# Smart Shopping Trolley

Tushar R. Unale[1], Harshad P. Sankpal[2], Shripad G. Pujari[3], Rasika R. Minache[4], Menka M. Havagondi[5]

[1,2,3,4,5]*SGI, Atigre, Kolhapur, Maharashtra, India*

*Abstract*— **Nowadays, in mall for purchasing variety of items it requires trolley. Every time customer has to pull the trolley from rack to rack for collecting items and at the same time customer has to do calculation of those items and need to compare it with his budget in pocket. After this procedure, customer has to wait in queue for billing. So, to avoid headache like pulling trolley, waiting in billing queue, thinking about budget, we are introducing new concept that is "SMART SHOPPING TROLLEY". Each shopping cart is designed or implemented with a Product Identification Device (PID) that contains microcontroller, LCD, an RFID reader, EEPROM, and RF module. Purchasing product information will be read through a RFID reader on shopping cart, mean while product information will be stored into EEPROM attached to it and EEPROM data will be send to Central Billing System through RF module. The central billing system gets the cart information and EEPROM data, it access the product database and calculates the total amount of purchasing for that particular cart. In this paper, we have designed system by using microcontroller, because microcontroller based system are less bulky and also easily transferable. It requires less power. So the system becomes cheap. It requires less space, easy to install, so can fitted easily in. transferable. It requires less power. So the system becomes cheap. It requires less space, easy to install, so can fitted easily in.**

*Keywords*— **RFID, IC 89c52, EEPROM, RF Module, IR sensor**

## I. INTRODUCTION

Programmers build up software applications every day in order to augment efficiency and productivity in a mixture of situations. A system is a way of working, organizing or doing one or many tasks according to a fixed plan, program, or set of rules. A system is also an arrangement in which all its units assemble and work together according to the plan or program. An embedded system is one that has computer-hardware with software embedded in it as one of its most important component. It is a dedicated computer-based system for an application (s) or product. It may be either an independent system or a part of a larger system. As its software usually embeds in ROM (Read Only Memory) it does not need secondary memories as in a computer. These systems are designed with a single 8- or 16-bit microcontroller; they have little hardware and software complexities and involve board level design. They may even be battery operated.

When developing embedded software for these, an editor, assembler and cross assembler, specific to the microcontroller or processor used, are the main programming tools. Usually, 'C' is used for developing these system

Radio frequency identification (RFID) is a rapidly growing technology that has the potential to make great economic impacts on many industries. While RFID is a relatively old technology, more recent advancements in chip manufacturing technology are making RFID practical for new applications and settings, particularly consumer item level tagging.

## II. HARDWARE IMPLEMENTATION AND DESIGN OF CART

The given fig.1 shows hardware modules for the device which is attached to shopping cart of supermarket. It consists of a microcontroller, display unit (LCD), an EEPROM, RFID reader, RF transceiver and a battery power source. The battery power source increases the mobility of the device. A liquid crystal display is special thin flat panels that can let light go through it, or can block the light. Each block is filled with liquid crystals that can be made clear or solid, by changing the electric current to that block. Liquid crystal displays are often abbreviated LCDs.

### A. Microcontroller

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost effective solution to many embedded control applications.

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry.

In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.
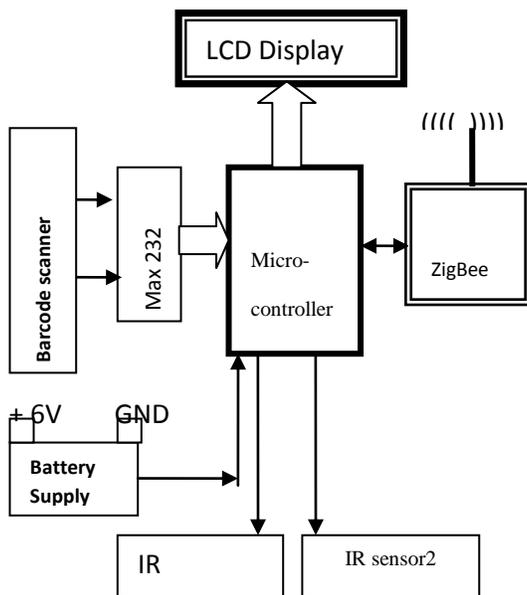


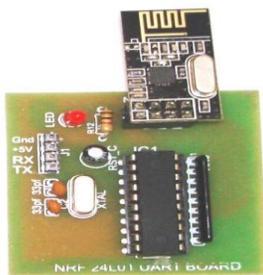**Fig.1 Block Diagram**

*B. NRF24L04 RF module*



**Fig. 2 NRF24L04 RF module**

NRF24L01 RF Module is a trans receiver module which provides easy to use RF communication at 2.4 Ghz. It can be used to transmit and receive data at product database. The automated billing system will be developed using visual basic. Visual Basic was designed to accommodate beginner programmers. Programmers can not only create simple GUI applications, but to also develop complex applications. Programming in VB is a combination of visually arranging components or controls on a form, specifying attributes and actions for those components, and writing additional lines of code for more functionality. Since VB defines default attributes and actions for the components, a programmer can develop a simple program without writing much code. Programs built with earlier versions suffered performance 9600 baud rates from any standard CMOS/TTL source. It works in half duplex mode.

