ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

DATA TRANSMISSION USING BLUETOOTH AT HOTELS

A.Sarala[1], P.Selvin Paul[2], S.Sutharson Ebinezer[3], J.Richarson[4]
[1]Asst professor, [2,3,4] UG Scholars
Kings Engineering College, Chennai

ABSTRACT: **To bring a change in the ordering of the desired menu in a hotel or a restaurant we have decided to generate a system called as the Touch- screen based advanced menu ordering system. This is the method by which any person can select the desired items by their choice which are present in menu display & place an order for it by a single touch on the menu display screen. This order will be transferred to the kitchen section touch screen display with the help of the Bluetooth module & further it will also be provided to the manager section for the billing of the order. A feedback will be provided to the customer section from the kitchen section and the ordered menu will be provided to the customer.**

Introduction Embedded system are often required to provide Real time response .A Real time response is defined as a system whose correctness depends on the timeliness of its response .Example of such system are fight control system of an aircraft,sensor system in neuclear reactor and power plant.

For those systems ,delay in purpose is a fatal error.A more relaxed version of Real time system is one where the timely response with small delay is acceptable.example of a such ystem would be the scheduling Display on the railway platforms. In technical terminology ,real system can be classified as

- Hard real Time systems-system with severe constrains on the timeliness of a response
- Soft Real Time system-system with tolerate small variation in response times
- Hybrid real Time system-system with exhibit both hard and soft constraints of its performance

1.11 APPLICATION

Embedded system are playing important roles inour life every day,even though they might not necessarily be visible.Some of the embedded system we use every day,control the menu system on television in fact ,recent poll data shows that embedded computer system currently out numbedered human in the U.S.A embedded system are rapidly growing industry where groth oppturnities are numerous

1.12 PROGRAMMING LANGUAGES

It is nice to have functional example code in some real language. Also it is useful to point out some features of popular programming languages that are especially important for embedded systems

ANSI C Programming language: Many microprocessors and microcontrollers can be programmed in C and a number of C cross compilers exist for that purpose is perhaps the most frequently used languages for new embedded system development . The “const” and the “volatile” keywords, rarely used in desktop application programming, become very important in embedded system.

Assembly languages: There are many different microcontroller families, each with their own assembly languages with its own unique quirks. This book will cover some basics of assembly languages common to most microcontrollers. Unlike desktop application programming, embedded system programs generally must set up an ‘interrupt vector table.

1.3 OBJECTIVE OF THE PROJECT

The main objective of the project is to make the ordering system in the hotel easily, in order to reduce the man power in this project Bluetooth transmitter and receiver section is used to transmit the menu from kitchen and to display the menu LCD display is used.

1.4 EXISTING SYSTEM

In olden days the suppliers save the menu to the customers this process takes more time and some customers feels guilty to ask the menu cards and it takes more time for customers for suppliers to attend all the customers when lots of people come to hotel at same time and it also takes more time to pay the bills

PROBLEM OF EXISTING SYSTEM

In an existing system each time the server has to ask for the choise of the costumer which takes more time, and since some of the costumer feels guilty to ask for a menucard ,here we introduce a automated menu transmission system which makes the work much easy.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

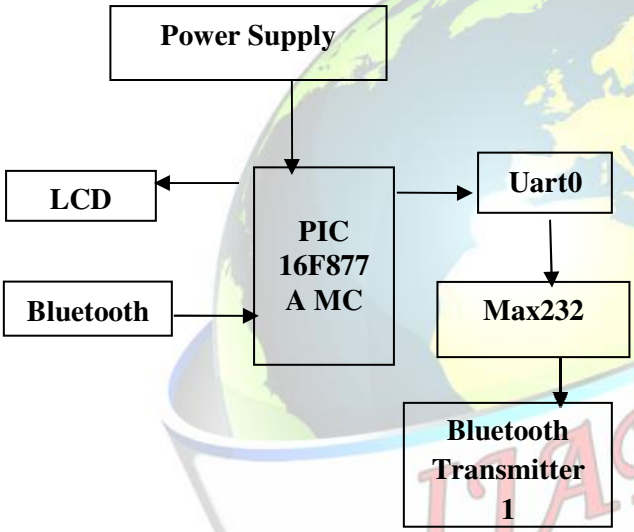
1.5 PROPOSED SYSTEM

Here we introduce a new technology in restaurant for automatic digital menu transmission through mobile phone. Bluetooth technology is used to wide transmission of data without occurring of noise. The system automatically provide the menu in indoor without any manual work. It reduces the complexity among to server and customer, and we also introduce a system in which the menus can be paid online which reduce the time of costumer.

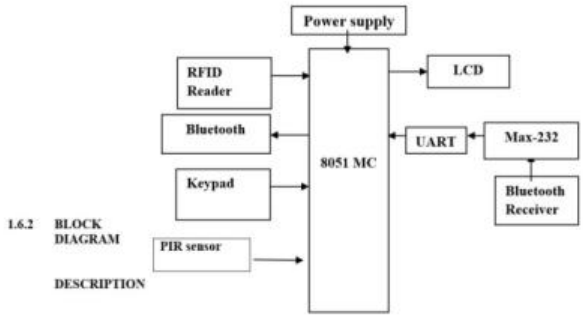
1.6 IMPLEMENTATION OF PROJECT

1.6.1 BLOCK DIAGRAM

TRANSMITTER SYSTEM



RECEIVER SECTION



1.6.2 BLOCK DIAGRAM DESCRIPTION

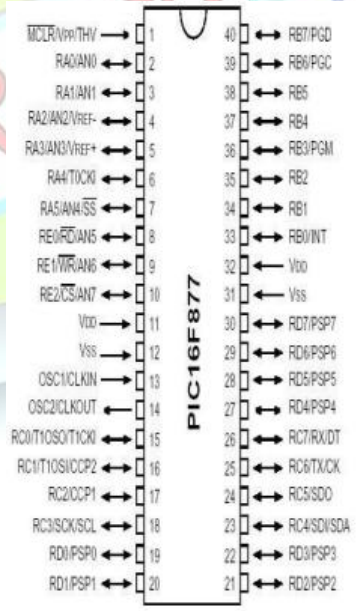
1.6.2 BLOCK DIAGRAM DESCRIPTION

When a person enters a hotel the PIR sensor detects the human and confirms the presence of costumer in the table , and sends the information to the kitchen and from the kitchen the workers sends the menu which displays in the LCD display and the costumer had to select the desired menu and sends them back to the kitchen and the bill for the desired menu arrives through the Bluetooth transmitter and the costumer can pay the bills using the RFID tag in the table immediately after paying bills dish will be brought by the waiters in the hotel

Hardware design:

PIC Microcontroller:

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). All of these features make it ideal for more advanced level A/D applications in automotive, industrial, appliances and consumer applications.



