USER INTENTION SMART SHOPPING

CART SYSTEM

PROJECT REPORT

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BONAFIDE CERTIFICATE

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LIST OF ABBREVIATIONS

RFID	Radio Frequency Identification
LCD	Liquid Crystal Display
PC	Personal Computer
IC	Integrated Circuit
MIPS	Million Instructions Per Second
RISC	Reduced Instruction Set
EEPROM	Electrically Erasable Programmable Read Only Memory
SRAM	Static Random Access Memory
JTAG	Joint Test Action Group
IEEE	Institute of Electrical and Electronic Engineers
PWM	Pulse Width Modulation
SPI	Serial Peripheral Interface
USART	Universal Synchronous/Asynchronous Receiver/Transmitter
ALU	Arithmetic Logic Unit
CISC	Complex Instruction Set
CPU	Central Processing Unit
Gnd	Ground
CSMA-CA	Carrier Sense Multiple Access with Collision Avoidance
CLK	Clock
VB	Visual Basic
JVM	Java Virtual Machine

ABSTRACT

Today purchasing various items in malls or supermarkets require a trolley. Product procurement represents a complex process. On each occasion customer has to pull the trolley from rack to rack for collecting items and simultaneously customer has to perform estimated expense computation. At the end, customer has to wait in queue for billing and payment. To overcome that we have been developed a smart way for shopping. Each and every product has RFID tag instead of barcode scanner. The smart trolley will consists of a RFID reader, LCD display and Zigbee transmitter. When a person puts any product in the trolley it will scan the product and the cost and the name of the product will be displayed. The sum total cost of all the products will be added to the final bill, which will be stored in the microcontroller memory. It will wirelessly transfer the product information of the items placed in the trolley using a Zigbee transmitter to the main computer. So, to avoid waiting in billing queue while constantly thinking about the budget, a new concept has been introduced which is the 'SMART CART'.

CHAPTER 1

1.INTRODUCTION

Large grocery stores are used by millions of people for the acquisition of an enlarging number of products. Product acquisition represents a complex process that comprises time spent in corridors, product location and checkout queues.Shopping mall is a place where people get their daily necessities ranging from food products, clothing, electrical appliances etc. Purchasing and shopping at big malls is becoming a daily activity in metro cities. People purchase different items and put them in trolley. After total purchase one needs to go to billing counter for payments. At the billing counter the cashier prepare the bill using bar code reader which is a time consuming process and results in long queues at billing counters.

Continuous improvement is required in the traditional billing system to improve the quality of shopping experience to the customers. To overcome these problems and to improve the existing system, we have designed a SMART SHOPPING CART. This can be done by simply attaching RFID tags to the products and a RFID reader with a LCD display on the shopping trolley. Therefore, with this system, customer will have the information about price of every item that is scanned in, total price of the item. This system will save time of customers and manpower required in mall and cost associated with the product.

The system will be placed in all the trolleys. Also the product's position can be announced using Voice IC. At the billing Counter the total bill data will be transferred to PC by ZigBee Modules.

CHAPTER 2

2.HARDWARE DESCRIPTION

2.1 BLOCK DIAGRAM OF USER INTENTION SMART SHOPPING CART SYSTEM

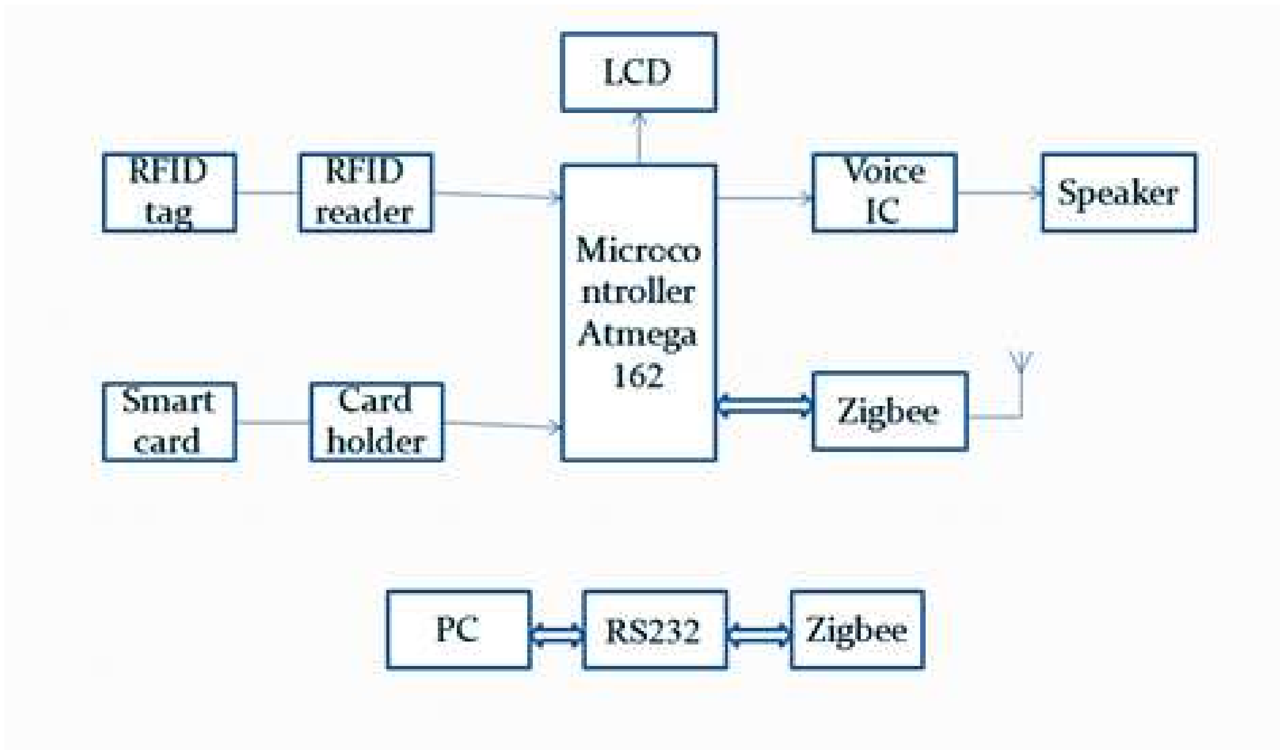
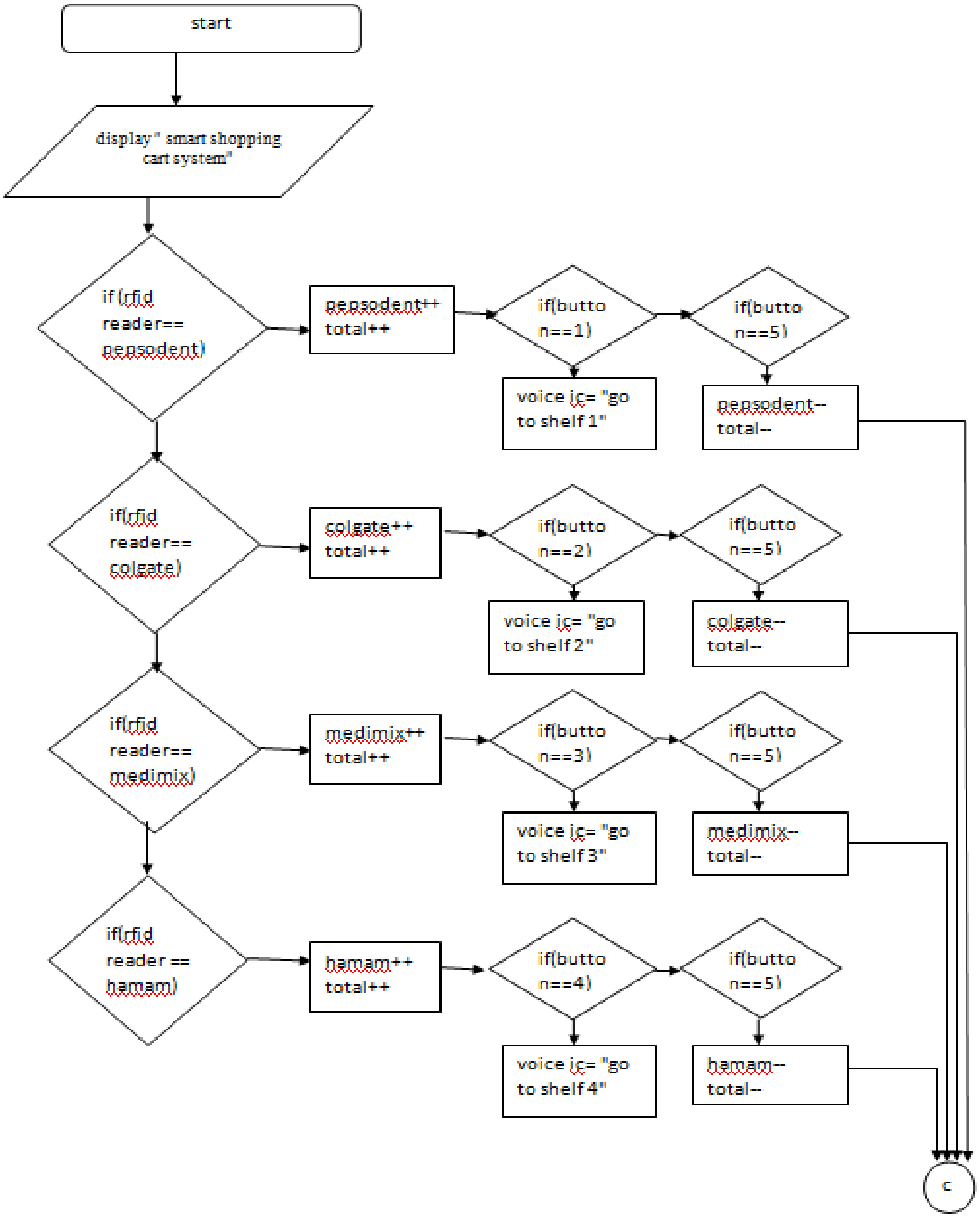
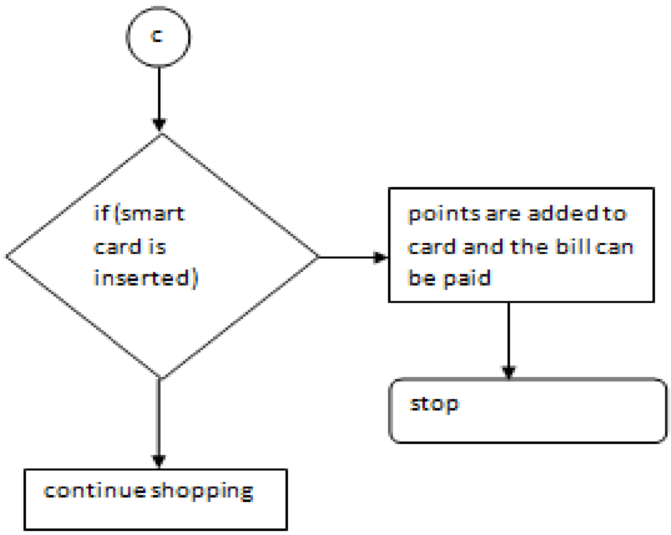


