ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

An Intelligent Sensing Follower Cart

A.R.Revathi[1],S Gokulnath[2], S Giridharan[3], B Krishnan[4], N Dhamotharan[5]

Assistant Professor, Dept. of Information Technology, SRM Valliammai Engineering College, India [1]

UG Students, Dept. of Information Technology, SRM Valliammai Engineering College, India [2][3][4][5]

ABSTRACT: An Innovation in technology is an Automation. Automation is to make the human effort is less and that saves them a precious thing called time... Here have made the shopping trolley with a Liquid Controller Display (LCD) that can show the product information using Radio Frequency Identification (RFID). When the products that contain the RFID tags are kept inside the trolley the details of the products are displayed on the LCD screen. Once the shopping is over, the customer press the finish button, thereby using Zigbee technology to transfer the customer purchased details displaying in administrator system, so they can pay the bill in cash counter using a Transaction ID that is displayed. Also user need not move the trolley they are provided with the RF receiver is placed in the trolley and the transmitter is given to the customer. Location of the trolley is traced then and there by the administrator using of IR. A User Interface provided to the user, they can select the product in the display itself. When the selection of the product completed a short time span is allocated, they can utilize that time for any other work once before the time elapse the shopkeeper will give the delivery to the customer. This ISF cart provides a better shopping experience for the customers by saving their time.

KEYWORDS: RFID, LCD, Trolley, RF Transmitter& Receiver, Zigbee, IR.

I. INTRODUCTION

In the fastest growing technology, Automation is an emerging technology in the research and development. Making a manual process into an automated one will reduce the manpower and saves more time. In supermarkets, everything is in a manual process and now in this emerging world, everyone needs to save their precious time. According to a survey conducted by the US Bureau of Labour, on an average, human beings spend 0.8 hours every day on a shopping [10].

Shopping is one of our regular tasks where we spent a considerable amount time. To save their time, many have started to buy used online, where their user's satisfactions can't meet up to the mark because there is problem in delay of delivery goods, defect products and returning policies. Large supermarkets have a great variety of goods and people spend much time in finding the details of the product, Estimation of bill calculating the amount of total product and paying the bill by standing in queues where they spending a valuable amount time these issues are overcome by the smart way of using our cart system. This ISF will provide with an LCD display [3] [4][18]and that communicates with an RFID reader[12][13][18]. The reader will sense the product which has an RFID tag on it. Once the shopping is done by the customer they need to press a complete button and that the bill that's generated will send to the administrator system using Zigbee [4] [6] [17] transceiver. At the end a token number will generate and the customer need to note that and went to the cash counter and they need to pay the bill over there. The trolley where the customer presses the complete key will be tracked using an IR sensor [13] and that will show to the administrator. The entire set of the trolley will be controlled using an RF transmitter and receiver.

A user interface consists of the product list that's available in the shopping mart and once they pick the product the customer need to place the order once they press submit button the user will be provided with a time span which will be given as per the number of products they have chosen. Before the time gets elapsed the shopkeeper will deliver the goods to the respective customer, hence both the way of using ISF-Cart will provide the customer to have technological shopping experience and saves their effort and time. This ISF-Cart will enable the customer to have a fast and efficient way of shopping nowadays people feels it's a hard job to buy their needs in a supermarket because of the time that take to pay our bill and finding the details of the product and so on because of that many users are buying products online. There they face lots of problems like delay in delivery, change of product and customer and poor quality of goods.

In this paper section II provides information on existing systems and section III explains about the proposed methodology, describes about the shopping bill generation, stock updating and finding the location of the cart. The

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

section IV deals with technical aspects needed and section V is about experimental result. Finally, section VI will conclude the work.

II. LITERATURE SURVEY

Many authors have implemented the RFID technology in shopping mart. Due to some problem in this system is not implemented in real time. Many authors are discussed about their work and challenges which are listed as follows.
KAMRUDDIN NUR [1] practically explains the concept that navigation, viewing and projection of RFID obtained product information with a help of a robot that contains the RFID reader contains antennas using that is sensuous and sent to the UI devices and that shows the map of the product locations. In author [2] illustrate that the control center built with RFID reader module, the card reader guides this message to control center over fiber optic displays 3-D location. Using GPS technology to find the accurate location of the man is founded. From [1] [2] it's given that the tracking with GPS technology is the advanced way for the location finder.