2.1 PIN DESCRIPTION

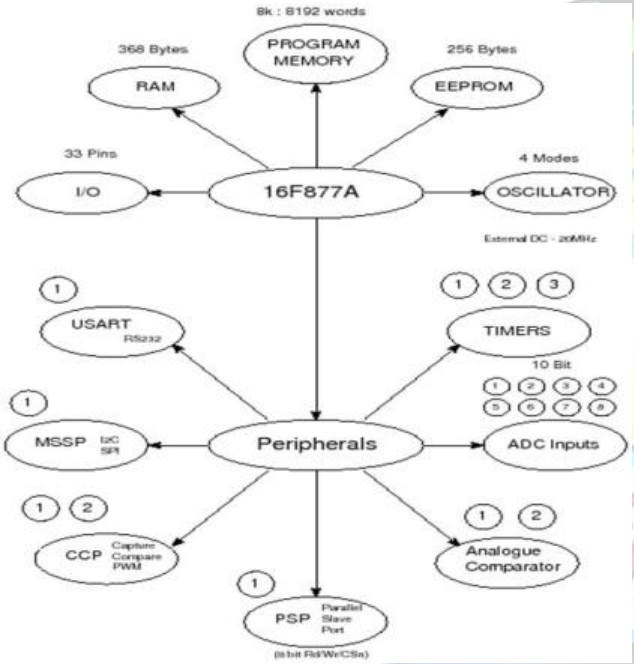
The PIC microcontroller has totally 40 pins. The functional description of the pins depends on the package. Here we are using 40 pin PDIP package supply is given to the pin 11 and 32.The pins 12 and 33 will be grounded. The crystal oscillator is connected to the pin 13 and 14.except the supply and ground

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

pins all other pins are bi directional. At pin 5 the reference voltage will be applied. The programming voltage or the reset is applied to the pin no1.The pin 2 will be the output of analog to digital converter. Comparator input or ADC input is applied to 3.Pin 6 will be timer clock output. Timer 1output is obtained form 15 pin. PWM output is taken from the 17 pin. The pin no 19, 20, 21 and 22 will be the general purpose I/O pins. The pins 32, 33, 34 and 35 will be ADC channel output PIC16F873A/876A devices are available only in 28-pin packages while PIC16F874A/877A devices are available in 40- pin and 44-pinpackages

2.12 FEATURES OF PIC



HIGH-PERFORMANCE RISC CPU

Only 35 single-word instructions to learnAll single-cycle instructions except for program branches which are two-cycle

- Operating speed:DC-20MHz clock input DC-200ns instruction cycle
- Up to 8K x 14 words of Flash Program Memory, up to 368 x 8 bytes of Data Memory (RAM).UP to 256 x 8 bytes of EEPROM Data Memory
- Pin out compatible to other 28-pin or 40/44-pin PIC16CXXX and PIC 16FXXX microcontrollers

Analog Applications:

10-bit, up to 8-channel Analog-to-Digital Converter (A/D), Brown-out Reset (BOR), Analog Comparator module with, Two analog comparators Programmable on-chip voltage reference (VREF) module, Programmable input multiplexing from device inputs and internal voltage reference, Comparator outputs are externally accessible

High-Performance RISC CPU:

Only 35 single-word instructions to learn, All single-cycle instructions except for program branches, which are two-cycle, Operating speed: DC – 20 MHz clock input DC – 200 ns instruction cycle, Up to 8K x 14 words of Flash Program Memory, Up to 368 x 8 bytes of Data Memory (RAM), Up to 256 x 8 bytes of EEPROM Data Memory, Pinout compatible to other 28-pin or 40/44-pin PIC16CXXX and PIC16FXXX microcontrollers

Peripheral Details:

Timer0: 8-bit timer/counter with 8-bit prescaler, Timer1: 16-bit timer/counter with prescaler, can be incremented during Sleep via external crystal/clock, Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler, Two Capture, Compare, PWM modules, Capture is 16-bit max, resolution is 12.5 ns Compare is 16-bit max, resolution is 200 ns, PWM max, resolution is 10-bit Synchronous Serial Port (SSP) with SPI (Master mode) and I2C (Master/Slave), Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection, Parallel Slave Port (PSP) – 8 bits wide with external RD, WR and CS controls (40/44-pin only), Brown-out detection circuitry for Brown-out Reset (BOR).

Special Microcontroller Applications:

100,000 erase/write cycle Enhanced Flash program memory typical, 1,000,000 erase/write cycle Data EEPROM memory typical, Data EEPROM Retention > 40 years, Self-reprogrammable under software control, In-Circuit Serial Programming via two pins, Single-supply 5V In-Circuit Serial Programming Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation Programmable code protection, Power saving Sleep mode, Selectable oscillator options, In-Circuit Debug (ICD) via two pins.