Fig 2.1 block diagram of user intention smart shopping cart system

The transmitter module contain the microcontroller, LCD, RFID reader module, RFID tag, smart card holder, Zigbee transmitter, Voice IC and the loud speaker. The receiver module contains the zigbee receiver which communicates with the PC through the RS 232.

2.2 FLOWCHART





2.3 ALGORITHM

- **STEP 1**: Start the module
- **STEP 2**: Let 'n' be the name of buttons.
- **STEP 3** :if n=1 voice IC indicates pepsodent's shelf location or if n=2 voice IC indicates colgate's shelf location or if n=3 voice IC indicates medimix's shelf location or if n=4 voice IC indicates hamam's shelf location.
- **STEP 3**: If rfid reads pepsodent, its count gets increased and the amount of the product is added to the total amount
- **STEP 4**: If rfid reads colgate,its count gets increased and the amount of the product is added to the total amount
- **STEP 5**: If rfid reads medimix, its count gets increased and the amount of the product is added to the total amount

- **STEP 6**: If rfid reads hamam, its count gets increasedand the amount of the product is added to the total amount
- **STEP 7**: If n==5, the count of particular product gets decremented and the amount of the product is subtracted from the total amount
- **STEP 8**: If rfid is read again, step 3 or 4 or 5 or 6 is executed.
- **STEP 9**: If smart card is inserted, points are added to the card and bill can be paid.
- **STEP 10** :End the program

2.4 POWER SUPPLY

2.4.1 BLOCK DIAGRAM OF POWER SUPPLY

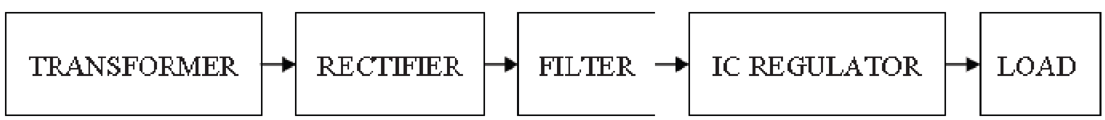


Fig 2.4.1 Block diagram (Power supply)

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

2.4.2 SCHEMATIC DIAGRAM OF POWER SUPPLY

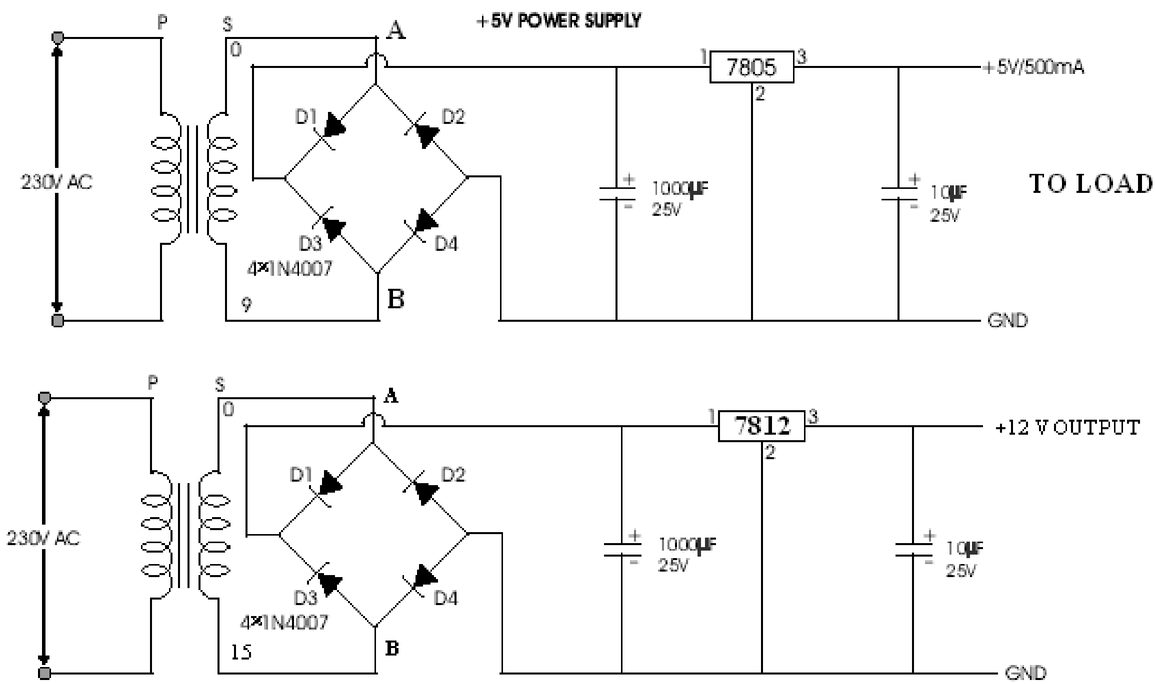


Fig 2.4.2 schematic diagram of power supply

2.4.2 TRANSFORMER

The potential transformer will step down the power supply voltage (0-230V) to (0-15V and 0-9V) a level. If the secondary has less turns in the coil then the primary, the secondary coil's voltage will decrease and the current or AMPS will increase or decreased depend upon the wire gauge. **This is called a STEP-DOWN transformer.** Then the secondary of the potential transformer will be connected to the rectifier.

2.4.3 BRIDGE RECTIFIER

2.4.3 FULL WAVE RECTIFICATION

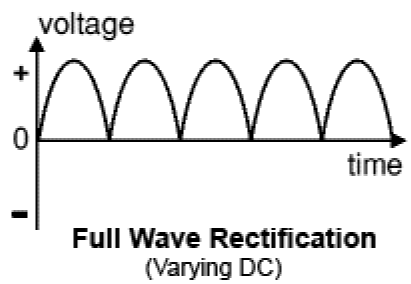


Fig 2.4.3 Full wave rectification

Bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional half-wave circuit. This bridge rectifier always drops 1.4Volt of the input voltage because of the diode. We are using 1N4007 PN junction diode, its cut off region is 0.7Volt. So any two diodes are always conducting, total drop voltage is 1.4 volt.