UDITA GANGWAL [3] describe and implements of smart shopping for automating billing using wireless sensor network. First scans the barcode of the product using the barcode scanner and places on the cart, a picture of the product is taken and stored in the system's memory. The camera is fitted in barcode scanner. In this author [4] gives that RFID Reader fitted in to the trolley which scans the RFID tag. This system uses Microcontroller AT89S52The product price and cost will be displayed using LCD display Data transfer between trolley and main computer is done using ZIGBEE transmitter which is fitted at the trolleys. Referring the [3] [4] authors it's given that Replacing of barcode with RFID gives faster way for reading the product details. In this author [5] proposed the concept of automated warehousing system they have developed a new system using that they allocate the dispatching of the products based on the latest expiry date and nearest location of the delivery. The details of the product are getting used an RFID tag that are available in the product and that are scanned using a reader that shows the details and they are set priority based on the latest expiry and nearest location. Hence, they have overcome an existing system where these works are done manually and they spilt the dispatch based on the order date. In this author [6] The RFID Tag is placed in ceiling environment and RFID reader is placed in ROBOT. The reader used to read the tag from the surface and give information to the server using ZIGBEE. Thus, they defined [5] [6] that the transferring of data using the ZIGBEE mode gives the faster rate and long range of transfer. In this author [7] The bus is entering into the bus stand premises, the bus is located at the stop point. The bus is leaving out gate, next bus in a queue. Such information is stored in ARDUINO micro controller. From the [4] [7] its infer that using of ARUDINO has more benefit.

The author [8] has implemented and concept for tracing dynamic objects with long ranges passive UHF RFID. The UHF RFID is fitted in a mobile robot and that's set to move around the area. This robot will sense the objects that are available at the distance of 7m-10m. In this they use particle Filter that reads the objects that away from the reader distance, hence this paper gives a method for tracking the objects that are around in an area. In this paper author [9] has provided the information for the collision when multiple tags are interfaced. The algorithm described here is 1) Anti-collision algorithm based on Binary Tree. It processes without the use of memory and it's based on bit prefix. If the prefix serial number matches the query tag it transmits the serial number as a response to the command. 2) The anti - collision algorithm based on ALOHA.[8] [9] Describes that using of multiple tags will lead to collided hence to overcome that an anti-collision algorithm has been derived.

III. PROPOSED METHODOLOGY

The Intelligent Sensing Follower Cart consists of the Radio Frequency Identification reader. The reader is interfaced with the Arduino Microcontroller. It's loaded with the code for sensing the RFID tags that are kept in the products. When the RFID tags are shown near the reader the tag is sensed and displayed on the LCD screen. The overall proposed process is described in fig no. 1(a). If the products are shown one time the product is added to the cart if it's shown second time the products is removed. Once the customer gives the finalize button the shopping gets ended and the bill generated for the particular customer is transferred to the administrator system using a Zigbee transceiver.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

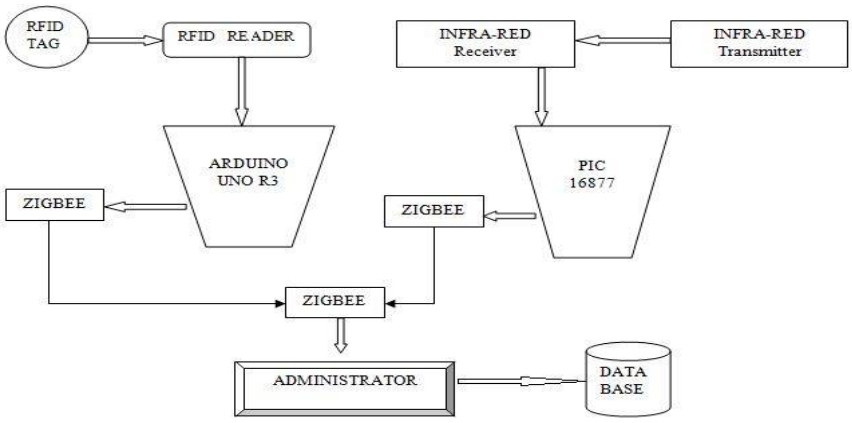


Fig No.1(a) Overview of ISF-Cart

If the customer gives the finalize button, then the trolley's location can be seen by the administrator. A IR transmitter that's fit in the shelf and the receiver is placed in the trolley. The IR are sensed and its transferred using a Zigbee transceiver. The process architechture diagram is in fig no.1(b)Another system which provides the customer can select their products using the User Interface. After the product selection is completed the system shows an estimate delivery time for the products to the customer. This span time is allocated based on the number of products selected by the customer. Within that span time the shopkeeper needs to deliver the products.