CMOS Technology:

Low-power, high-speed Flash/EEPROM technology, Fully static design, Wide operating voltage range (2.0V to 5.5V), Commercial and Industrial temperature ranges, Low-power consumption.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

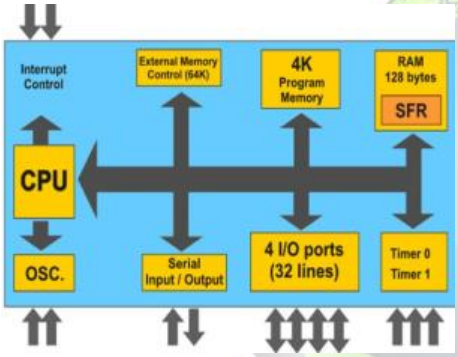
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

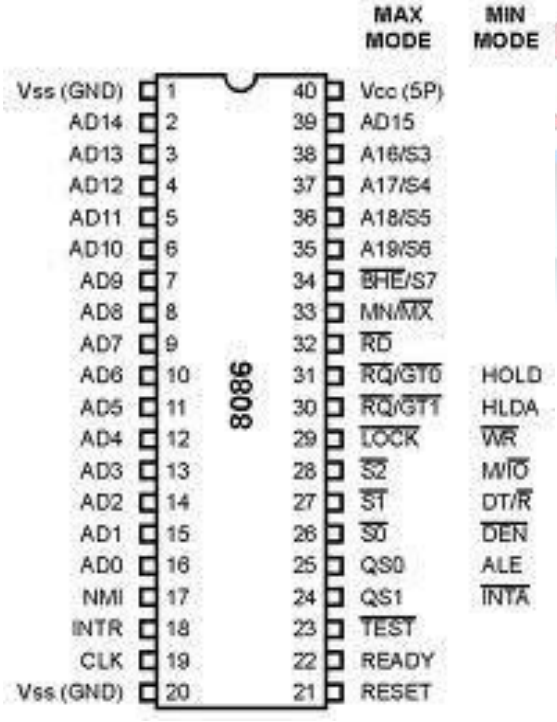
PIN DESCRIPTION

2.13 Microcontroller:

A microcontroller (also microcontroller unit, MCU or µC) is a small computer on a single integrated circuit consisting of a relatively simple CPU combined with support functions such as a crystal oscillator, timers and etc. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, remote controls, office machines, appliances, power tools, and toys.

The input and output device or connected to port pins of the controller. Typical input and output devices include switches, relays, solenoids, LEDs, small or custom LCD displays, radio frequency devices, and sensors for data such as temperature, humidity, light level etc. The device, such as GSM, GPS and RFID are interfaced to the controller via serial communication i.e. TX and RX pins.





8051 microcontrollers have 4 I/O ports each of 8-bit, which can be configured as input or output. Hence, total 32 input/output pins allow the microcontroller to be connected with the peripheral devices.

- **Pins 1 to 8 –** These pins are known as Port 1. This port doesn't serve any other functions. It is internally pulled up, bi-directional I/O port
- **Pin 9 –** It is a RESET pin, which is used to reset the microcontroller to its initial values.
- **Pins 10 to 17 –** These pins are known as Port 3. This port serves some functions like interrupts, timer input, control signals, serial communication signals RxD and TxD, etc.
- **Pins 18 & 19 –** These pins are used for interfacing an external crystal to get the system clock.
- **Pin 20 –** This pin provides the power supply to the circuit.
- **Pins 21 to 28 –** These pins are known as Port 2. It serves as I/O port. Higher order address bus signals are also multiplexed using this port.
- **Pin 29 –** This is PSEN pin which stands for Program Store Enable. It is used to read a signal from the external program memory.
- **Pin 30 –** This is EA pin which stands for External Access input. It is used to enable/disable the external memory interfacing.
- **Pin 31 –** This is ALE pin which stands for Address Latch Enable. It is used to demultiplex the address-data signal of port.
- **Pins 32 to 39 –** These pins are known as Port 0. It serves as I/O port. Lower order address and data bus signals are multiplexed using this port.
- **Pin 40 –** This pin is used to provide power supply to the circuit.
- **Pin configuration**, i.e. the pin can be configured as 1 for input and 0 for output as per the logic state.
- **Input/Output (I/O) pin –** All the circuits within the microcontroller must be connected to one of its pins except P0 port because it does not have pull-up resistors built-in.
- **Input pin –** Logic 1 is applied to a bit of the P register. The output FE transistor is turned off and the other pin remains connected to the power supply voltage over a pull-up resistor of high resistance.

COMPONENTS AND SPECIFICATION

3.1 BLUETOOTH

Bluetooth is a de facto standard and specification for small-form factor, low-cost, short range radio links between mobile PCs, mobile phones and other portable devices. The technology allows users to form wireless connections between various

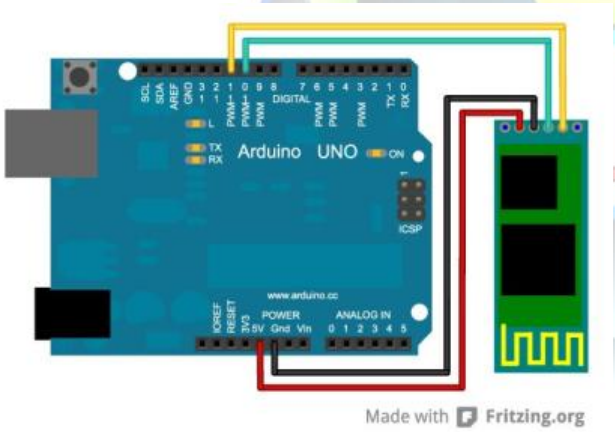
ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

communication devices, in order to transmit real-time voice and data communications. The Bluetooth radio is built into a small microchip and operates in the 2.4Ghz band, a globally available frequency band ensuring communication compatibility worldwide. It uses frequency hopping spread spectrum, which changes its signal 1600 times per second which helps to avoid interception by unauthorized parties. In addition software controls and identity coding built into each microchip ensure that only those units preset by their owners can communicate.

The specification has two power levels defined; a lower power level that covers the shorter personal area within a room, and a higher power level that can cover a medium range, such as within a home. It supports both point-to-point and point-to-multipoint connections and provides up to 720 Kbps data transfer within a range of 10 meters (up to 100 meters with a power boost). The technology uses omni directional radio waves that can transmit through walls and other non-metal barriers. If there is interference from other devices, the transmission speed decreases but does not stop.

With the current specification, up to seven slave devices can be set to communicate with a master radio in one device. This connection of devices (slaves and master) is called a piconet. Several piconets can be linked together to form scatternets which allow communication between other device configurations.