2.4.4 IC VOLTAGE REGULATOR

2.4.4 VOLTAGE REGULATOR

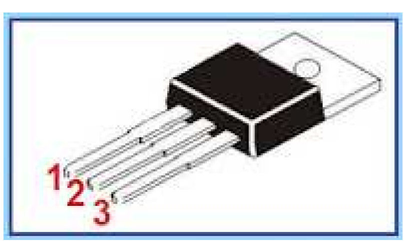


Fig 2.4.4 Voltage regulator

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustably set voltage.

Component description:

1) Input
2) Ground
3) Output

2.4.1 TYPES OF POSITIVE VOLTAGE REGULATOR

78xx Regulator		
IC Part	Minimum Input Voltage	Regulated Output
7805	7.3V	5V
7806	8.4V	6V
7808	10.5V	8V
7809	11.5V	9V
7810	12.5V	10V
7812	14.6V	12V
7815	17.7V	15V
7818	21.0V	18V
7824	27.1V	24V

2.5 ATmega162

The ATmega162 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega162 achieves throughputs approaching 1 MIPS per MHZ allowing the system designer to optimize power consumption versus processing speed.

The high-performance, low-power Microchip 8-bit AVR RISC-based microcontroller combines 16KB of programmable flash memory, 1KB SRAM, 512B EEPROM, and a JTAG interface for on-chip debugging. The device supports throughput of 16 MIPS at 16MHz and operates between 2.7-5.5 volts.

By executing instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed

2.5.1 ATmega162

Fig 2.5.1 ATmega162

2.5.2 FEATURES:

- High-performance, Low-power AVR® 8-bit Microcontroller
- Advanced RISC Architecture
  - 131 Powerful Instructions – Most Single-clock Cycle Execution
  - 32 x 8 General Purpose Working Registers
  - Fully Static Operation

– Up to 16 MIPS Throughput at 16 MHz

– On-chip 2-cycle Multiplier

• High Endurance Non-volatile Memory segments

– 16K Bytes of In-System Self-programmable Flash program memory

– 512 Bytes EEPROM

– 1K Bytes Internal SRAM

– Write/Erase cycles: 10,000 Flash/100,000 EEPROM

– Data retention: 20 years at 85°C/100 years at 25°C

– Optional Boot Code Section with Independent Lock Bits

In-System Programming by On-chip Boot Program

True Read-While-Write Operation

– Up to 64K Bytes Optional External Memory Space

– Programming Lock for Software Security

• JTAG (IEEE std. 1149.1 Compliant) Interface

– Boundary-scan Capabilities According to the JTAG Standard

– Extensive On-chip Debug Support

– Programming of Flash, EEPROM, Fuses, and Lock Bits through the JTAG Interface

• Peripheral Features

– Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes

– Two 16-bit Timer/Counters with Separate Prescalers, Compare Modes, and Capture Modes

– Real Time Counter with Separate Oscillator

– Six PWM Channels

– Dual Programmable Serial USARTs

– Master/Slave SPI Serial Interface

– Programmable Watchdog Timer with Separate On-chip Oscillator

• Special Microcontroller Features

– Power-on Reset and Programmable Brown-out Detection

– Internal Calibrated RC Oscillator

– External and Internal Interrupt Sources

– Five Sleep Modes: Idle, Power-save, Power-down, Standby, and Extended Standby

2.5.2 PINOUT DIAGRAM OF ATMEGA162V:

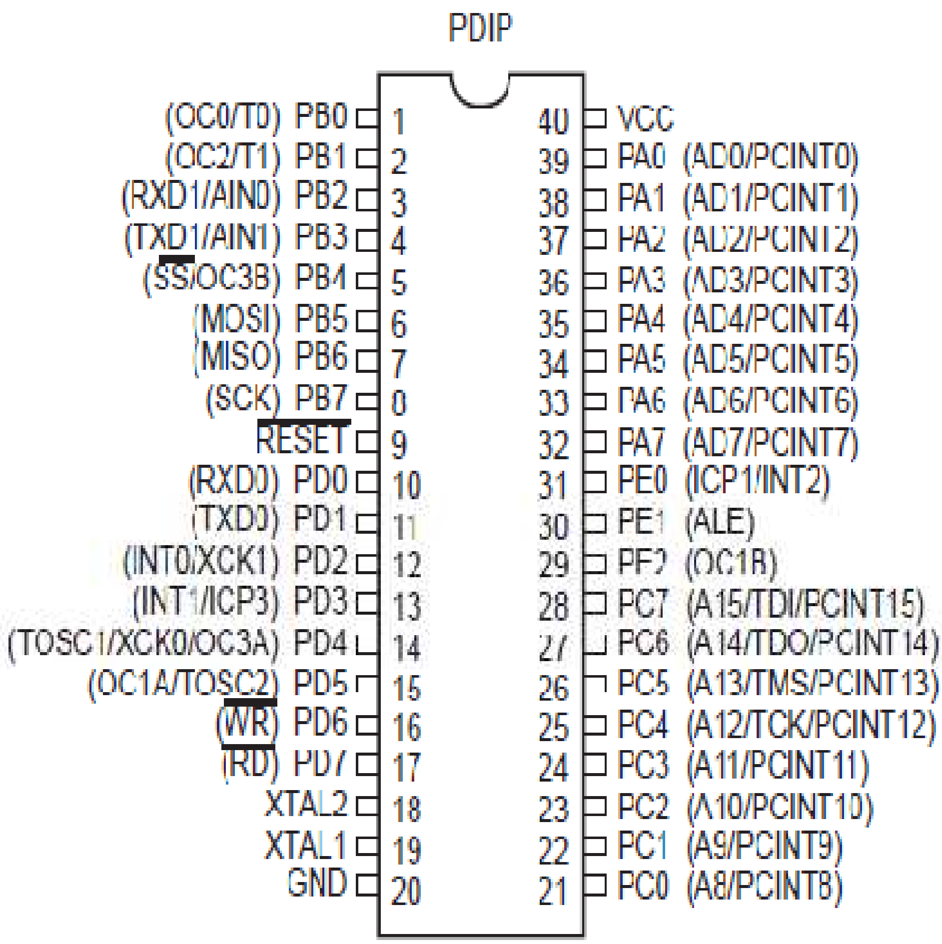


Fig 2.5.2 Pin diagram of ATmega162

• I/O and Packages

– 35 Programmable I/O Lines

– 40-pin PDIP, 44-lead TQTQFP, and 44-pad MLF

• Operating Voltages

– 1.8 - 5.5V for ATmega162V

– 2.7 - 5.5V for ATmega162

• Speed Grades

– 0 - 8 MHz for ATmega162V

– 0 - 16 MHz for ATmega162

The AVR core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers

The ATmega162 provides the following features: 16K bytes of In-System Programmable Flash with Read-While-Write capabilities, 512 bytes EEPROM, 1K bytes SRAM, an external memory interface, 35 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for Boundary-scan, On-chip Debugging support and programming, four flexible Timer/Counters with compare modes, internal and external interrupts, two serial programmable USARTs, a programmable Watchdog Timer with Internal Oscillator, an SPI serial port, and five software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning.

2.5.1PARAMETER DESCRIPTION

PARAMETER	VALUE
Program Memory Type	Flash
Program Memory (KB)	16
CPU Speed (MIPS)	16
RAM Bytes	1
Data EEPROM (bytes)	512
Digital Communication Peripherals	2-UART, 1-SPI,
Capture/Compare/PWM Peripherals	22 CCP6
Comparators	1
Temperature Range (C)	-40 to 85
Operating Voltage Range (V)	1.8 to 5.5
Pin Count	44
Cap Touch Channels	16

.

The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or Hardware Reset. In Power-save mode, the Asynchronous Timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. In Standby mode, the crystal/resonator Oscillator is running while the rest of the device is sleeping.

This allows very fast start-up combined with low-power consumption. In Extended Standby mode, both the main Oscillator and the Asynchronous Timer continue to run. The device is manufactured using Atmel's high density non-volatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed In-System through an SPI serial interface, by a conventional non-volatile memory programmer, or by an On-chip Boot Program running on the AVR core. The Boot Program can use any interface to download the Application Program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self-Programmable Flash on a monolithic chip, the Atmel ATmega162 is a powerful microcontroller that provides a highly flexible and cost effective solution to many embedded control applications.