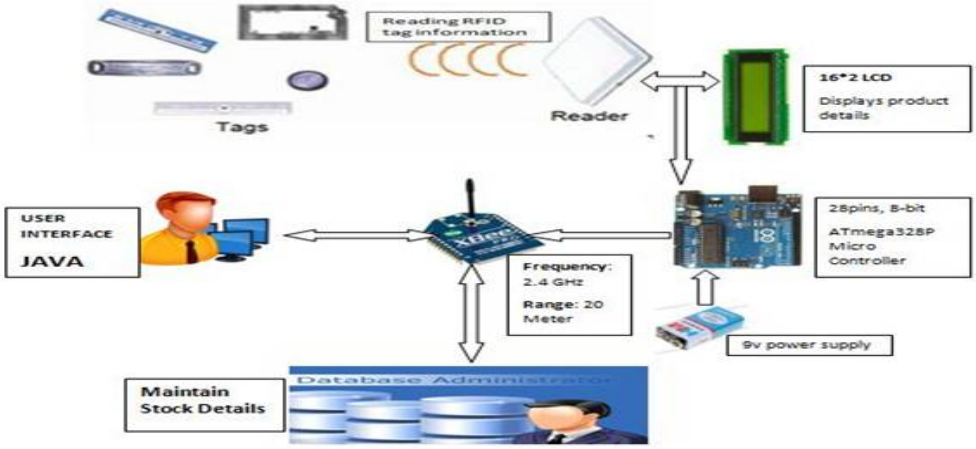


Fig no.1(b) Architecture diagram

Proposed system provides the customer to have a smart and faster way of shopping. The time consumed by the customer in the shopping mart is saved with ISF-Cart. This system will reduce the staff needed in the shopping mart. Here in this paper we have discussed about the system implementation and design of the cart and it has been tested successfully. ISF-Cart provides the customer to have an efficient and faster shopping.

IV. TECHNICAL BACKGROUND

RADIO FREQUENCY IDENTIFICATION (RFID)

RFID is a technology that consists of a Reader and tag. The information that is available with the tags are sensed using the RFID reader a) **READER:** Radio – Frequency Identification (RFID) uses electromagnetic signals to identify object automatically. It tracks the RFID tag that attached to the object within the particular field.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

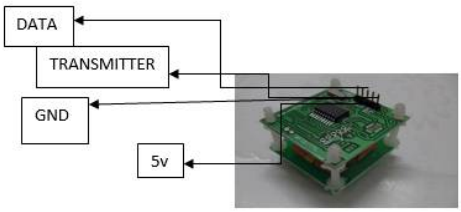


Fig no.2(a) RFID Reader

Table No.1 Types of RFID reader.

Band	*Range*	*Data speed*
120-159 KHz Low frequency	5-10cm	Low
13.56 MHz High Frequency	10cm-1m	Low to Moderate
433 MHz Very High frequency	1-100m	Moderate

The tag contains electronically stored information. There are different types of reader available, they are shown in the table no 1.

TAG: There are two types of tags. *Active RFID* tag contains an on board power source such as a battery. They are active throughout the process. This tag will be sensed by the reader at all the time. *Passive RFID* Tag are commonly used they are sensed when they are needed for the process. The power source for the tags are generated by the nearby RFID reader's interrogating radio waves.

Fig no.2(b) RFID Tag

Table No.1(a) Types of RFID reader.

Specification	Passive tag	Active tag
Range	1-10cm	1-100m
Frequency	125-134Khz	433-915MHz
External supply	No	Needed

ARDUINO: In this work implemented by microcontroller board (Arduino Mega 328). The Arduino Mega 328 is a microcontroller Board and it is based on ATmega 328.