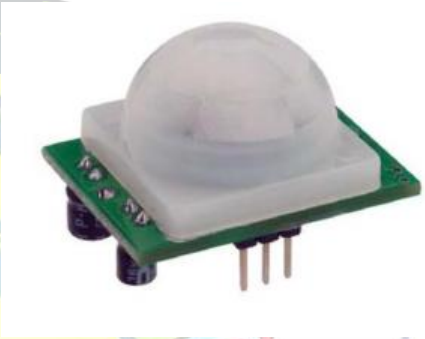
SPECIFICATION

- The IEEE standard of Bluetooth is 802.15
- It can connect up to range of 10-50m
- Data rate is 150kbps

3.2 PIR SENSOR

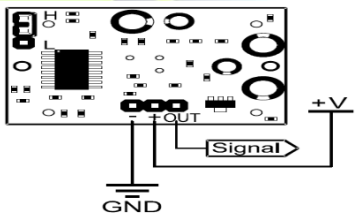
A passive infrared sensor is a electronic sensor that measures infrared liht radiation from objects in its field of view. They are most often used in PIR based motion detectors.

All objects with a temperature above absolute zero emit heat in form of radiation.usually this radiation isint visible to human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose.The term passive in this instance refers to the fact that PIR devices do not generate or radiate any energy for detection purposes. They work entirely by detecting the energy given off by other objects. PIR sensors don't detect or measure "heat"; instead they detect the infrared radiation emitted or reflected from an object.



PIR pin definition and ratings:

Pin	Name	Function
-	GND	Ground: 0 V
+	Vin	3.3 to 5 VDC
OUT	Output	Connect to I/O pin set to INPUT mode (or transistor/MOSFET)



SPECIFICATION

- Passive infrared sensor
- It detects the obstacles
- It can ranges up to 30 feet
- It can also be used for security purpose
- Input voltage 5v to 12v

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

- ➢ Power consumption 0.1(static),0.4(work)
- ➢ Dimensions

- ✓ Width 8cm
- ✓ Height 9cm
- ✓ Depth 5cm
- ✓ Weight 110g

3.3 RFID READER

An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data.

An RFID tag is a microchip combined with an antenna in a compact package; the packaging is structured to allow the RFID tag to be attached to an object to be tracked. "RFID" stands for Radio Frequency Identification. The tag's antenna picks up signals from an RFID reader or scanner and then returns the signal, usually with some additional data (like a unique serial number or other customized information).

A passive tag is an RFID tag that does not contain a battery; the power is supplied by the reader. When radio waves from the reader are encountered by a passive rfid tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory.

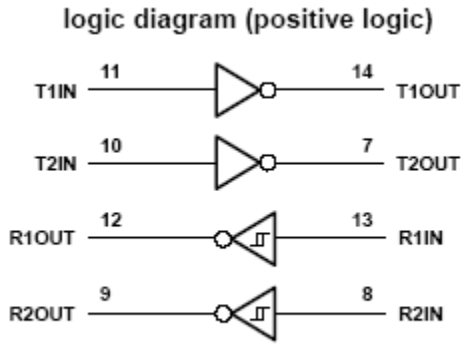
The RX and TX pins of RFID reader connected to Tx and Rx pins of 8051 Microcontroller respectively. Then the reader senses the data from the Tag and transmits the sensed data to microcontroller via serial port.

SPECIFICATION

- ➢ It is used to pay bills
- ➢ Read distance up to 10cm
- ➢ Identification speed 0.08 seconds
- ➢ Operating frequency 13.56Mhz
- ➢ Operating temperature -40◦c to +115◦c
- ➢ Operating voltage 2.7v to 5.5v
- ➢ Transmitting power 100mW

3.4 MAX 232

The MAX 232 is a dual driver/receiver that includes a capacitive voltage generator to supply RS 232 voltage levels from a single 5v supply. Each receiver converts RS-232 to 5v TTL/CMOS levels. Each driver converts TLL/CMOS input levels into EIA-232 levels. The P3_0 (RX) and P3_1 (TX) pin of controller is connected to the max 232 driver and the TX and RX pin of max 232 is connected to the GSM modem or PC.



In this circuit the microcontroller transmitter pin is connected in the MAX232 T2IN pin which converts input 5v TTL/CMOS level to RS232 level. Then T2OUT pin is connected to reviver pin of 9 pin D type serial connector which is directly connected to PC.

In PC the transmitting data is given to R2IN of MAX232 through transmitting pin of 9 pin D type connector which converts the RS232 level to 5v TTL/CMOS level. The R2OUT pin is connected to receiver pin of the microcontroller. Likewise the data is transmitted and received between the microcontroller and PC or other device vice versa

SPECIFICATION

- ➢ It is a 16 pin IC
- ➢ Power supply 5v
- ➢ It is used as a communication IC between PC and microcontroller
- ➢ Input voltage -0.3v to +0.3

3.5 LCD (Liquid Crystal Display)

The LCD standard requires 3 control lines and 8 I/O lines for the data bus.

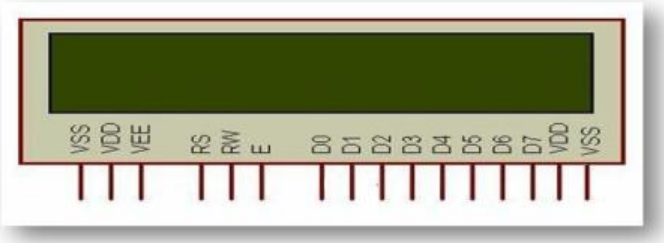
• 8 data pins D7:D0
Bi-directional data/command pins. Alphanumeric characters are sent in ASCII format.
• RS: Register Select
RS = 0 -> Command Register is selected
RS = 1 -> Data Register is selected
• R/W: Read or Write

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

• **E: Enable (Latch data)**

The 8 data lines are connected to PORT 1 of 8051 microcontroller. The three control lines (RS, RW and EN) are connected to PORT 3.5,3.6 and 3.7 respectively.