The ATmega162 AVR is supported with a full suite of program and system development tools including: C compilers, macro assemblers, program debugger/simulators, In-Circuit Emulators, and evaluation kits.

2.5.3 PIN DESCRIPTIONS:

VCC

Digital supply voltage

GND

Ground

PORT A (PA7-PA0)

PORT A is an 8-bit bi-directional I/O PORT with internal pull-up resistors The PORT A output buffers have symmetrical drive characteristics with both high sink and sourcecapability. When pins PA0 to PA7 are used as inputs and are externally pulled low, they willsource current if the internal pull-up resistors are activated. The PORT A pins are tri-stated when areset condition becomes active, even if the clock is not running.

PORT B (PB7-PB0)

PORT B is an 8-bit bi-directional I/O PORT with internal pull-up resistors The PORT B output buffers have symmetrical drive characteristics with both high sink and sourcecapability. As inputs, PORT B pins that are externally pulled low will source current if the pull-upresistors are activated. The PORT B pins are tri-stated when a reset condition becomes active,even if the clock is not running.

PORT C (PC7-PC0)

PORT C is an 8-bit bi-directional i/o port with internal pull-up resistors The PORT C output buffers have symmetrical drive characteristics with both high sink and sourcecapability. As inputs, PORT C pins that are externally pulled low will source current if the pull-upresistors are activated. thePORT C pins are tri-stated when a reset condition becomes active,even if the clock is not running. if the JTAG interface is enabled, the pull-up resistors on pinspc7(tdi), pc5(tms) and pc4(tck) will be activated even if a reset occurs.

PORT D (PD7-PD0)

PORT D is an 8-bit bi-directional i/o PORT with internal pull-up resistors The PORT D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, PORT D pins that are externally pulled low will source current if the pull-upresistors are activated. thePORT D pins are tri-stated when a reset condition becomes active,even if the clock is not running.

PORT E (PE2-PE0)

PORT E is an 3-bit bi-directional i/o PORT with internal pull-up resistorsThe PORT E output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, PORT E pins that are externally pulled low will source current if the pull-upresistors are activated. thePORT E pins are tri-stated when a reset condition becomes active,even if the clock is not running.

RESET

RESET input.A low level on this pin for longer than the minimum pulse length will generate areset, even if the clock is not running. shorter pulses are not guaranteed to generate a reset

XTAL1

Input to the inverting oscillator amplifier and input to the internal clock operating circuit.

XTAL2

output from the inverting oscillator amplifier.

2.6 PASSIVE TAG AND READER:

Passive tags are those energized by the reader itself, they contain no power source, typically have very long lifetimes (near indefinite) a drawback over active tags is the read range, typically 2cm (1in) to 1.5m (4.5 ft), a strong positive is individual tag cost. RFID Passive tag is composed of a integrated electronic chip and a antenna coil that includes basic modulation circuitry and non-volatile memory.

The reader powers the tag (transponder), by emitting a radio frequency wave. The tag then responds by modulating the energizing field. This modulation can be decoded to yield the tags unique code, inherent in the tag. The resultant data can be the passed to a computer from processing. Tags have various salient features apart from their physical size: Other available features are: Read Only, Read Write, Anti-Collision.

2.6.1 DIFFERENT TYPES OF TAGS

Fig 2.6.1Different types of tags

2.6.2 INTERACTION BETWEEN READER AND TAG

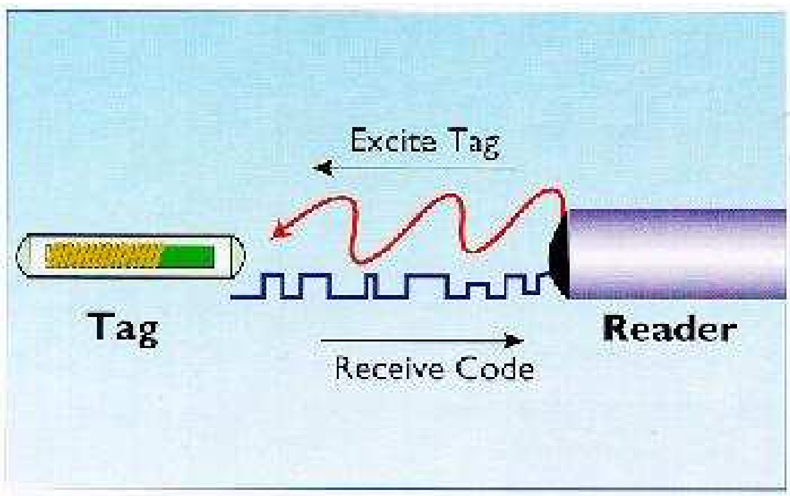


Fig 2.6.2 Interaction between tag and reader

2.6.3 RFID READER MODULE

Fig 2.6.3 RFID reader module

2.6.1 ADVANTAGES

The tag functions without a battery; these tags have a useful life of twenty years or more. The tag is typically much less expensive to manufacture

- The tag is much smaller (some tags are the size of a grain of rice). These tags have almost unlimited applications in consumer goods and other areas.
- Tags can be read through a variety of substances such as snow, fog, ice, paint, crusted grime, and other visually and environmentally challenging conditions, where barcodes or other optically read technologies would be useless.
- RFID tags can also be read in challenging circumstances at remarkable speeds, in most cases responding in less than 100 millisecond

2.6.1TECHNICAL SPECIFICATIONS OF RFID

Frequency:	125 KHz / 13.56 MHz / 915 MHz / 2.45 GHz Read/Write
Distance:	Up to 6m (with mounted antenna)
Dimensions	Varies, as small as 0.8mm diameter
Weight:	6-54g
Memory:	Up to 16 Kbits
Data durability:	10 Years

2.7 SMART CARD

A smart card, chip card, or integrated circuit card (ICC), is any pocket-sized card with embedded integrated circuits. There are two broad categories of ICCs. Memory cards contain only non-volatile memory storage components, and perhaps dedicated security logic. Microprocessor cards contain volatile memory and microprocessor components. The card is made of plastic, generally polyvinyl chloride, but sometimes acrylonitrile butadiene styrene or polycarbonate

2.7.1 SMART CARD

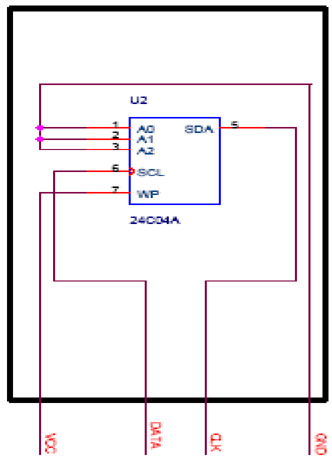


Fig 2.7.1 Smart card

Circuit Description:

The IS24C04 is a low cost 4,096-bit serial EEPROM. It is fabricated using ***ISSI***'s advanced CMOS EEPROM technology and operates from a single supply.

The IS24C04 is internally organized as two 256 x 8 memory banks. The IS24C04 features a serial interface and software protocol allowing operation on a simple 2-wire bus. Up to eight IS24C04s may be connected to the 2-wire bus by programming the A0, A1, and A2 inputs.

The IS24C04 features a SERIAL communication, and supports bidirectional data transmission protocol allowing operation on a simple two-wire bus between the different devices connected somewhere on the system bus. The two-wire bus was defined as a serial data line (SDA), and a serial clock line (SCL).

The protocol defines any device that sends data onto the SDA bus as a transmitter, and the receiving device as a receiver. The device controlling the data transmission is named MASTER device, and the controlled device is named SLAVE device. In all cases, the IS24C04 will be a slave device, since it never initiates any data transfers. Up to four IS24C04 can be connected to the bus. Device's physical address inputs A0-A2 must be connected to either Vcc or GND.

Following a START condition, the MASTER (transmitter) device must initiate the "Device Addressing Byte" including device type identifier, device address, and a read or write operation to select a slave device (receiver) connected to the system bus. The receiver will then respond with an Acknowledge by pulled the SDA line LOW.

The Acknowledge is used to indicate successful data transfers. The transmitting device will release the data bus (SDA goes HIGH) after transmitting eight bits (one data bit is transferred at the falling edge of each clock cycle). During the ninth clock cycle, the receiver will pull the SDA line LOW to acknowledge the transmitter that it received the eight bits of data.

2.8 ZIGBEE

ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection.

2.8.1 ZIGBEE

Fig 2.8.1 Zigbee transmitter and receiver

The ZigBee specification is a combination of HomeRF Lite and the 802.15.4 specification. The spec operates in the 2.4GHz (ISM) radio band - the same band as 802.11b standard, Bluetooth, microwaves and some other devices. It is capable of connecting 255 devices per network.

