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SHOPIFY – The Smart Shopping Cart

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Abstract - Shopping is easy but waiting on a bill counter after shopping is too boring and time consuming task. Also manually pulling cart also requires human effort. After purchasing, customerwant to pay the bill for their purchasing. So, here we have made an innovative project named SHOPIFY which will make shopping cart smart, in the way that cart will automatically generate bill and cart can move automatically. The cart system consist of a RFID reader which is controlled by PIC microcontroller. So, whenever the shopper puts any product in cart it is been detected by the RFID module and it is displayed on LCD along with the price of the product. As the shopper adds more things it is detected by the module and the price according to that increases. In case if customer changes his/her mind and doesn't want any product added in the cart he can remove it and the price added will be deducted automatically. At the end of shopping the shopper will press the button which when pressed add up allthe product along with the price and gives the total bill to be paid. We also introduced a system to send bill directly to the registered mobile via GSM technology which will contain a link that the customer can use to pay the bill instantly. The cart also contains a system for automatic movement of the cart by using a combination of obstacle detection using ultrasonic sensor and line follower. Hence, this system is suitable for use in places such as supermarkets, where it can help in reducing man power and in creating a better shopping experience for its customers by reducing shopping time.

1. INTRODUCTION

Humans have always invented and developed a technology to support their needs ever since the beginning of mankind. The basic purpose of advancement in technology has been in minimizing tasks and making everyday chores easier and faster, irrespective of the various domains available. A major task on which human beings are found spending considerable amount of time is shopping. According to a Survey, approximately most of the humans spend 1.5 hours daily on shopping. Mall and market is a big corner for customer to purchasing the daily requirement like branded food item, snacks, cloth materials, electric and electronic devices etc. Nowadays, a maximum numbers of shopping mall are available large as well as small in the world. In holidays and weekend time we can see a huge rush at mall. The public was demand & spending more time in shopping mall. After purchasing a long time, the customers waste of unnecessary time at the billing counter for billing the purchased item. Continuously improvement was compulsion in the common billing system to increase the quality of shopping experience to the customers.

To overcome these problems and to change and improve the existing system, we have designed a SMART SHOPPING CART named SHOPIFY. This can be done by simply attaching using RFID tags to the products and a RFID reader with a LCD display on the shopping trolley. In this system, customer will have to just insert or remove items and every item is scanned with help of RFID reader, item name and total price of the item will be displayed in LCD. The system also has automatic movement system which is realised using combination of obstacle detection using ultrasonic sensor and line follower. In this system will save time of customers and man power required in mall. It is also used to reduce the employee work in the shopping mall.

2. LITERATURE SURVEY

Dr. Suryaprasad J in "A Novel Low-Cost Intelligent Shopping Cart" proposed to develop a low-cost intelligent shopping aid that assists the customer to search and select products and inform the customer on any special deals available on the products as they move around in the shopping complex.

Amine Karmouche in "Aisle-level Scanning for Pervasive RFID-based Shopping Applications" proposed to develop a system that is able to scan dynamic and static products in the shopping space using RFID Reader antennas. Instead of conducting the RFID observations at the level of individual carts, aisle-level scanning is performed.

Satish Kamble in "Developing a Multitasking Shopping Trolley Based on RFID Technology" proposed to develop a product to assist a person in everyday shopping in terms of reduced time spent while purchasing. The main aim of proposed system is to provide a technology oriented, low- cost, easily scalable, and rugged system for assisting shopping in person.

Varsha jalkote, proposed a system futuristic trolley for smart billing with amalgamation of RFID and Zigbee.

In this system they have used microcontroller, the rfid reader reads the rfid tag number and compared with stored tag numbers if it is present, then the product cost is added to the total bill amount, and product details are displayed in lcd screen like product cost, manufacturing year, brand name etc. If it is not in found in data base it will display product is not found or not present and this process will continue until the end of shopping. This total bill information will be sent to master pc using zig bee at the receiver and the receiver side the bill is generated. The output of this proposed system is better than existing technology but it has certain limitations because of them, it cannot be used to keep the all sales track and item availability at the shopping malls.

Kalyani dawkhar, proposed a system as electronic shopping cart for efficient shopping based on rfid technology. In this system the rfid reader, microcontroller is used to read the did tag number and comparing with database, if it is present then it displays product details and like this goes on.

Galande jayshree, proposed a system as automatic billing trolley based on rfid technology. In this system shopper will have the details about price of every item that are scanned and total price of the items. This system will save time of customers and reduces the employees required in the mall. Bar code technology is replaced by fixing rfid tags to the products and a rfid reader with a lcd in the shopping trolley.

3. BLOCK DIAGRAM

This is the block diagram of our project. There are total 4 proximity sensors. We are using IR proximity sensors. The 2 proximity sensors on the left are used for line following purpose. The IR proximity sensor consists of IR led and a photodiode. The light emitted from IR led gets reflected from white surface and is received by photodiode .For black surface the emitted IR light gets absorbed from the surface. The line follower uses this mechanism to distinguish between white and black surfaces and follow the black line.