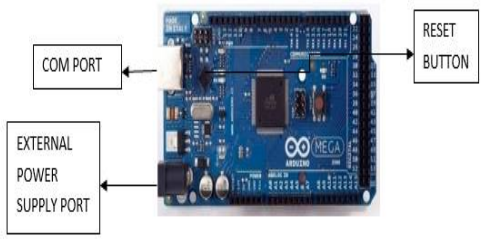


Fig No.2(c) ARDUINO UNO R3

Table No.1(b) ARDUINO Data Sheet

Microcontroller	**ATmega328**
Operating Voltage	5V
Input Voltage	7-12V
Digital I/O Pins	54
Analog Input Pins	16
Length	101.52 mm
Width	53.3 mm
Weight	37 g

The Arduino Microcontroller Board is shown in fig no, It has 54 input and output pins of which includes 16 analog inputs, 4 UARTs, a 16MHz crystal oscillator, a power jack, an ICSP header, a USB connection, and a reset button. Data Sheet for Arduino MEGA is shown in Table 1(b).

ZIGBEE: ZigBee operates in the industrial, scientific and medical (ISM) radio bands: 2.4 GHz. Data rates vary from 20 kbit/s (868 MHz band) to 250 kbit/s (2.4 GHz band). ZigBee is a transceiver, low-cost, low-power to transfer the data from one place to another.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

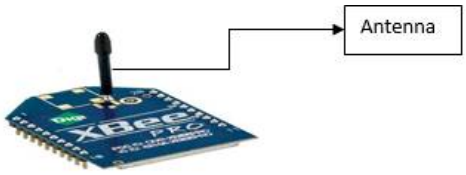


Fig No.2(d) Zigbee

Table no.1(c) Zigbee Data Sheet

Range	30m
Interface	Serial(1200-115200) beeps
Supply voltage	2.8-3.4V
Operating Frequency	ISM 2.4GHz
Receive Current	50mA@3.3V
Operating temperature	-40 to 85° C

The ZigBee network layer natively supports both star and tree networks, and generic mesh networking. ZigBee chips are typically integrated with radios and with a microcontroller that have between 60-256 KB flash memory. Operating voltage 2.8 – 3.4 V. ZigBee builds on the physical layer and media access control defined in IEEE standard 802.15.4 for low-rate WPANs. Detailed specification of Zigbee has been given in table no 1(c).

RF TRANSMITTER AND RECEIVER

An **RF module** (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. Datasheet for the RF module is given in table no 1(d).This wireless communication through radio frequency (RF) communication.

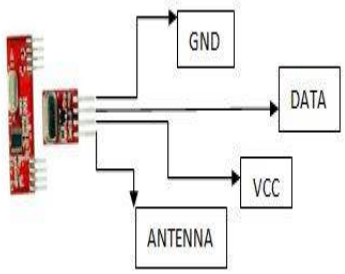


Table No.1(d) RF Data Sheet

Range in open space	100 Meters
RX Receiver Frequency	433MHz
RX Supply Current	3.5mA
Voltage Supply	3V-6V
TX Frequency Range	433.92MHz
Power consumption	Low

Fig No.2(e) RF transmitter and receiver

The RX – ASK is an ASK Hybrid receiver module. It is an effective, low cost solution for using 433MHz. The TX-ASK is an ASK hybrid transmitter module. TX-ASK is designed by the saw resonator, with an effective, low cost, small size and simple to use for designing**.**

LIQUID CRYSTAL DISPLAY (LCD): The implementation of the LCD screen is for showing the details of the products that are purchased by the customer and total bill generated from their purchased products.
This screen can show up to 16 characters of data in each line it has two line spaces for displaying the characters. LCD consists of 16 pins and requires a min of 0.3v and max of 7v of power supply the data sheet for the LCD screen is given in table no.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

Fig.No.2(f) LCD Screen

Table No.1(e) LCD Specifications

Input voltage	0.3v-7v
Size	16*2
Input Character	32
Module Dimension	80.0 x 36.0 mm
Viewing Area	66.0 x 16.0 mm
Dot Size	0.56 x 0.66 mm
Character Size	2.96 x 5.56 mm

PIC MICROCONTROLLER: PIC stands for peripheral interface controller. PIC had a read-only memory (ROM) or field programmable EPROM for program storage, some with provision for erasing memory. All current models use Flash memory for program storage, and newer models allow the PIC to reprogram itself.

Fig No.2(g) PIC Microcontroller

Table No.1(f)Specification of PIC.