SPECIFICATION

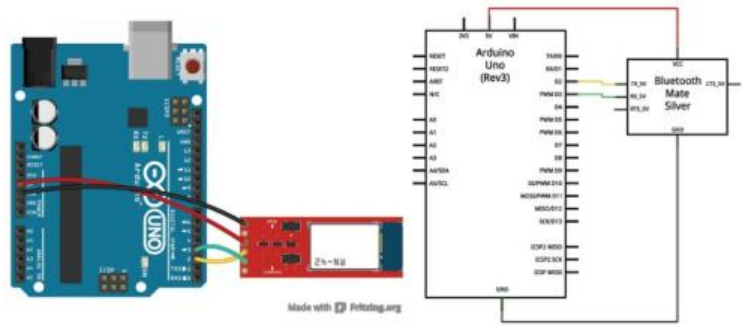
- It is a 14 pin device
- It is a electronic visual display
- Input voltage 3V to 5V
- Used to display menu
- Is has 16*2 display
- It is a easily programmable device

3.6 ZIGBEE

ZigBee is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power, wireless sensor networks. The standard takes full advantage of the IEEE 802.15.4 physical radio specification and operates in unlicensed bands worldwide at the following frequencies: 2.400–2.484 GHz, 902-928 MHz and 868.0–868.6 MHz.

a) The power levels (down from 5v to 3.3v) to power the zigbee module.
b) The communication lines (TX, RX, DIN and DOUT) to the appropriate voltages.

The Zigbee module acts as both transmitter and receiver. The Rx and Tx pins of ZIGBEE are connected to Tx and Rx of microcontroller respectively. The data's from microcontroller is serially transmitted to Zigbee module via UART port. Then Zigbee transmits the data to another Zigbee. The data's from Zigbee transmitted from Dout pin. The Zigbee from other side receives the data via Din pin.



SPECIFICATION

- Reliable and self configuration
- Supports large number of nodes
- Easy to deploy
- Very long battery life
- Can be used Globally.

3.7 KEYPAD

A keypad is a set of buttons arranged in a block or "pad" which bear digits, symbols or alphabetical letters. Pads mostly containing numbers are called a numeric keypad. Numeric keypads are found on alphanumeric keyboards and on other devices which require mainly numeric input such as calculators, push-button telephones, vending machines, ATMs, Point of Sale devices, combination locks, and digital door locks. Many devices follow the E.161 standard for their arrangement.

Keypads for the entry of PINs and for product selection appear on many devices including ATMs, vending machines, Point of

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

Sale payment devices, time clocks, combination locks and digital door locks.

Keypad Connection to Microcontroller:

The 4 rows of the keypad would be connected to the microcontroller pins directly without other connections. However, each of the 3 columns of the keypad would be connected into a pull up resistor (i.e. 18kΩ) which is connected into a voltage source and the microcontroller. The microcontroller pins that are used are I/O ports, so they can be programmed and used in a different way. All the pins of the keypad are connected to make sure that it would be easy to detect which pin is pushed easily. The connections between the microcontroller and the keypad are provided in figure 3. Another connection ways are possible, but for the provided one there would be an explained example on how it works in the next part.

SPECIFICATION

- It is a 4*4 matrix keypad
- It is used to type the number of dish
- Operating temperature -20 to +40◦c

SOFTWARE USED

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.

In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing.

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.

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.

Other High-level programming languages like Pascal, FORTRAN also provide some of the advantages.

Keil c

The Keil C51 C Compiler for the 8051 microcontroller is the most popular 8051 C compiler in the world. It provides more features than any other 8051 C compiler available today.

The C51 Compiler allows you to write 8051 microcontroller applications in C that, once compiled, have the efficiency and speed of assembly language. Language extensions in the C51 Compiler give you full access to all resources of the 8051.

The C51 Compiler translates C source files into relocatable object modules which contain full symbolic information for debugging with the µVision Debugger or an in-circuit emulator. In addition to the object file, the compiler generates a listing file which may optionally include symbol table and cross reference information.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

FEATURES

- Nine basic data types, including 32-bit IEEE floating-point,
- Flexible variable allocation with bit, data, bdata, idata, xdata, and pdata memory types,
- Interrupt functions may be written in C,
- Full use of the 8051 register banks,
- Complete symbol and type information for source-level debugging,
- Use of AJMP and ACALL instructions,
- Bit-addressable data objects,
- Built-in interface for the RTX51 Real-Time Kernel,
- Support for dual data pointers on Atmel, AMD, Cypress, Dallas Semiconductor, Infineon, Philips, and Triscend microcontrollers,
- Support for the Philips 8*x*C750, 8*x*C751, and 8*x*C752 limited instruction sets,
- Support for the Infineon 80C517 arithmetic unit.

SENSOR MODULE

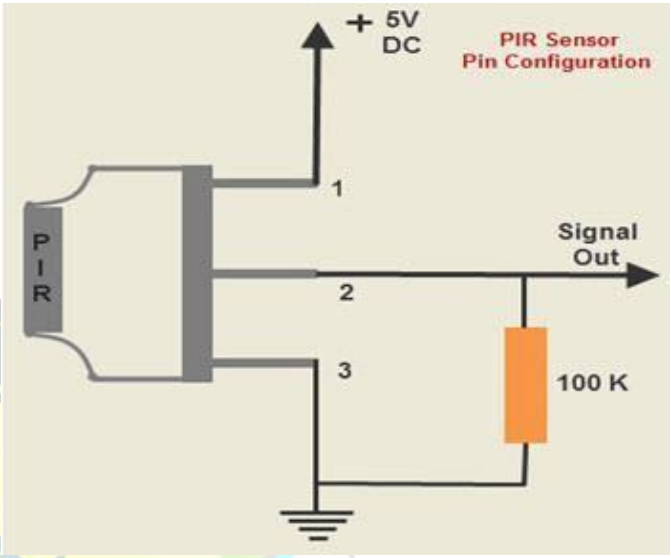
Passive Infrared Sensor (PIR)

The term PIR is the short form of the PassiveInfra Red. The term "passive" indicates that the sensor does not actively take part in the process, which means, it does not emit the referred IR signals itself, rather passively detects the infrared radiation scoming from the human body in the surrounding area.

PIR Sensor

The detected radiations are converted into an electrical charge, which is proportional to the detected level of the radiation. Then this charge is further improved by a built in FET and fed to the output pin of the device which becomes applicable to an external circuit for further triggering and amplification of the alarm stages.The PIR sensor range is up to 10 meters at an angle of +15o or -15o.

