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RFID and GSM Based Smart Trolley

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Abstract: One of the major problems faced by consumers while shopping at a supermarket is the inability to purchase items as desired time and also to carry goods to the billing counter. In this paper, we describe a cost-effective method to overcome these issues by creating a smart trolley using RFID and GSM in order to complete the tasks. Each product of shopping mall, super markets will be provided with a RFID tag, to identify its type. Each shopping cart is designed or implemented with a Product Identification Device (PID) that contains microcontroller such as PIC16F877A, LCD, an RFID reader and it is implemented to the smart phone app, and is environment friendly as well.

Keywords: PIC(Peripheral Interface Controller), RFID (Radio Frequency Identification), GSM (Global System for Mobile Communications) Driver unit(ULN2803) , Microcontroller (PIC16F877A), LCD (Liquid crystal display), Level Converter(MAX232).

I. INTRODUCTION

The past decade has seen an explosion in advancements in science and technology. Utilizing the same to ease day to day life activities of humans has been the latest paradigm and new research is seeing the light of day in this regard. Not only are scientists looking for ways to simplify the lifestyle of humans, but they are also trying to make the solutions as cost effective as possible Radio frequency identification (RFID) is a rapidly growing technology that has the potential to make great economic impacts on many industries. While RFID is one of the technology, with more recent advancements in chip manufacturing technology are making RFID practical for new applications and settings, particularly consumer item level tagging. These advancements have the potential to revolutionize supply-chain management, inventory control, and logistics. At its most basic, RFID systems consist of small transponders, or tags, attached to physical objects. RFID tags may soon become the most pervasive microchip in history. When wirelessly interrogated by RFID transceivers, or readers, tags respond with some identifying information that may be associated with arbitrary data records. Thus, RFID systems are one type of automatic identification system, similar to optical bar codes. Supermarket is the place where customers come to Purchase their daily using products and pay for that. So there is need to calculate how many products are sold and to generate the bill for the customer. Cashier's desks are placed in a position to promote circulation. At present, many supermarket chains are attempting to further reduce labour costs by shifting to self-service check-out machines, where a single employee can oversee a group of four or five machines at once, assisting multiple customers at a time.

II. METHODOLOGY USED

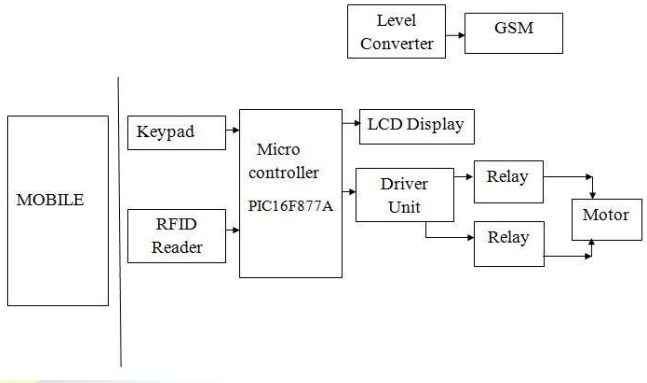

Figure. 1 Block diagram of RFID and GSM based smart Trolley.

In the initial step, once turn on the switch, enter the mobile number using keypad. Now, the required product is to be taken and scanned through the RFID module that is kept on the top side of the trolley. The RFID reader sends the signal to the PIC Microcontroller with the help of ADC. After that in second step, it sends an activation signal to other external devices attached with it. Such as DC motor IC (ULN 2803A), LCD (Liquid crystal display), and to GSM. In the last step, many tasks have been performed such as it activates simultaneously and message display on liquid crystal display screen as shown in Figure 1. At the end, while all the purchase has been completed successfully the user has to press the

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finish button so that the required bill for the purchased item is displayed to the user's Mobile. Then with the help of reset button the whole system reached to the initial stage.

A. PIC Microcontroller

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 40- or 44-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. The PIC16F877A features 256 bytes of EEPROM data memory, self-programming, an ICD, 2 Comparators, 8 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 (I²C™) bus and a Universal Asynchronous Receiver Transmitter (USART) as Figure 2. All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.