*Protocol: Packet format:* Payload or user data can vary between 1 to 30 bytes. '#' is the end character or a stop byte which determines end of packet. If the user has a payload of more than 30 bytes it needs to be broken down into packets of 30 bytes each followed by a stop byte. As the module receives a end character or a stop byte '#', it initiates the transmission. A minimum of 20msec delay is required between two successive packet transmission, as the chip is operated in auto re-transmit mode.

*C. EEPROM*

The AT24C02 provides 2048 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 256 words of 8 bits each. The device is optimized for use in many industrial and commercial applications where low-power and low-voltage operation are essential

**Table I.**
**Eeprom Pin Configuration**

| Sr. no. | Pin name | Function |
|---|---|---|
| 1 | A0-A2 | Address Input |
| 2 | SDA | Serial Data |
| 3 | SCL | Serial Clock Input |
| 4 | WP | Write Protect |
| 5 | NC | No Connect |
| 6 | GND | Ground |
| 7 | VCC | Power Supply |

*D. RFID Reader*



**Fig. 3 RFID  Reader**

RFID Proximity OEM Reader Module has a built-in antenna in minimized form factor. It is designed to work on the industry standard carrier frequency of 125 kHz. This LF reader module with an internal or an external antenna facilitates communication with Read-Only transponders—type UNIQUE or TK5530 via the air interface. The tag data is sent to the host systems via the wired communication interface with a protocol selected from the module Both TTL and Wiegend Protocol.

Radio-frequency identification (RFID) is a technology to electronically record the presence of an object using radio signals. It is used for inventory control or timing sporting events. RFID is not a replacement for the bar-coding, but a complement for distant reading of codes. The technology is used for automatically identifying a person, a package or an item.

*E.  IR Sensor*

IR sensor is a sensor which uses proximity sensing technique. Proximity sensing based upon infrared signal detection requires two parts: infrared LED and infrared sensor. The infrared LED emits infrared signal to the sensing object, a portion of that signal bounces back from the surface of sensing object, these reflected infrared signal was then captured by the infrared sensor. The intensity of captured infrared signal changes accordingly when an sensing object is getting closer or moving, the captured infrared signal is processed in real time through light to digital conversion to reveal the distance or even the motion of sensing object.

For infrared proximity sensing, the internal IR LED driver turns on and delivers from 12.5mA to 100mA to drive the external IR LED. The entire proximity detection cycle requires three different sequential phases: ambient light sensing, infrared sensing and proximity sensing. When the integrated digital ambient light and proximity sensor is programmed in proximity sensing mode, the external IR LED is turned on by the built-in IR LED driver to sink 12.5mA, 25mA, 50mA or 100mA current based on user programmed choice. When the infrared sensing signal from the LED reaches the sensing object and gets reflected back, the reflected infrared signal is captured by the infrared sensor and converted into photo current, then further converts into 16-bit digital data stream. The eventual proximity readout is linearly proportional to the reflected infrared signal intensity but inversely proportional to the square of the distance between proximity sensor and the sensing object. When under significant background infrared noise like direct sunlight, both infrared sensing phase and proximity sensing phase are needed for background noise cancellation.
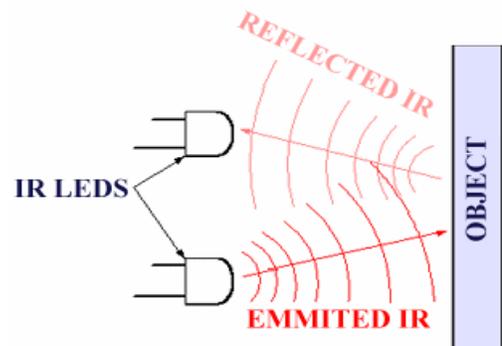


**Fig. 4 IR SENSOR**

When the sensing object is within 10cm distance from the center point between the IR LED and the light sensor as shown in Figure shown below, the reflected infrared signal is captured by the sensor; the proximity readout is linearly proportional to the captured infrared light signal intensity and inverse proportional to the square of the distance.

*F.  RS–232 Specification*

RS–232 is a "complete" standard.  This means that the standard sets out to ensure compatibility between the host and peripheral systems by specifying 1) common voltage and signal levels, 2)common pin wiring configurations, and 3) a minimal amount of control information between the host and peripheral systems.  Unlike many standards which simply specify the electrical characteristics of a given interface, RS–232 specifies electrical, functional, and mechanical characteristics in order to meet the above three criteria.
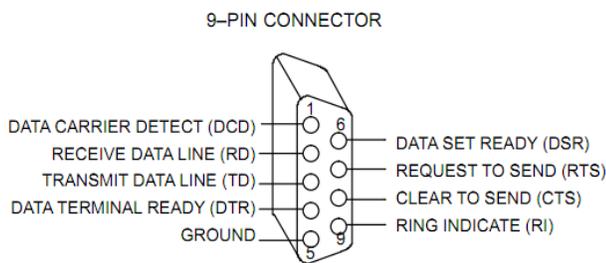
**Fig. 5 RS–232 Specification**

*Transmitted Data (TD):* One of two separate data signals. This signal is generated by the DTE and received by the DCE.