The below image shows a typical pin configuration of the PIR sensor, which is quite simple to understand the pinouts; and, one may easily arrange them into a working circuit with the help of the following points:



Pin Configuration of PIR

The Passive infrared sensors consist of three pins as indicated in the diagram shown above.

- Pin1 corresponds to the drain terminal of the device, which should be connected to the positive supply 5V DC.
- Pin2 corresponds to the source terminal of the device, which should be connected to the ground terminal via a 100K or 47K resistor. The Pin2 is the output pin of the sensor, and the detected IR signal is carried forward to an amplifier from the pin 2 of the sensor.
- Pin3 of the sensor is connected to the ground.

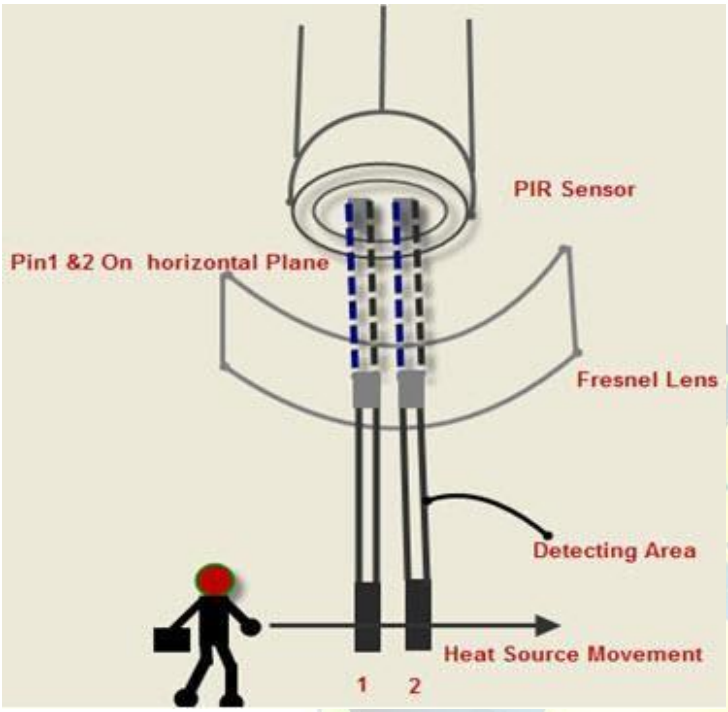
PIR Sensor'sWorking Principle

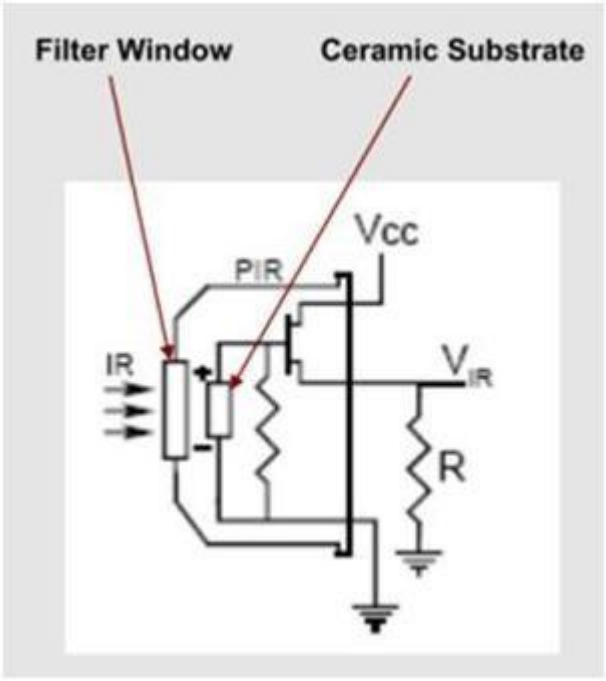
The PIR sensors are more complicated thanthe other sensors as they consists of two slots. These slots are made of a special material which is sensitive to IR. The Fresnel lens is used to see that the two slots of the PIR can see out past some distance. When the sensor is inactive, then the two slots sense the same amount of IR.The ambient amount radiates from the outdoors, walls or room,etc. When a human body or any animal passes by, then it intercepts the first slot of the PIR sensor. This causes a positive differential change between the two bisects.When a human body leaves the sensing area,the sensor generates a negative differential change between the two bisects. The infrared sensor itself is housed in a hermetically sealed metal to improve

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

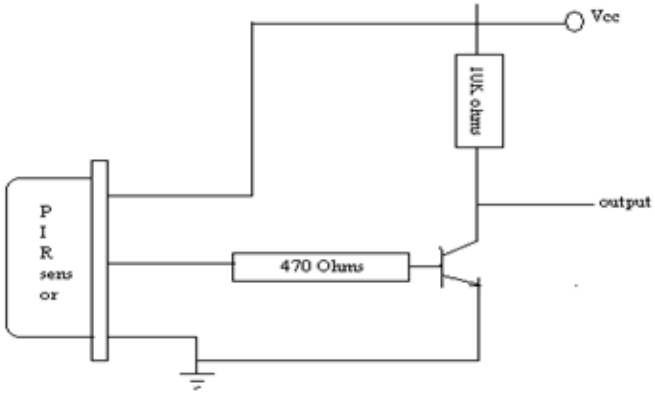
humidity/temperature/noise/immunity. There is a window which is made of typically coated silicon material to protect the sensing element.





A Motion Detection Circuit Using PIR Sensor

In the above segment, we have learned the pin outs of a PIR sensor, now let's move on to study a simple application of the PIR sensor. The below diagram depicts a motion detector PIR sensor circuit. In the presence of a human IR energy or radiation, the infrared sensor detects the energy and immediately converts it into minute electrical pulses, enough to activate the transistor BC547 into conduction and to make its collector go low.



PIR Sensor IC

The PIR sensor IC consists of 3 pins- Vcc, Ground and Output.

In presence of human IR radiations, the sensor detects the radiations and converts it directly to electrical pulses, which is fed to the inverter circuit. The inverter circuit consists of a transistor,which gets into saturation with application of high base current and eventually develops a low collector voltage. Thus the transistor output is low.

