric. It gives the beep sound when social distancing is not followed it Shown in figure 11.



Fig.11: Buzzer

E.LCD Display

LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day-to-day life, either at PCO's or calculators. The appearance and the pin outs have already been visualized above now let us get a bit technical.16x2 LCD is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like, 8x1, 8x2, 10x2, 16x1, etc. but the most used one is the 16x2 LCD. So, it will have $(16 \times 2 = 32)$ 32 characters in total and each character will be made of 5x8 Pixel Dots. Shown in fig 13.

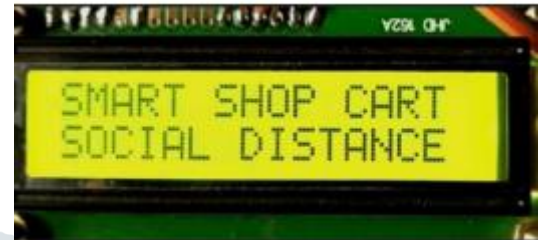


Fig.12: 16x2 LCD Display

3. SOFTWARE REQUIREMENTS:

• ARDUINO IDE

Arduino IDE Arduino IDE is an open source software that makes to write the code in easy manner and helps to upload it into the Arduino board and the uploaded code contains the program that describes the working of the process. The main advantage is the software can be used in any Arduino board. The Arduino can control and interact with a wide variety of sensors like temperature, accelerometer and heart beat sensor.

• UBI DOTS

The basics components of any Internet of Things application powered by Ubidots are: Devices, Variables, Synthetic Variables Engine, Dashboards, and Events. Within this article we will address each of these concepts as they relate to Ubidots IoT Development and Deployment Platform and how you can better organize your Ubidots Apps to best connect with the users.

6. EXPERIMENTAL RESULTS

The Project "IoT Based Social Distance Shopping using RFID and Ultrasonic Sensor" has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus, contributing to the best working of the unit.

Secondly, using Arduino and IoT with the help of growing technology the project has been successfully implemented. IoT Based Social Distance Shopping using RFID and Ultrasonic Sensor helps customers in shopping. It can reduce the time waiting in a queue for billing and payment. The hardware kit shown in Figure 13.

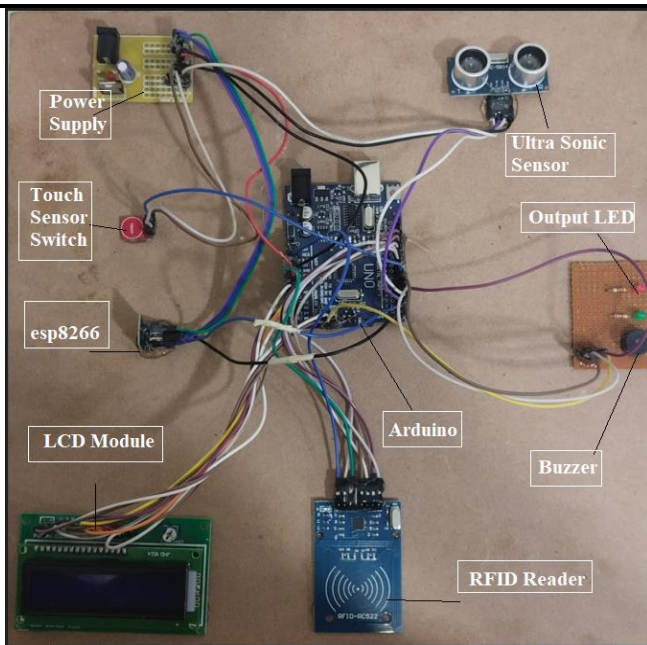


Fig.13: Experimental Hardware setup

The Payment adding and items adding and deleting that displayed on LCD shown in below figures from 14 to 19. IoT Notification Shown in figure 20 and email alerts of shopping shown in figure 21.



Fig.16: LCD Shows that When Pen added to cart and reduce the amount 50 Rs. from balance



Fig.17: LCD Shows that When Pencil added to cart and reduce the amount 80 Rs. from balance



Fig.14: LCD Shows that ATM Card Balance When top up with ATM Card



Fig.18: LCD Shows that When Sharpener added to cart and reduce the amount 90 Rs. from balance



Fig.15: LCD Shows that When Book added to cart and reduce the amount 100 Rs. from balance



Fig.19: LCD Shows that showing ATM Card Balance

The below figure 21 and 22 depicts the output of the Flame sensor when there is Flame detected in the field and notification received from ubidots.