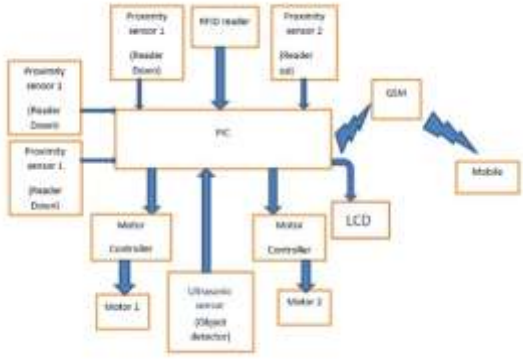

Fig -1: Block diagram

The two proximity sensors on the top portion are used to determine whether the product is inserted or removed from the cart. There is an EM18 RFID Reader module and we are using passive RFID tags. The controller used is PIC16F876A. There are 2 motor controllers. The motor driver used is L293D and there are total of 4 motors connected to 2 motor drivers. There is an ultrasonic sensor for object detection. The automatic movement of cart is realized using ultrasonic sensor and line follower .The shopper has to move in front of the cart. The cart follows the line on the Shopping mall. Whenever the shopper stops walking and gets inside the specified range, the ultrasonic sensor detects the person and cart stops. When the shopper moves out of that specified range the cart again starts moving. There is an LCD display which displays the item and its cost when a product is inserted or removed. Also it displays the total bill and total amount to be paid when a switch is pressed .There is a SIM 800 GSM module which sends bill details and a link to pay the bill online.

4. HARDWARE DESIGN

The system consist of PIC16F876A, EM-18 RFID Reader Module ,125khz RFID Tags, LM016L LCD, Crystal Oscillator , Resistors , Capacitors, Transistors, Cables & Connectors, SIM-

800 GSM Module, Diodes , PCB, Proximity Sensors, LED, Ultrasonic Sensor, Transformers / Adapters, Push Button, Switches, 5V DC Motor and L293D Motor Driver.

PIC16F876A: This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC architecture into an 28-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. The PIC16F876A features

256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 5 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI) or the 2-wire Inter- Integrated Circuit (I^2C) bus and a Universal Asynchronous Receiver Transmitter (USART). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.

EM-18 RFID Reader module: The EM-18 RFID Reader module operating at 125 kHz is an inexpensive solution for your RFID based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply. Power-up the module and connect the transmit pin of the module to receive pin of your microcontroller. Show your card within the reading distance and the card number is thrown at the output. Optionally the module can be configured for also a weighand output.

125 KHz RFID Tags: RFID tags can be either passive, active or battery-assisted passive. An active tag has an on-board battery and periodically transmits its ID signal. A battery- assisted passive (BAP) has a small battery on board and is activated when in the presence of an RFID reader. A passive tag is cheaper and smaller because it has no battery; instead, the tag uses the radio energy transmitted by the reader. However, to operate a passive tag, it must be illuminated with a power level roughly a thousand times stronger than for signal transmission. That makes a difference in interference and in exposure to radiation.

Tags may either be read-only, having a factory-assigned serial number that is used as a key into a database, or may be read/write, where object-specific data can be written into the tag by the system user. Field programmable tags may be write-once, read-multiple; "blank" tags may be written with an electronic product code by the user.

RFID tags contain at least three parts: an integrated circuit that stores and processes information and that modulates and demodulates radio-frequency (RF) signals; a means of collecting DC power from the incident reader signal; and an antenna for receiving and transmitting the signal. The tag information is stored in a non-volatile memory. The RFID tag includes either fixed or programmable logic for processing the transmission and sensor data, respectively.

SIM-800 GSM Module: SIM800 is a quadband GSM modu- le designed for the global market. It works on frequencies GS M- 850MHz, EGSM 900MHz, DCS 1800MHz and PCS1900

MHz. SIM800 features GPRS multi-slot class 12/ class

10(opti onal) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of

24*24*3mm, SIM800 can meet almost all the space requirements in users' applications, such as M2M, smart phone, PDA and other mobile devices. SIM800 has 68 SMT pads, and provides all hardware interfaces between the module and customers' boards. SIM800 is designed with power saving technique so that the current consumption is as low as 1.2mA in sleep mode. SIM800 integrates TCP/IP protocol and extended TCP/IP AT commands which are very useful for data transfer applications.

HC-SR04 Ultrasonic Sensor: Ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. An ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. This enables miniaturization of the sensor head. The HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are VCC, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that Distance = Speed × Time. The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module.

L293D Motor Driver: L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H- bridge Motor Driver integrated circuit (IC). It works on the concept of H - bridge. H - bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence, H- bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors.

5. CONCLUSION

In this proposed project, a secure smart shopping system utilizing RFID technology is employed in enhancing shopping experiences. The smart cart is able to monitor the items on the shopping mall by reading the RFID signals from the tags. The smart carts are able to read and retrieve information of the items inside the cart itself. The automatic movement system implemented using combination of line follower and obstacle detection using ultrasonic sensor helps in reducing the manual effort of customers to move the cart around the mall. An RFID reader is kept before the exit door in order to check if all the items in the cart have been paid for. This enhances security of overall shopping. The Smart Shopping Cart has the potential to make the shopping experience more comfortable, pleasurable and efficient for the customer and the inventory control easier for the store management. Using product identification within the individual cart itself, the customers don't have to wait at the bill counter. It actually removes the need for bill counter. The proposed smart shopping cart named SHOPIFY is highly dependable, authentic, customer friendly and time efficient one. There will be reduction in salary amount given to employees, reduction in theft, reduction in customer's effort to move cart manually. Also, the system is very time-efficient.

Fig -2: Smart cart

6. FUTURE SCOPE

The proposed Smart Shopping Cart System intends to assist shopping in-person which will minimize the considerable amount of time spent in shopping as well as to time required in locating the desired product with ease. The customer just needs to type the name of the product he wants to search on the Android device, and the cart will automatically guide him/her to the product/s locations.

The cart can be made more efficient by adding thermal printer for generating bill instantly and also replacing line follower with image processing system. The bill print using thermal printer will contain QR code that allows the shopper to pay the bill easily. Also, the image processing allows random movement of cart along the shopping mall which will make the cart more efficient and user friendly.

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