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# Design of Advanced Shopping Trolley based on QR Code

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***Abstract* - This system proposes advanced shopping trolley based on Quick Response (QR) code. This is done by Android smart phone. It reduces the wastage of time during shopping as it is a day to day regular activity. This system is divided into two sections- Transmitter and Receiver section .The shopping trolley is designed for malls or shopping markets. As per detail givens QR code verifies products by capturing it through the smart phone, then decodes and sends to the server for billing. In this way it can reduces shopping time easily and effectively ,customer will not have to waste more time on shopping**

***Index Terms –.QR Code, Microcontroller, IR sensor, DC Motor, ZIGBEE, Bluetooth***

## 1. INTRODUCTION

Two-dimensional matrix codes also known as the QR Code (Quick Response Code) , on other side, is advancement over the Barcode Systems and is used for various commercial purposes. The QR Code stores information in two dimensions that can be scanned and read by an application known as the QR-Code Reader. The QR code can be used to store various form of information like images, videos, price and all.

As QR codes are one of the modes of mobile marketing, this study assumes that customers'' beliefs about QR codes are positively associated with their intentions. [1]. Shopping guide hopes to guide the customer shopping process. Customers entering the store often be confused by the complicated layout and wide varieties of goods, which impede the implementation of purchasing behavior. [2] In this context, the authors consider a shopping process where the customers are required to track and locate their choice of products by scanning the QR code tagged on every product item. [3] The authors propose a novel clustering algorithm based on genetic algorithms (GA) to effectively segment the online shopping market. This paper proposes an RFID (Radio Frequency Identification) technology-based pervasive comparison shopping business model. [4].

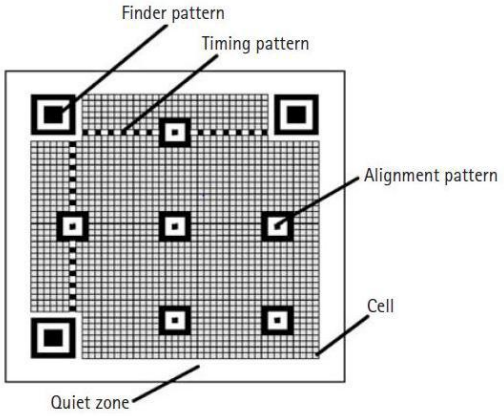


Fig.1.1 Design of QR Code

The objective of this project is to propose a real time capturing system for consumer supplies using Quick Response (QR) code in a Android smart phone. Using multiplexing and demultiplexing process encode and decode the information from single QR code with special symbols and split the data back to their QR Code pattern where these QR Code pattern can be read by Android smart phones. [5]

## 2. BLOCK DIAGRAM

From our system, billing of product done automatically by using android app. The customer will have to put the product in front of QR Code scanner; it scans the Code and saves the information of the product in microcontroller. We use LCD for the display of product information to customer. After that this information is send to the counter PC via Zigbee, in case of customer don't have smart phone, he can pay at the counter.

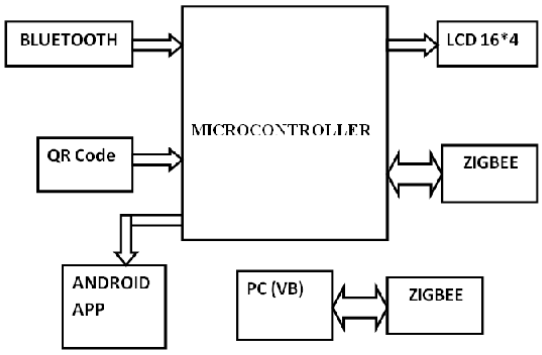


Fig.2.1 Block Diagram of the system

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### *2.1 MICROCONTROLLER UNIT*

The microcontroller is the final decision making body on the system. The logic is developed and then the program is written inside the microcontroller and the other peripherals are accessed via microcontroller only.