Ubidots

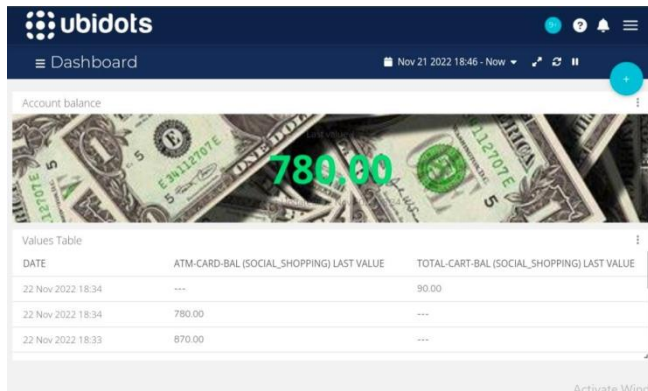


Fig.20: Shows that Shopping details in ubidots.

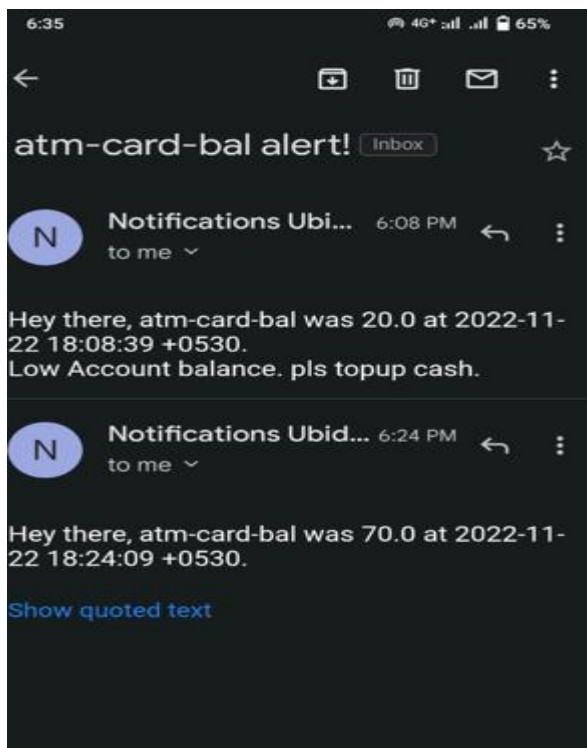


Fig.21 shows that received Shopping alerts notification from ubidots

7. CONCLUSION AND FUTURESOCPE

Smart shopping application creates an automatic central billing system in malls as well as in supermarket with the maintenance of the social distancing. The main agenda of this project is to avoid crowd in shopping mart in an efficacious approach. Many obstacles can be removed and everything becomes customer friendly. Hence this project reduces a huge cost which is spent on many modules to connect it with servers and routers in each shelves to transfer the information to the server.

Future Work

In future it will be developed that the customer just type the name of the consumer products he/she want to purchase on android device, the trolley will automatically guide them to where the products placed

ACKNOWLEDGEMENT

The author would like to thank to department of Electronics and Communication for providing various test components and Mr. A. Balachandra Reddy, M.Tech Associate Professor for guiding about project. I have reviewed the concept very nicely and the above described project has brought me great knowledge regarding IOT and interfacing part of the hardware components.

REFERENCES

1. IoT application on secure Smart Shopping system by Ruinian Li , Tianyi Song , Nicholas Capurso , Jiguo Yu, Jason Couture , and Xiuzhen Cheng - 2017.
2. Nagaraj, Naveenprabu, Jagadesh, Mahalakshmi published Robust low-cost passive UHF RFID based smart shopping trolley in 2020.
3. International Conference on Communication, Information & Computing Technology published "A novel video processing based cost effective smart trolley system for supermarkets using FPGA," by R.Karishma, S.R.Rupanagudi, V.K.Bharadwaj, F.Jabeen, V. G. Bhat V.R.Savarni and S. Adinarayana in 2015.
4. H. Anandakumar and K. Umamaheswari, "Supervised machine learning techniques in cognitive radio networks during cooperative spectrum handovers," Cluster Computing, vol. 20, no. 2, pp. 1505- 1515, Mar. 2017.
5. H. Anandakumar and K. Umamaheswari, "A bio-inspired swarm intelligence technique for social aware cognitive radio handovers," Computers & Electrical Engineering, vol. 71, pp. 925-937, Oct. 2018. doi: 10.1016/j.compeleceng.2017.09.016
6. 3S Cart: You-Chiun Wang and Chang-Chen Yang's "Light weight interactive Sensor based cart for smart shopping in super market" in 2016.
7. IoT Based Smart Shopping Using radio frequency identification by Mobeen Shahroz, Muhammad Faheem Mushtaq , Maqsood Ahmad.
8. Saleem Ullah , Arif Mehmood , and Gyu Sang Choi - 2020.
9. Coronavirus : Haryana Govt orders shops and offices to remain shut on weekends except the shops selling essential goods published on TIMESNOWNEWS by Amarnath Yatra in August 2020.
10. How Covid-19 impacts Shopping in day-to-day life - BBC by Anna Rahmanan in July 2020.
11. How has Covid - 19 pandemic impacted the buying habits of consumers? By Hemani sheth Mumbai-The Hindu sept-2020.