This low inverter output is connected to the microcontroller. Based on the input received by the microcontroller, it controls the motor driver , which in turn controls the motion of the motor.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

Motion Detection using PIR Sensor

A PIR or a Passive Infrared Sensor can be used to detect presence of human beings in its proximity. The output can be used to control the motion of door.

Basically motion detection use light sensors to detect either the presence of infrared light emitted from a warm object or absence of infrared light when a object interrupts a beam emitted by another part of the device.

A PIR sensor detects the infrared light radiated by a warm object. It consists of pyro electric sensors which introduce changes in their temperature (due to incident infrared radiation) into electric signal. When infrared light strikes a crystal, it generates an electrical charge

FEATURES OF PIR

- Complete with PIR, Motion Detection.
- Dual Element Sensor with Low Noise and High Sensitivity.
- Supply Voltage – 5V.
- Delay Time Adjustable.
- Standard TTL Output.

PLACES WHERE PIR USED

- All outdoor Lights
- Lift Lobby
- Multi Apartment Complexes
- Common staircases
- For Basement or Covered Parking Area
- Shopping Malls

CHAPTER 5

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.

The technology defined by the ZigBee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range low-rate wireless data transfer.

Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. ZigBee is typically used in low data rate applications that require long battery life and secure networking (ZigBee networks are secured by 128 bit symmetric encryption keys.)

ZigBee has a defined rate of 250 kbit/s, best suited for intermittent data transmissions from a sensor or input device. ZigBee was conceived in 1998, standardized in 2003, and revised in 2006. The name refers to the waggle dance of honey bees after their return to the beehive, ZigBee protocols are intended for embedded applications requiring low power consumption and tolerating low data rates. The resulting network will use very small amounts of power — individual devices must have a battery life of at least two years to pass ZigBee certification.

Typical application areas include:

- Home Entertainment and Control — Home automation such as in QIVICON, smart lighting, advanced temperature control, safety and security, movies and music
- Wireless sensor networks — Starting with individual sensors like Telosb/Tmote and Iris from Memsic
- Industrial control
- Embedded sensing
- Medical data collection
- Smoke and intruder warning
- Building automation

Device types and operating modes

ZigBee devices are of three kinds:

- ZigBee Coordinator (ZC): The most capable device, the Coordinator forms the root of the network tree and might bridge to other networks. There is precisely one ZigBee Coordinator in each network since it is the device that started the network originally (the ZigBee LightLink specification also allows operation without a ZigBee Coordinator, making it more usable for over-the-shelf home products). It stores information about the network, including acting as the Trust Center & repository for security keys.
- ZigBee Router (ZR): As well as running an application function, a Router can act as an intermediate router, passing on data from other devices.
- ZigBee End Device (ZED): Contains just enough functionality to talk to the parent node (either the Coordinator or a Router); it cannot relay data from other devices. This relationship allows the node to be asleep a significant amount of the time thereby giving long battery life. A ZED requires the

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

least amount of memory, and, therefore, can be less expensive to manufacture than a ZR or ZC.

The current ZigBee protocols support beacon and non-beacon enabled networks. In non-beacon-enabled networks, an unslotted CSMA/CA channel access mechanism is used. In this type of network, ZigBee Routers typically have their receivers continuously active, requiring a more robust power supply. However, this allows for heterogeneous networks in which some devices receive continuously while others only transmit when an external stimulus is detected. The typical example of a heterogeneous network is a wireless light switch: The ZigBee node at the lamp may constantly receive, since it is connected to the mains supply, while a battery-powered light switch would remain asleep until the switch is thrown. The switch then wakes up, sends a command to the lamp, receives an acknowledgment, and returns to sleep. In such a network the lamp node will be at least a ZigBee Router, if not the ZigBee Coordinator; the switch node is typically a ZigBee End Device.

In beacon-enabled networks, the special network nodes called ZigBee Routers transmit periodic beacons to confirm their presence to other network nodes. Nodes may sleep between beacons, thus lowering their duty cycle and extending their battery life. Beacon intervals depend on data rate; they may range from 15.36 milliseconds to 251.65824 seconds at 250 kbit/s, from 24 milliseconds to 393.216 seconds at 40 kbit/s and from 48 milliseconds to 786.432 seconds at 20 kbit/s. However, low duty cycle operation with long beacon intervals requires precise timing, which can conflict with the need for low product cost.

In general, the ZigBee protocols minimize the time the radio is on, so as to reduce power use. In beaconing networks, nodes only need to be active while a beacon is being transmitted. In non-beacon-enabled networks, power consumption is decidedly asymmetrical: Some devices are always active while others spend most of their time sleeping.

Except for the Smart Energy Profile 2.0, ZigBee devices are required to conform to the IEEE 802.15.4-2003 Low-Rate Wireless Personal Area Network (LR-WPAN) standard. The standard specifies the lower protocol layers—the physical layer (PHY), and the Media Access Control portion of the data link layer (DLL). The basic channel access mode is "carrier sense, multiple access/collision avoidance" (CSMA/CA). That is, the nodes talk in the same way that humans converse; they briefly check to see that no one is talking before he or she start, with three notable exceptions. Beacons are sent on a fixed timing schedule and do not use CSMA. Message acknowledgments also do not use CSMA. Finally, devices in beacon-enabled networks that have low latency real-time requirements may also use Guaranteed Time Slots (GTS), which by definition do not use CSMA.

Main components

The ZDO (ZigBee Device Object), a protocol in the ZigBee protocol stack, is responsible for overall device management, security keys, and policies. It is responsible for defining the role of a device as either coordinator or end device, as mentioned above, but also for the discovery of new (one-hop) devices on the network and the identification of their offered services. It may then go on to establish secure links with external devices and reply to binding requests accordingly.

The application support sublayer (APS) is the other main standard component of the layer, and as such it offers a well-defined interface and control services. It works as a bridge between the network layer and the other elements of the application layer: it keeps up-to-date binding tables in the form of a database, which can be used to find appropriate devices depending on the services that are needed and those the different devices offer. As the union between both specified layers, it also routes messages across the layers of the protocol stack.

Communication models[edit]

An application may consist of communicating objects which cooperate to carry out the desired tasks. The focus of ZigBee is to distribute work among many different devices which reside within individual ZigBee nodes which in turn form a network (said work will typically be largely local to each device, for instance, the control of each household appliance).