Operating Voltage	2-5.5v
Pin Count	40
RAM	368 bytes
Data EEPROM	256 bytes
Program memory	14Kb
CPU speed	5 MIPS

INFRA-RED: EVERLIGHT'S Infrared Emitting Diode (IR333-A) is a high intensity diode, moulded in a blue transparent plastic package. The device is spectrally matched with phototransistor, photodiode and infrared receiver module. Specification of the IR has been given in the table

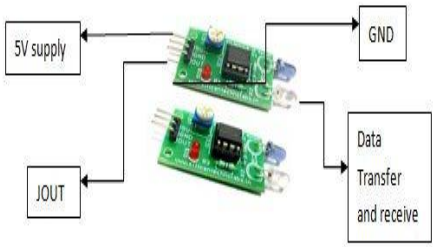


Fig no.2(h) IR transmitter and receiver

Table no.1(g) IR data sheet

Wavelength	940nm
Chip material	GaAs with AIGaAs window
Lens radius	5mm
Angle	40 deg
Input voltage	5v
Distance	100cm-500cm

V. EXPERIMENTAL SETUP

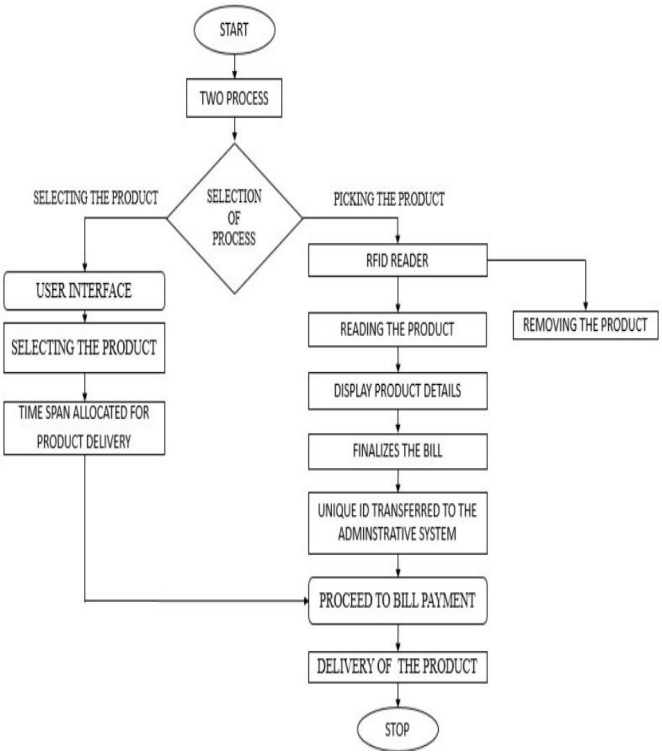
The RFID reader is placed in left side of the user and LCD display located in opposite to the customer. The RFID Tag is getting closer to the RFID reader range of 5cm, it reads the information and displays in LCD. Using PIC Micro controller to interface the IR sensor to find the Cart Location. Zigbee is interfaced with the ARDUINO & PIC controllers where they are located in a nearby LCD screen in the cart. The setup is shown a flow in the fig no.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016



Now a days very less number people shopping in mall due to time delay for purchasing the product for eg. Customer fixed budget for buying monthly provision to getting the product, proceeding to bill payment. At the billing counter there is time delay due to replacement of the product therefore it took up to 45mins for entire shopping time if we use ISF-cart system, it take 10mins for purchasing and for billing it take 5mins altogether the entire shopping process gets completed within 15mins. Hence system saves 75% of time that a customer uses in the shop. Thus, testing conducted or ISF-Cart are made as table and shown in Table No.2. The table no. shows the success and failure ratio of ISF-cart these is shown as a line graph. Thus this shows that ISF system will have better performance when it's used in real time.

Figno.3ISF cart Process Flow

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

TESTING DESCRIPTION	NO. OF TRAIL	NO. OF FAILURE	NO. OF SUCCESS
Forward Movement ISF-Cart [a]	15	4	11
Backward Movement of the Cart [b]	13	3	10
Left Movement of the Cart [c]	14	2	12
Right Movement of the Cart [d]	14	4	10
Scanning of the RFID tag by RFID Reader [e]	10	2	8
Displaying the product details using LCD Display [f]	10	2	8
Date Transmission from Cart to the Administrative system using ZIGBEE [g]	10	1	9
Identifying the Cart location using the IR Transmitter and Receiver [h]	12	2	10
Creating the User Interface for the customer [i]	11	4	7