There are three different ZigBee device types that operate on these layers in any self-organizing application network. These devices have 64-bit IEEE addresses, with option to enable shorter addresses to reduce packet size, and work in either of two addressing modes – star and peer-to-peer.

1. **The ZigBee coordinator node**: There is one, and only one, ZigBee coordinator in each network to act as the router to other networks, and can be likened to the root of a (network) tree. It is designed to store information about the network.

2. **The full function device FFD**: The FFD is an intermediary router transmitting data from other devices. It needs lesser memory than the ZigBee coordinator node, and entails lesser manufacturing costs. It can operate in all topologies and can act as a coordinator.

3. **The reduced function device RFD**: This device is just capable of talking in the network; it cannot relay data from other devices. Requiring even less memory, (no flash, very little ROM and RAM), an RFD will thus be cheaper than an FFD. This device talks only to a network coordinator and can be implemented very simply in star topology.

The specification supports data transmission rates of up to 250 Kbps at a range of up to 30 meters. ZigBee's technology is slower than 802.11b (11 Mbps) and Bluetooth (1 Mbps) but it consumes significantly less power.

2.8.1 ZigBee General Characteristics:

1. Dual PHY (2.4GHz and 868/915 MHz)
2. Data rates of 250 kbps (@2.4 GHz), 40 kbps (@ 915 MHz), and 20 kbps (@868 MHz)
3. Optimized for low duty-cycle applications (<0.1%)
4. CSMA-CA channel access Yields high throughput and low latency for low duty cycle devices like sensors and controls
5. Low power (battery life multi-month to years)
6. Multiple topologies: star, peer-to-peer, mesh
7. Addressing space of up to:
   - 18,450,000,000,000,000,000 devices (64 bit IEEE address)
   - 65,535 networks
8. Optional guaranteed time slot for applications requiring low latency
9. Fully hand-shaked protocol for transfer reliability
10. Range: 50m typical (5-500m based on environment)

2.9 LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

The built-in controller IC has the following features:

- Correspond to high speed MPU interface (2MHz)
- 80 x 8 bit display RAM (80 Characters max)
- 9,920 bit character generator ROM for a total of 240 character fonts. 208 character fonts (5 x 8 dots) 32 character fonts (5 x 10 dots)
- 64 x 8 bit character generator RAM 8 character generator RAM 8 character fonts (5 x 8 dots) 4 characters fonts (5 x 10 dots)
- Programmable duty cycles
  1/8 – for one line of 5 x 8 dots with cursor
  - 1/11 – for one line of 5 x 10 dots with cursor
  - 1/16 – for one line of 5 x 8 dots with cursor
- Wide range of instruction functions display clear, cursor home, display on/off, cursor on/off, display character blink, cursor shift, display shift.
- Automatic reset circuit, that initializes the controller / driver

2.9.1 PIN DIAGRAM OF LCD

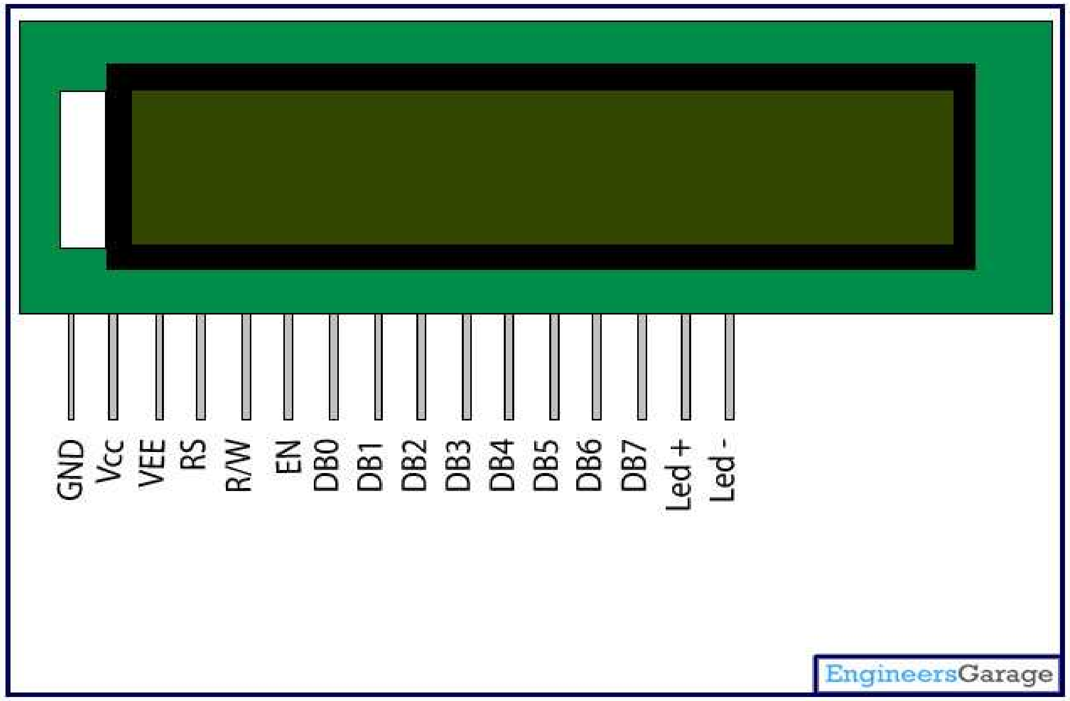


Fig 2.9.1 Pin diagram of LCD.

2.9.1 REGISTER SELECTION TABLE

RS	R/W	Operation
0	0	IR write as an internal operation
0	1	Read busy flag (DB7) and address counter (DB0 to DB6)
1	0	DR write as an internal operation (DR to DD RAM or CG RAM)
1	1	DR read as an internal operation (DD RAM or CG RAM to DR)

2.9.2 PIN DESCRIPTION OF LCD

Pin No	**Function**	**Name**
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD

2.10 VOICE IC :

WTV-040 is low cost sound record and playback module which can be used to play 32 different sounds using 5-bit address pins. The module works with 3.3V supply, but the adaptor makes it compatible for both 5V as well as 3.3 volt application using on-board regulator.

2.10.1 VOICE IC

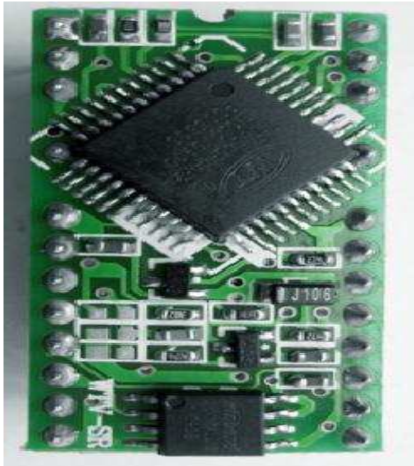


Fig 2.10.1 Voice IC

2.10.1 PIN DESCRIPTION OF VOICE IC

PIN	SYMBOL	FUNCTIONS
1	P14	BUSY output in normal times is high level
2	P15	Spare I/O
3	P16	Spare I/O
4	NC	N/C
5	P17	Spare I/O
6	NC	N/C
7	RESET	Reset pin, low level 10ms active
8	AUDIO-L	External amplifier positive
9	SP-	Direct drive speaker output negative
10	SP+	Direct drive speaker output positive
11	DI	SPI- FLASH DI, for download
12	DO	SPI- FLASH DO, for download
13	CLK	SPI- FLASH CLK, for download
14	GND	Ground
15	CS	SPI- FLASH CS, for download
16	P05	Push button
17	P04	Push button
18	P03	Push button/ DATA (3 wires)/ DATA (2 wires)
19	P02	Push button/ CLK (3 wires)/ CLK (2 wires)
20	P01	Push button/ CS (3 wires)
21	P00	Push button
22	3.3V	Power positive
23	NC	N/C
24	MIC+	Mic.in positive
25	NC	N/C
26	LINE IN	External audio input for line in record
27	P06	Push button
28	P07	Push button

The control pins include Play, Record and Erase pins.