*Received Data (RD):* The second of two separate data signals. This signal is generated by the DCE and received by the DTE.
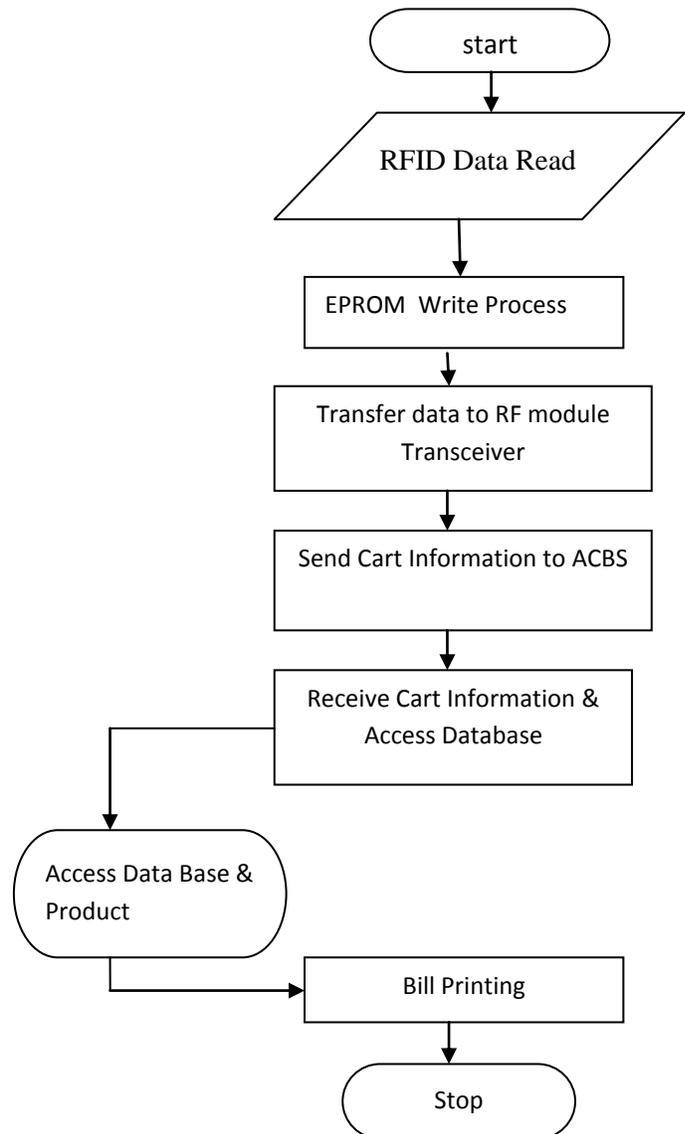
III.   FLOW CHART

**Fig. 6 Control flow diagram**

## IV. ADVANTAGES

- Each barcode has unique identity.
- System requires less space.
- It operates on less power.
- It gives easy shopping experience.
- Customer friendly

## V. DISCUSSION

We Discuss that the customer no need to wait in billing que and also costumer can perches products in his budget. Also smart Trolley can give easy shopping experience to the costumer. Costumer can see how much total amount of running bill. If costumer wants removing any product from trolley then he can easily remove out and passing through decrement sensor and this removable item automatically remove from bill. This trolley gives easy shopping experience and costumer can enjoy the shopping with smart trolley.

## REFERENCES

[1] Y. J. Zuo "Survivable RFID systems: Issues, challenges, and techniques", IEEE Trans. Syst., Man, Cybern. C, Appl. Rev., vol.40,no. 4, pp.406 -418 2010

[2] T. M. Choi "Coordination and risk analysis of VMI supply chains with RFID technology", IEEE Trans Ind. Informat., vol. 7, no. 3, pp.497-504 2011

[3] J. D. Porter and D. S. Kim "An RFID-enabled road pricing system for transportation", IEEE Syst. J., vol. 2, no. 2, pp.248 -257 2008

[4] H. H. Bi and D. K. Lin "RFID-enabled discovery of supply networks", IEEE Trans. Eng. Manag., vol. 56, no. 1, pp.129 -141 2009

[5] K. Finkenzeller RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification, 2003 :Wiley

[6] J. Z. Gao , L. Prakash and R. Jagatesan "Understanding 2D-BarCode technology and application in M-commerce-design and implementation of a 2D barcode processing solution", Proc. Comput. Softw. Appl. Conf., pp.49 -56 2007

[7] D. Hahnel , W. Burgard , D. Fox , K. Fishkin and M. Philipose "Mapping and localization with RFID technology", Proc. IEEE Int. Conf Robot. Autom., pp.1015 -1020 2004

[8] J. Y. Zhou , J. Shi and X. L. Qiu "Landmark placement for wireless localization in rectangular-shaped industrial facilities", IEEE Trans. Veh. Technol., vol. 59, no. 6, pp.3081 -3090 2010

[9] S. S. Saad and Z. S. Nakad "A standalone RFID indoor positioning.