The ARM7TDMI-S is 32-bit microprocessor, which offers high-performance and very low power consumption. The architecture of ARM7 is based on Reduced Instruction Set Computer (RISC) architecture, and the instruction set and related decode mechanism are much easier than that of micro programmed CISC architecture. This simplicity results in a high instruction execution and quality real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are implemented such that all sections of the processing and memory systems can operate continuously.
For an instance, when one instruction is being employed, its successor is being decoded, and a third instruction is being acquired from memory. A unique architectural strategy known as Thumb, is employed with the help of ARM7TDMI-S processor, which makes it ideally compatible to high-volume applications with memory restrictions, or applications where code density is an issue. A super-reduced instruction set was the key idea behind using The Thumb.

### *2.2 LIQUID CRYSTAL DISPLAY*

LCD is used in a project to analyze the result of the application. In the system, we have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can read and write 16 characters in each line. Hence, we can display total 32 characters on 16x2 LCD.

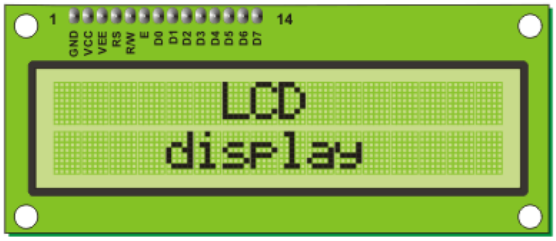


Fig 2.2.1 LCD Display

LCD can also be used in a project to verify the result of different modules interfaced with the microcontroller. Henceforth, a major part in a project to see the output and to debug the system module for in case of failure of system in order to rectify the problem can be performed by LCD plays.

### *2.3 IR OBSTACLE SENSOR*

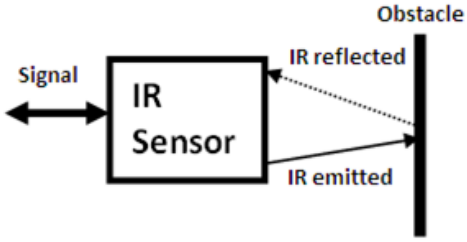


Fig. 2.3.1 IR Sensor

Here we are connecting an IR based obstacle sensor. For current limiting mechanism, the 50 ohm resister is used. The current through the LED is 5v / 50 ohm = 100 mA, which is high for an LED. Since, as we have to increase the range of the obstacle sensor we have used a lower range resistor of 50 ohm.

Over the receiver side we have mounted the IR receiver in reverse bias fashion. So as soon as the light falls in the IR receiver the anode voltage rises and the LED is in forward bias mode and start conducting when the anode voltage is getting more than the voltage of cathode.

### *2.4 DC MOTORS*

DC motors are used to physically drive the application as per the requirement provided in software. The dc motor works on 12v.

Fig 2.4.1 DC motor

To make the module locomotive, we require DC motor driver namely L293D. This driver can drive 2 dc motors at a time. In order to protect the dc motor from a back EMF generated by the dc motor from changing the rotation direction, the dc motor driver have an internal protection suit. We can also provide the protection suit for back EMF by connecting 4 diode configurations across each dc motor.

### *2.5 RF TX-RX (ZIGBEE)*


Fig. 2.5 1 Zigbee Module

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In the wireless world, the name Bluetooth and WIFI have become a household name now-a-days. They find applications amongst others in mobile computing and mobile phones.

Zigbee is the result of the demand from various industry and consumer for wireless applications that demand for lower data rate, longer battery life, short range, simple design and low cost solutions.

## 3. DESIGN AND ANALYSIS

In this design section we have comprised all the sections including Power supply system which involves rectification of the supplied DC power source to 12V-1A.

### *3.1 POWER SUPPLY SYSTEM*

In this project we are using a DC regulated power supply system for the functioning of the module. The basic circuit diagram is provided below for the better understanding of the system. The transformer regulates the 12V with the use of bridge rectifier. The whole system functions over 5V-1A supply chain.

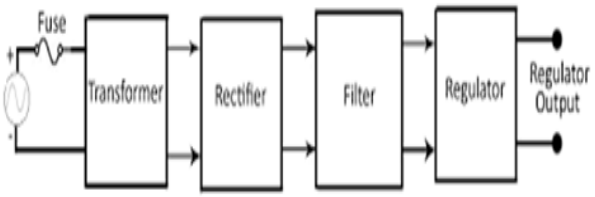


Fig.2.1.1 Steps in Regulated Power Supply System

We require 5V at the output of the regulator. The dropout voltage of the regulator is 2V (theoretically).