1) **Record** — should be hold towards ground(0V from uC output) for recording sound in address selected with (A0-A4)
2) **Play** — 100 ms low pulse to begin playback with sound selected by address (A0-A4)
3) **Erase** — Erase pin 100 ms low pulse to erase sound record selected by address P03 ~ P07. Keeping low for 3 seconds erase all the voice files.
4) **Address** (A0-A4) – Address selection header

2.10.1 FEATURES

- Up to 7 kinds of operating modes : MP3 mode, one to one key mode, parallel mode, one record one play key mode , Audio-book mode, two-wire serial mode and three -wire serial mode
- Support MIC and LINE -IN recording
- Support plug-in 64M bit SPI-FLASH, recording time up to 1600 seconds
- Support upload and download voice via USB
- Support playback the high -quality voice which downloaded from computer
- Can record up to 252 segments voice (including fixed voice)
- With function of power-down data protection
- Support audio recording at 10KHz or 14KHZ sample rate
- Adopt a separate document management system, recording without debris,

more reasonable distribution of SPI-FLASH space

- Support key and MCU control
- 8-level controllable volume
- Operating voltage: DC2.6 ~ 3.6V, sleep current :10uA (typical).
- Module package: DIP28, can be defined, reference value: 18.30mm * 36.00mm
- WTV-SR using SPI-FLASH store voic e messages, the current version supports the largest of 64M. Specific as following table, the table data is from audio recording at 10KHz sample rate (unit: sec)

2.10.3 BLOCK DIAGRAM OF VOICE IC

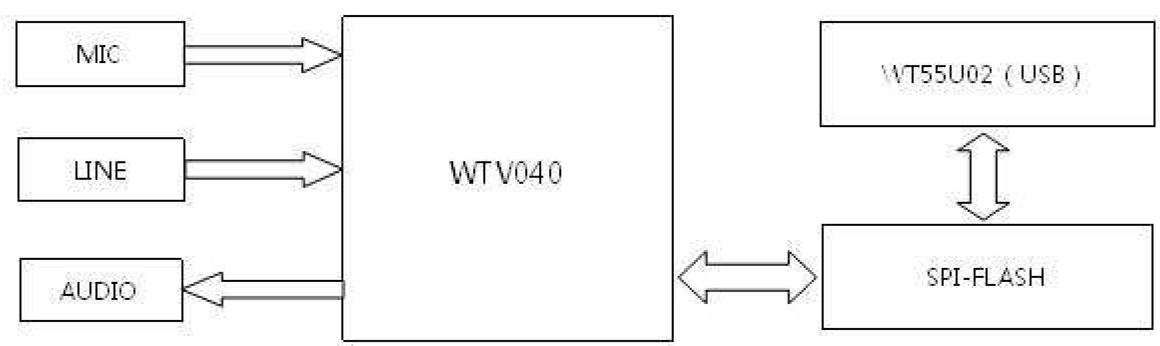


Fig 2.10.3 Block diagram of Voice IC

2.10.2 RECORDING DURATION

WTV-SR using SPI-FLASH to store voice messages ,Duration is in connection with the storage of SPI -FLASH. The latest version support up to 64M SPI-FLASH.

Specific as following table, the table data is from audio rec ordingat 10KHz sample rate (unit: sec)

2.10.2 RECORDING DURATION OF VOICE IC

SPI-FLASH	4Mbit	8Mbit	16Mbit	32Mbit	64Mbit
Recording time (seconds)	101	206	416	836	1600

2.11 LOUD SPEAKER

A **loudspeaker** (or "speaker") is an electroacoustic transducer that converts an electricalsignal into sound. The speaker moves in accordance with the variations of an electrical signal and causes sound waves to propagate through a medium such as air or water.

After the acoustics of the listening space, loudspeakers (and other electroacoustic transducers) are the most variable elements in a modern audio system and are usually responsible for most distortion and audible differences when comparing sound systems frequency ranges and routes them to the appropriate driver. A loudspeaker system with *n* separate frequency bands is described as "*n*-way speakers": a two-way system will have a woofer and a tweeter; a three-way system employs a woofer, a mid-range, and a tweeter.

2.11.1 LOUD SPEAKER

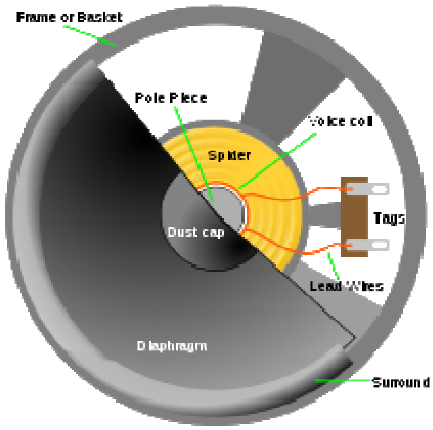


Fig 2.11.1 Loud speaker

2.12 RS232

2.12.1 RS 232

Fig 2.12.2 RS 232

Serial communication is the most simplistic form of communication between two devices.RS-232 is a standard by which two serial devices communicate:The connection must be no longer than 50 feet. Transmission voltages are –15V and +15V.It is designed around transmission of *characters* (of 7 bits of length).

Every time a character is sent, the same communication occurs

1. Start bit sent.
2. Seven data bits sent.
3. Stop bit sent.
4. This communication is dependent on the fact that both devices are sampling the bits at the same rate.

2.12.1 SPEED OF RS232

- The maximum speed, according to the standard, is 20kbit/s. However, modern equipment can operate much faster than this. (i.e. Lynx can reach 115200 baud.)
- The length of the cable also plays a part in maximum speed.
- The longer the cable and the slower the speed at which you can obtain accurate results.
- A large wire capacitance and inductance limits the maximum length of the cable and/or the maximum speed;
- Moreover higher is the capacitance of the cable higer is the interference between two adjacent signal wire.
- 50 feet (15m) @ max baudrate is commonly quoted as the maximum distance.

CHAPTER 3

3.SOFTWARE TOOLS

3.1 EMBEDDED C

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations.

Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, datatype declaration, conditional statements (if, switch case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc.

3.1.1 ADVANTAGES

- It is small and simpler to learn, understand, program and debug.
- Compared to assembly language, C code written is more reliable and scalable, more portable between different platforms.
- C compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers.
- Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems.
- As C combines functionality of assembly language and features of high level languages, C is treated as a 'middle-level computer language' or 'high level assembly language'.

- It is fairly efficient.
- It supports access to I/O and provides ease of management of large embedded projects.
- Java is also used in many embedded systems but Java programs require the Java Virtual Machine (JVM), which consumes a lot of resources. Hence it is not used for smaller embedded devices.
- In Embedded applications there is a need to read/write data on a given address, and in C it is easy to access and modify addresses, because of the pointers which are a language feature.

3.2 VISUAL BASIC

- VISUAL BASIC is a high level programming language that evolved from the earlier DOS version called BASIC. BASIC means Beginners' All-purpose Symbolic Instruction Code. The code looks a lot like English Language. Now, there are many versions of Visual Basic available in the market, the lastest being Visual Basic 2015 that is bundled with other programming languages such as C#. However, the most popular one and still widely used by many VB programmers is none other than Visual Basic 6.
- VISUAL BASIC is a VISUAL Programming Language because programming is done in a graphical environment. In VB6 , you just need to drag and drop any graphical object anywhere on the form and click on the object to enter the code window and start programming.

  In addition, Visual Basic 6 is Event-driven because we need to write code that performs some tasks to response to certain events. The events usually comprises but not limited to the user's inputs. Some of the events are load, click, double click, drag and drop, pressing the keys and more. We will learnmore about events in later lessons. Besides that, a VB6 Program is made up of many subprograms or modules, each has its own program code, and each can be executed independently; they can also be linked together in one way or another.