The collection of objects that form the network communicates using the facilities provided by APS, supervised by ZDO interfaces. The application layer data service follows a typical request-confirm/indication-response structure. Within a single device, up to 240 application objects can exist, numbered in the range 1-240. 0 is reserved for the ZDO data interface and 255 for broadcast; the 241-254 range is not currently in use but may be in the future.

Two services are available for application objects to use (in ZigBee 1.0):

- The key-value pair service (KVP) is meant for configuration purposes. It enables description, request and modification of object attribute through a simple interface based on getting/set and event primitives, some allowing a request for a response. Configuration uses compressed XML (full XML can be used) to provide an adaptable and elegant solution.
- The message service is designed to offer a general approach to information treatment, avoiding the necessity to adapt application protocols and potential overhead incurred on by KVP. It allows arbitrary payloads to be transmitted over APS frames.
- Addressing is also part of the application layer. A network node consists of an 802.15.4-conformant radio transceiver and

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

one or more device descriptions (basically collections of attributes which can be polled or set, or which can be monitored through events). [10] discussed about a project, in this project an automatic meter reading system is designed using GSM Technology. The embedded micro controller is interfaced with the GSM Module. This setup is fitted in home. The energy meter is attached to the micro controller. This controller reads the data from the meter output and transfers that data to GSM Module through the serial port. The embedded micro controller has the knowledge of sending message to the system through the GSM module. Another system is placed in EB office, which is the authority office. When they send "unit request" to the microcontroller which is placed in home. Then the unit value is sent to the EB office PC through GSM module. According to the readings, the authority officer will send the information about the bill to the customer. If the customer doesn't pay bill on-time, the power supply to the corresponding home power unit is cut, by sending the command through to the microcontroller. Once the payment of bill is done the power supply is given to the customer. Power management concept is introduced, in which during the restriction mode only limited amount of power supply can be used by the customer.

Communication and device discovery

For applications to communicate, their comprising devices must use a common application protocol (types of messages, formats and so on); these sets of conventions are grouped in profiles. Furthermore, binding is decided upon by matching input and output cluster identifiers, unique within the context of a given profile and associated to an incoming or outgoing data flow in a device. Binding tables contain source and destination pairs.

Depending on the available information, device discovery may follow different methods. When the network address is known, the IEEE address can be requested using unicast communication. When it is not, petitions are broadcast (the IEEE address being part of the response payload). End devices will simply respond with the requested address while a network coordinator or a router will also send the addresses of all the devices associated with it.

This extended discovery protocol permits external devices to find out about devices in a network and the services that they offer, which endpoints can report when queried by the discovering device (which has previously obtained their addresses). Matching services can also be used.

The use of cluster identifiers enforces the binding of complementary entities using the binding tables, which are maintained by ZigBee coordinators, as the table must always be available within a network and coordinators are most likely to have a permanent power supply. Backups, managed by higher-level layers, may be needed by some applications. Binding requires an established communication link; after it exists, whether to add a new node to the network is decided, according to the application and security policies.

Communication can happen right after the association. Direct addressing uses both radio address and endpoint identifier, whereas indirect addressing uses every relevant field (address, endpoint, cluster, and attribute) and requires that they are sent to the network coordinator, which maintains associations and translates requests for communication. Indirect addressing is particularly useful to keep some devices very simple and minimize their need for storage. Besides these two methods, broadcast to all endpoints in a device is available, and group addressing is used to communicate with groups of endpoints belonging to a set of devices.

References

[1] Kra mes M.R., Shchekin O.B., Mueller-Mach R., *et al.* Status and future of high-power light-emitting diodes for solid-state lighting [J]. Journal
of Display Technology. 2007, 3(2): 160-175.

[2] Tanaka Y., Komine T., Haruyama S. *et al.* Indoor visible light data transmission system utilizing white LED lights [J]. IEICE Transactions on Communications. 2003, E86B(8): 2440-2454.

[3] Zhang J.M., Zeng H.L., and Jiang T. A Primary- Side Control Scheme for High-Power-Factor
LED Driver With TRIAC Dimming Capability [J]. IEEE Transactions on Power Electronics. 2012. 27(11): 4619-4629.

[4] Jiaying LU, Xiaobo WU. A Novel Multipl e Modes P WM Con troller for LEDs [C]. The IEEE International Symposium on Circuits and Systems
(ISCAS 2009), Taipei, China, May 24-27, 1767-
1770.

[5] Hwang J.T., M.S. Jung, D.H. Kim *et al.* Off-the- Line Primary Side Regulation LED Lamp Driver With Single-Stage PFC and TRIAC Dimming Using LED Forward Voltage and Duty Variation Tracking Control [J]. IEEE Journal of Solid-State Circuits. 2012. 47(12): 3081-3094.

[6] Mirvakili A., Joyner V. A Digitally-controlled, Bi-level CMOS LED Driver Circuit Combining PWM Dimming and Data Transmission for Visible Light Networks [C]. 2010 IEEE Globecom Workshops: 1067-1071.

[7] Svilainis L. Comparison of the EMI Performance of LED PWM Dimming Techniques for LED Video Display Application [J]. Journal of Display Technology. 2012, 8(3): 162-165.

[8] Wu Y.S., Yang A.Y., Feng L.H. *et al.* Modulation based cells distribution for visible light communication [J]. Optics Express. 2012, 20(22): 24196-
24208.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

[9] Lee K. and Park H., Modulations for Visible Light Communications With Dimming Control. Ieee Photonics Technology Letters, 2011. 23(16): p.
1136-1138.

[10] Christo Ananth, Kanthimathi, Krishnammal, Jeyabala, Jothi Monika, Muthu Veni, "GSM Based Automatic Electricity Billing System", International Journal Of Advanced Research Trends In Engineering And Technology (IJARTET), Volume 2, Issue 7, July 2015, pp:16-21

[11] Rajagopal S., Roberts R.D., and Lim S.K. Visible Light Communication: Modulation Schemes and Dimming Support [J]. IEEE Communications Magazine. 2012, 50(3): 72-82.