$$Vdc = 5+2 = 7V$$

So, at the regulator input, the voltage applied should be of 7V. According to the formula,

$$Vdc = \frac{Vm}{\pi}$$

But,

$$Vm = \frac{Vdc*\pi}{2}$$

$$Vrms = \frac{Vin}{\sqrt{2}}$$

Similarly,

$$Im = \frac{Idc*\pi}{2}$$

### *3.1.1 BRIDGE RECTIFIER*

A bridge rectifier can be created using 4 individual diodes, but it is also available in special packages containing the 4 diodes required. It is known a full-wave rectifier because it uses the entire AC wave (both positive and negative sections). 1.4V is used in this rectifier because each diode uses 0.7V when conducting and there are always 2 diodes conducting. Bridge rectifiers are rated by the maximum current they will pass and the maximum reverse voltage they will withstand (this must be at least three times the supply RMS voltage so the rectifier can withstand the peak voltages).

*i. Root Mean Square (RMS) Values:*

The value of an AC voltage is changing from zero up to the positive peak, through zero to the negative peak and back to zero again. For most of the time the value of this is less than the peak voltage, so this is not a good measure of its real effect.

Instead we are using the root mean square voltage (VRMS) which is equal to the 0.7 of the peak voltage ($V_{peak}$):

$VRMS=0.7 \times V_{peak}$ and $V_{peak} = 1.4 \times VRMS$

*ii. Reasons for choosing bridge rectifier are:*

The TUF is increased to 0.812 as compared to the full wave rectifier. The PIV across every diode is the peak voltage across the load = Vm and not 2Vm as in the two diode rectifier. Diodes used are 1N4007.

### *3.2 FILTER CAPACITOR*

#### *3.2.1 SMOOTHING*

Smoothing is performed by a large value electrolytic capacitor which is connected to the DC supply for acting as a reservoir, supplying current to the output when the varying DC voltage from the rectifier is falling.. The capacitor charges very fast near the peak of the varying DC, and after then discharges as it supplies current to the output

$$C = \frac{Vdc}{(f*Vr*R)}$$

Where,

$$R = \frac{Vdc}{Idc}$$

#### *3.2.2 VOLTAGE REGULATOR*

Voltage regulator ICs are available with fixed (typically 5, 12 and 15V) or variable output voltages. They are also rated by the value of maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies. Most of the regulators contain some automatic protection from excessive current ('overload protection') and overheating ('thermal protection'). This is used to make the stable voltage of +5V.

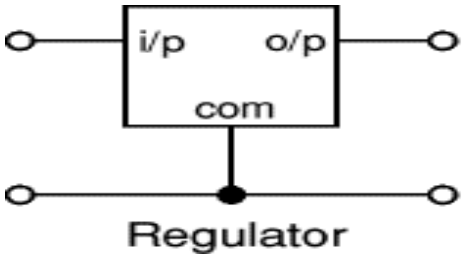


Fig. 3.2.2.1 variable voltage regulator

Many of the fixed voltage regulator ICs has 3 leads and look like power transistors, such as the 7805 +5V 1A regulator shown on the diagram. They contain a hole for attaching a heat sink if necessary.

International Journal of Engineering Research & Technology (IJERT)
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Fig.3.2.2.2 Voltage regulator LM7805 [11]

Output of the bridge rectifier is not purely DC and contains some AC Ripples in it. To remove these ripples we have to use capacitive filter, which smoothens the rippled output that we supply to 7805 regulators IC that gives 5V DC.
Voltage Regulator 7805 Specification:

1. Output current – 1A
2. Output Voltage – 5V
3. Drop out Voltage- 2V
5. Short circuit protection
6. Overload protection.

## 4. SOFTWARE SPECIFICATION

i. Keil uVision.

ii. Proteus version 7.7

iii. Express PCB

## 5. ACKNOWLEDGEMENT

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## 6. CONCLUSION

In this work, we studied and analyzed advanced shopping trolley by using QR-code. We studied wireless techniques for advanced billing. In this project, we have use ARM 7 microcontroller, android app for scanning QR-Code, Zigbee for wireless billing technique and other different hardware and software parts. Another feature is IR sensor which is used of sensing the products. Comparing these features with recent shopping trolley we recognize the time required for billing is less and man power is also decreased.

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