3.2.1 VB6 Programming Environment

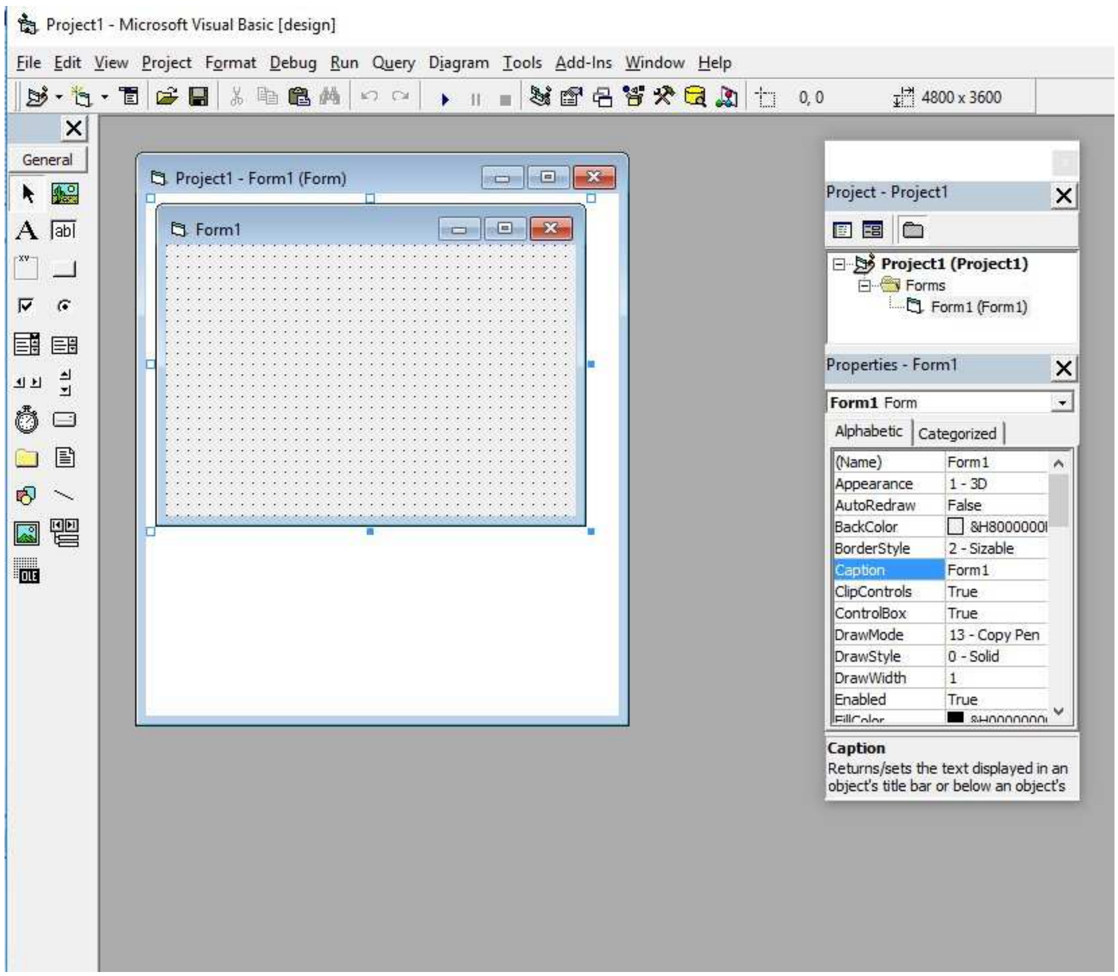


fig 3.2.1 VB6 programming environment

CHAPTER 4

4 WORKING

In this project there are two modules namely transmitter module and receiver module. There are three power supply; two in transmitter module and one in reciever module. One power supply in transmitter module goes to Voice IC and the other one goes to zigbee, microcontroller, RFID module. The power supply in receiver module goes to zigbee and max IC.

When the customer takes a product, he has to scan the RFID tag in the reader. The LCD in the trolley displays the cost of the particular product and the total amount. The customer can find the location of the product by pressing the appropriate keys in the trolley. Once the customer presses the key, the Voice IC informs the location through loud speaker. If the customer wants to remove a product from the trolley, he has to scan the product again and press the decrement key.

Once the customer completes the shopping, he has to insert the smart card into the card holder. Depending on the amount of purchase, the points will be credited to the card. Once the particular point is reached, the customers will be rewarded.

These informations from the trolley to the PC is done through Zigbee transmitter which will be received by zigbee receiver through RS 232. Here, we used the Visual Basic software to display the bill and points at the billing counter.

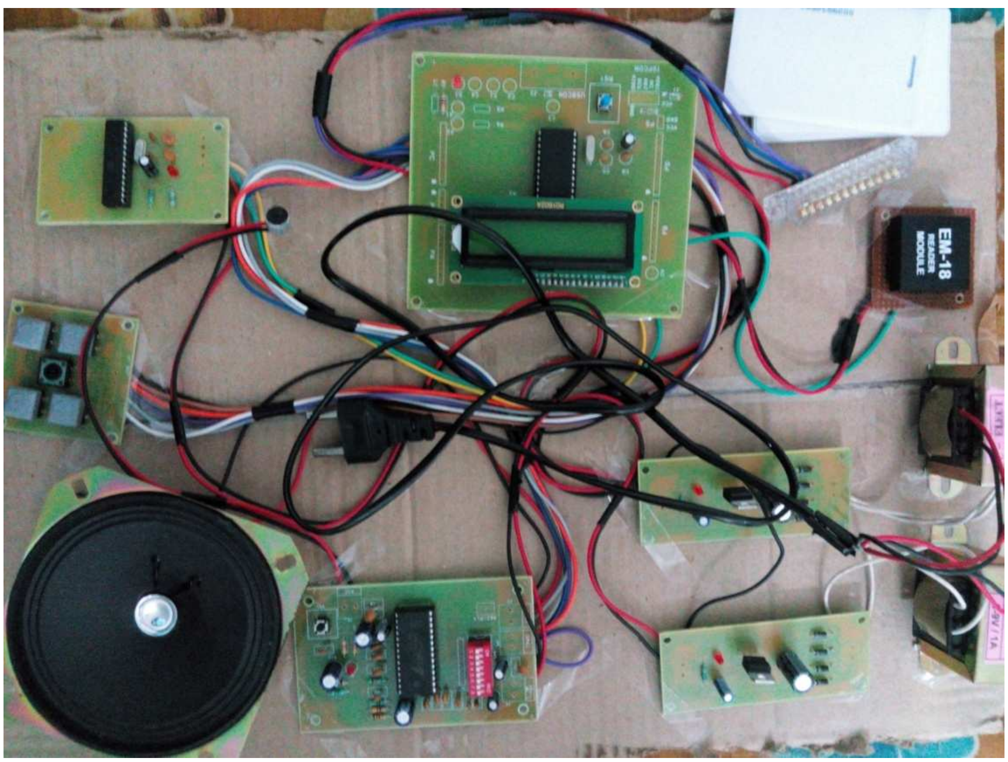
Since the billing is done in the trolley, the customer can avoid waste of time at the billing counter and he can pay the bill within a minute or two.

CHAPTER 5

5 CONCLUSION

5.1 RESULTS AND DISCUSSION

Thus the smart shopping cart system have been developed which helps the customers to find the location of the product, total amount while shopping so that they can shop according to their budget thereby avoiding the queue in billing counters. The customers will be provided with a smart card during their first visit and the points will be credited to their card depending on their purchase. If the particular points are reached, the customers will be rewarded. In this project, the trolley interacts with the PC through Zigbee.



This project designs a 3S-cart system to integrate the WSN technology with shopping carts to support smart shopping. It uses natural actions of customers on carts to infer their behavior and provides real-time interaction to improve the shopping experience. 3S-cart can also cooperate with other systems such as membership, visual surveillance, bar/QR-code, and RFID. Three applications are billing, sales-promotion and product-navigation, are developed to show the practicability of 3S-cart.

5.2 FUTURE SCOPE

The movement of the trolley can be made automatic with the help of various sensors. In this way there is no need to pull heavy trolley. The LCD side can be improvised. The discounts should be added to the products. The LCD can be provided with a layout of the shopping mall by which the customer can get the exact information of the products present in different areas. This increase user friendliness