Table no.2 testing of ISF-Cart

VI. CONCULSION

An ISF - cart system for displaying the product details on the LCD display and the Customer purchased information transfer to the administrator system using Zigbee technology. Location Tracking is also provided to find the Trolley location Using IR sensor. Another system is for selecting the products with a user interface hence by using of the ISF - cart, we can save 75% of shopping time and in future we plan to track the system using GPS, monitoring of every tag used in the shopping cart. Hence RFID based system can be implemented in the library management, warehousing management etc.,

REFERENCES

[1]. Kamruddin Nur, Marc Morenza-Cinos, Anna Carreras, "Projection of RFID Obtained Product Information on a Retail Store's Indoor Panoramas", IEEE Computer society-IEEE INTELLIGENT SYSTEMS,2015.
[2]. Sapna Kataria, Poonam Singh, Prachi Ahlawat, "Wireless underground positioning System", International Journal of Computer Application, Volume 130-No.1, November 2015
[3]. Udita Gangwal, Sanchita Roy, Jyotsna Bapat, "Smart Shopping Cart for Automated Billing Purpose using Wireless sensor network" The seventh international conference on sensor technologies and application,2013.
[4]. Mr. Yathisha, Abhishek, Harshith, Darshan Koundinya & Srinidhi "Automation of shopping cart to ease queue in malls by using RFID" International Research Journal of Engineering and Technology, Volume 2 Issue: 03, June-2015
[5] Qian Wang, Saleh Alyahya, Nick Bennett, and Hom Dhakal, "RFID-Enabled automated warehousing system", International journal of materials, mechanics and manufacturing, 2015
[6]. Emidio Di Giampaolo and Francesco Martinelli, "Robot localization by sparse and passive RFID tags", IEEE international conference on transaction, 2010
[7]. K.Vidyasagar Md. Abdul Farooq K. Suresh, "Public Road Transport Guiding System using Arduino Microcontroller", International Journal of Computer Applications, Volume 132- No.3, December 2015.
[8] Ran Liu, "On tracking dynamic objects with long range passive UHF RFID using a mobile robot", International journal of distributed sensor networks, 2015
[9] Yin-fei Dai, Nian-feng Li, Dan Shao "Further discussing about the conflict problem of RFID tag", International Journal of wireless communication, networking and mobile computing, 2016
[10]. http://www.bls.gov/tus/charts/
[11]Matthew Brown and David G. Lowe, "Automatic panoramic image stitching using invariant features", International journal for computer vision, 2007
[12] Elmakfalji Chaimae and Romadi Rahal, "New way of passive RFID deployment for Smart Grid", Journal of theoretical and applied information technology, 2015
[13] Zeeshan Ali, Reena Sonkusare, "RFID Based Smart Shopping and Billing", International journal of advanced research in computer and communication engineering, 2013
[14] Jiang-Liang Hou, Ting-Gin Chen, "RFID based Shopping Service System for retailers", Journal on Advanced Engineering Informatics, 2010
[15] P. Nurmi, A. Salovaara, S. Bhattacharya, T. Pulkkinen, and G. Kahl, "Influence of landmark-based navigation instructions on user attention in indoor smart spaces."in Proceedings of the 15th International Conference on Intelligent User Interfaces(IUI). ACM Press, 2011,pp.96-105.
[16] J.Suryaprasad, B.O.P. Kumar, D. Roopa and A.K. Arjun, "A Novel Low-Cost Intelligent Shopping Cart", IEEE 2nd International Conference on Networked Embedded System for Enterprise Applications,pp.1-4,2011.
[17] VarshaJalkote, Alay Patel, Vijaya Gawande,Manish Bharadia, Gitanjali R, "Futuristic Trolley for Intelligent Billing with Amalgamation of RFID and ZIGBEE",IJCA Proceedings on International Conference on Recent Trends in Engineering and Technology 2013.
[18] SatishKamble, Sachin Meshram, Rahul Thokal, RoshanGakre, "Developing a Multitasking Shopping Trolley Based On RFID Technology", International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-3, Issue-6, January 2014
[19] Black, D and Clemmensen, N.J.(2006)Researching Context-Awarness for Supermarket Application -Appendices Aalborg University.
[20] Bohnenberger, T., Jameson,A., Kruger, A., Butz, A. (2002) Location-Aware Shopping Assistance: Evaluation of a Decision- Theoretic Approach. Proc Mobile HCl 2002. Spriger Berlin, 18-20.