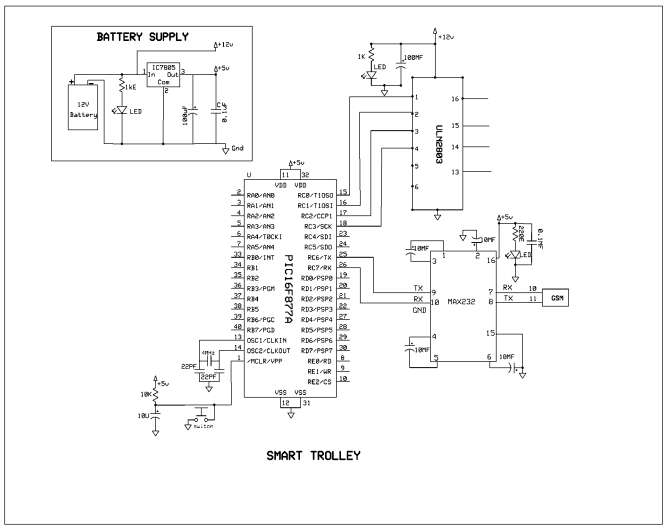

Figure 2 shows the typical flow of circuits

B. RFID Reader

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. RFID technology allows several items to be quickly scanned and enables fast identification of a particular product, even when it is surrounded by several other items. RFID tags have not replaced bar codes because of their cost and the need to individually identify every item.

C. Driver Unit

The ULN2803A device is a high-voltage, high-current Darlington transistor array. The device consists of eight NPN Darlington pairs that feature high voltage output with common cathode clamp diode for switching inductive loads the collector current rating of each Darlington pair is 500 mA. The Darlington pairs maybe connected in parallel for high current capability.

D. Level Converter

The MAX232 IC is used to convert the TTL/CMOS logic levels to RS232 logic levels during serial communication of microcontrollers with PC. The controller operates at TTL logic level (0-5V) whereas the serial communication in PC works on RS232 standards (-25 V to + 25V). This makes it difficult to establish a direct link between them to communicate with each other.The intermediate link is provided through MAX232. It is a dual driver/receiver that includes a capacitive voltage generator to supply RS232 voltage levels from a single 5V supply. Each receiver converts RS232 inputs to 5V TTL/CMOS levels. These receivers (R_1 & R_2) can accept ±30V inputs. The drivers (T_1 & T_2), also called transmitters, convert the TTL/CMOS input level into RS232 level .The transmitters take input from controller's serial transmission pin and send the output to RS232's receiver. The receivers, on the other hand, take input from transmission pin of RS232 serial port and give serial output to microcontroller's receiver pin. MAX232 needs four external capacitors whose value ranges from 1µF to 22µF as shown in Figure 3.

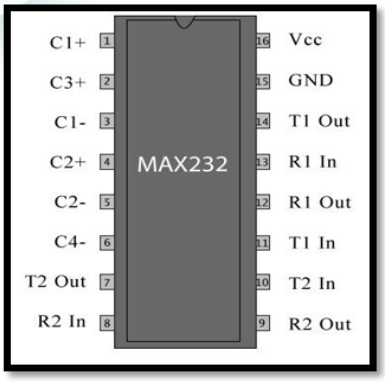

Figure. 3 Level Converter

E. GSM Module

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The GSM /SMS module Extra supervise that your computer and your application runs properly. Whenever the application stops responding to the GSM / SMS module Extra, that is recognized as an interrupt from normal operation and a SMS will be sent out to predefined receivers. It is shown in Figure.4

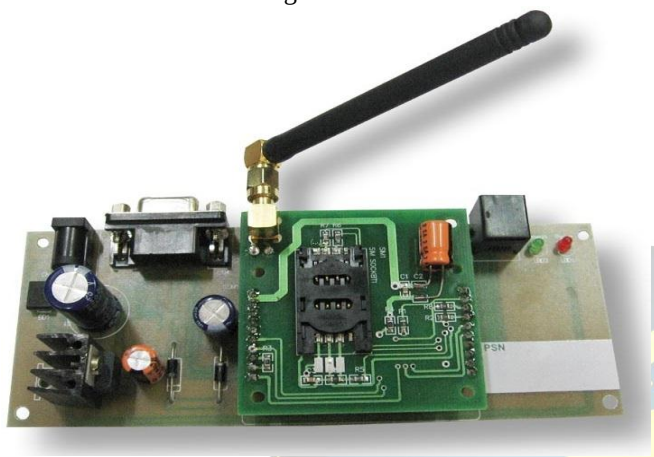

Figure. 4 GSM Module

III. RESULT

The prototype of RFID and GSM based Smart Trolley system has been shown in figure. 5. This system has been tested by taking the items near to the RFID reader and let the items to be deposited in the trolley and the microcontroller sends a signal to the GSM. After that microcontroller send an active signal to other externally connected device such as Mobile. As a result a message is displayed on LCD screen.

Figure. 5 Prototype model of proposed system

IV. CONCLUSION

In this system we have describe a new approach for billing system using RFID and GSM. The RFID sends a signal to microcontroller. In the next step microcontroller sends an active signal to other externally connected devices. Through this prototype we can reduce the loss of time in the place of Shopping Mall.

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