APPENDIX

```
#define F_CPU 8000000UL
#include <avr/io.h>
#include <util/delay.h>
#include <avr/interrupt.h>
#include <avr/eeprom.h>
#include "ATMEGA_LCD4_NEW.h"
#include "ATM_serial.h"
/*....OUTPUT....*/
#define v1On (PORTC &= ~(1<<0))
#define v1Off (PORTC |= (1<<0))
#define v2On (PORTC &= ~(1<<1))
#define v2Off (PORTC |= (1<<1))
#define v3On (PORTC &= ~(1<<2))
#define v3Off (PORTC |= (1<<2))
#define v4On (PORTC &= ~(1<<3))
#define v4Off (PORTC |= (1<<3))
#define v5On (PORTC &= ~(1<<4))
#define v5Off (PORTC |= (1<<4))
/*.....INPUT.....*/
#define set (PIND & (1<<2))
#define mov (PIND & (1<<3))
#define inc (PIND & (1<<4))
#define dec (PIND & (1<<5))
```

```
#define ent (PIND & (1<<6))
#define card (PINC & (1<<5))
intcount,sec,j;
unsigned char rfid[15];
unsigned int i,val,item,item1,item2,item3,item4,one;
unsignedintsoap,brush,bottle,pen,total;
int a,count1=0,count2=0,count3=0,count4=0,cardin;
unsignedintamount,balance,add;
ISR(TIMER0_OVF_vect)
{
	TCNT0=0x3D;		//EVERY 25ms
	count++;
	if(count>=40)	//1000ms
	{
		count=0;
		sec++;
	}
}
ISR(USART1_RXC_vect) // RFID
{
	rfid[j++]=UDR1;
}
int main()
{
	cli();
```

```
DDRA=0xFF;
DDRB=0x08;                                                                    //
(0<<0)|(0<<1)|(0<<2)|(1<<3)|(0<<4)|(0<<5)|(0<<6)|(0<<7);
DDRC=0x1F;                                                                    //
(1<<0)|(1<<1)|(1<<2)|(1<<3)|(1<<4)|(0<<5)|(0<<6)|(0<<7);
PORTC |= (1<<5);
DDRD=0x02;                                                                    //
(0<<0)|(1<<1)|(0<<2)|(0<<3)|(0<<4)|(0<<5)|(0<<6)|(0<<7);
PORTD |= (1<<2)|(1<<3)|(1<<4)|(1<<5)|(1<<6);
v1Off;v2Off;v3Off;v4Off;v5Off;
Lcd4_Init();
Lcd4_Display(0x80,"SMART SHOPPING  ",16);
Lcd4_Display(0xC0,"   CART SYSTEM  ",16);
_delay_ms(1500);
Serial0_Init(9600);_delay_ms(100); //ZIGBEE
Serial1_Init(9600);_delay_ms(100); //RFID
_delay_ms(500);
sei();
_delay_ms(500);
//Lcd4_Command(0x01);
TCCR0=0X05;// CS02,CS00=1 for 1024 prescale // timer0
TCNT0=0X3D;// for 25ms
TIMSK &= ~(1<<TOIE0);
Receive0(1);
Receive1(1);
if((eeprom_read_byte(0)==255) && (eeprom_read_byte(1)==255))
```

```
{
        eeprom_write_byte(0,0);
        eeprom_write_byte(1,0);
}
balance=eeprom_read_byte(0)|(eeprom_read_byte(1)<<8);
//Lcd4_Decimal4(0xC0,balance);
_delay_ms(1500);
//Lcd4_Command(0x01);
while(1)
{
        _delay_ms(500);
        if(j>11)
        {
                //Lcd4_Display(0xC0,rfid,12);
                j=0;
                if(cardin==0)
                {
                        Lcd4_Command(0x01);
                        if(strncmp(rfid,"08009625B209",12)==0)
                        {
                                soap=25;count1++;item=1;
                                Lcd4_Display(0x80,"MEDMX x ",8);
                                Lcd4_Decimal2(0x88,count1);
                                Lcd4_Write(0x8B,'=');
                                item1=count1*soap;
```

```
                Lcd4_Decimal4(0x8C,item1);
        }
else if(strncmp(rfid,"080095C63F64",12)==0)
        {
                brush=15;item=2;count2++;
                Lcd4_Display(0x80,"HAMAM x ",8);
                Lcd4_Decimal2(0x88,count2);
                Lcd4_Write(0x8B,'=');
                item2=count2*brush;
                Lcd4_Decimal4(0x8C,item2);
        }
else if(strncmp(rfid,"0800961A63E7",12)==0)
        {
                bottle=50;item=3;count3++;
                Lcd4_Display(0x80,"COLGTE x",8);
                Lcd4_Decimal2(0x88,count3);
                Lcd4_Write(0x8B,'=');
                item3=count3*bottle;
                Lcd4_Decimal4(0x8C,item3);
        }
else if(strncmp(rfid,"08009600B628",12)==0)
        {
                pen=10;item=4;count4++;
                Lcd4_Display(0x80,"PEPSDT x",8);
                Lcd4_Decimal2(0x88,count4);
```

```
                Lcd4_Write(0x8B,'=');
                item4=count4*pen;
                Lcd4_Decimal4(0x8C,item4);
            }
            total=item1+item2+item3+item4;
            Lcd4_Display(0xC0,"TOTAL=",6);
            Lcd4_Decimal4(0xC6,total);
        }
    }
    if(cardin==0)
    {
        if(!dec)
        {
            while(!dec);
            if(item==1)
            {
                count1--;
                if(count1<=0)count1=0;
                item1=count1*soap;
                Lcd4_Decimal2(0x88,count1);
                Lcd4_Decimal4(0x8C,item1);
            }
            else if(item==2)
            {
                count2--;if(count2<=0)count2=0;
```

```
            item2=count2*brush;
            Lcd4_Decimal2(0x88,count2);
            Lcd4_Decimal4(0x8C,item2);
        }
        else if(item==3)
        {
            count3--;if(count3<=0)count3=0;
            item3=count3*bottle;
            Lcd4_Decimal2(0x88,count3);
            Lcd4_Decimal4(0x8C,item3);
        }
        else if(item==4)
        {
            count4--;if(count4<=0)count4=0;
            item4=count4*pen;
            Lcd4_Decimal2(0x88,count4);
            Lcd4_Decimal4(0x8C,item4);
        }
        total=item1+item2+item3+item4;
        Lcd4_Display(0xC0,"TOTAL=",6);
        Lcd4_Decimal4(0xC6,total);
    }
}
if(!set)
{
```

```
        while(!set);
        v1On;
        _delay_ms(1000);_delay_ms(1000);
        v1Off;v2Off;v3Off;v4Off;v5Off;
}
else if(!mov)
{
        while(!mov);
        v2On;
        _delay_ms(1000);_delay_ms(1000);
        v1Off;v2Off;v3Off;v4Off;v5Off;
}
else if(!inc)
{
        while(!inc);
        v3On;
        _delay_ms(1000);_delay_ms(1000);
        v1Off;v2Off;v3Off;v4Off;v5Off;
}
if(card==0)
{
        Lcd4_Display(0x80,"    CARD IN     ",16);
        cardin=1;
        if(one==0)
        {
```

```
one=1;
amount=total/50;
amount=amount*2;
balance += amount;
eeprom_write_byte(0,balance);_delay_ms(100);

eeprom_write_byte(1,balance>>8);_delay_ms(100);

balance=eeprom_read_byte(0)|(eeprom_read_byte(1)<<8);
Lcd4_Display(0xC0,"CARD POINTS:",12);
Lcd4_Decimal4(0xCC,balance);
_delay_ms(1000);
Lcd4_Display(0xC0," SENDING DETAILS",16);
Serial0_Out('*');
Serial_Decimal3(soap);
Serial_Decimal3(brush);
Serial_Decimal3(bottle);
Serial_Decimal3(pen);
Serial_Decimal3(count1);

Serial_Decimal3(count2);
Serial_Decimal3(count3);
Serial_Decimal3(count4);
Serial_Decimal3(item1);
Serial_Decimal3(item2);
Serial_Decimal3(item3);
```

```
                Serial_Decimal3(item4);
                Serial_Decimal3(total);
                Serial_Decimal3(balance);
                Serial0_Out(0x0D);Serial0_Out(0x0A);
                _delay_ms(1000);
                Lcd4_Display(0xC0,"  DETAILS SENT  ",16);
                total=soap=brush=bottle=pen=0;
                count1=count2=count3=count4=0;
                item1=item2=item3=item4=0;
                _delay_ms(1000);
        }
        Lcd4_Display(0x80,"  PLEASE REMOVE ",16);
        Lcd4_Display(0xC0,"    YOUR CARD   ",16);
        }
else
{
        cardin=0;
        if(one==1)
        {
                Lcd4_Display(0x80,"THANK YOU.......",16);
                Lcd4_Display(0xC0,"  VISIT AGAIN   ",16);
                _delay_ms(1000);_delay_ms(1000);
                Lcd4_Display(0x80,"SMART SHOPPING  ",16);
                Lcd4_Display(0xC0,"   CART SYSTEM  ",16);
        }
```

```
                    one=0;
                }
        }
}
void delay()
{
        _delay_ms(500);_delay_ms(500);
        _delay_ms(500);_delay_ms(500);
}
void Serial_Decimal3(unsigned char val)
{
        unsignedintLcd_h,Lcd_hr,Lcd_t,Lcd_o;
        Lcd_h=val/100;
        Lcd_hr=val%100;
        Lcd_t=Lcd_hr/10;
        Lcd_o=Lcd_hr%10;
        Serial0_Out(Lcd_h+0x30);
        Serial0_Out(Lcd_t+0x30);
        Serial0_Out(Lcd_o+0x30);
}
```

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2.**ANALYSIS OF SHOPPING BEHAVIOUR BASED ON SURVEILLIANCE SYSTEM**

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3.RFID SMART TROLLEY SYSTEM FOR AUTOMATED BILLING USING RFID AND ZIGBEE

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*4.***RFID BASED AUTOMATIC BILLING TROLLEY**

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