MICRO SPY BOT WITH WIRELESS CAMERA

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

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ABSTRACT

The wireless communication technologies are rapidly spreading too many new areas, including the automation and the importance of the use of wireless technologies in the data acquisition, building control, monitoring systems and automation of manufacturing processes will grow. Intelligent mobile robots and cooperative multi-agent robotic systems can be very efficient tools to speed up search and research operations in remote areas.

Our preliminary aim project is developing this robot is for the surveillance of human activities in the war field or border regions in order to reduce infiltrations from the enemy side. The robot consists of wireless camera which can transmit videos of the war field in order to prevent any damage and loss to human life. Military people have a huge risk on their lives while entering an unknown territory. The robot will serve as an appropriate machine for the defense sector to reduce the loss of human life and will also prevent illegal activities. It will help all the military people and armed forces to know the condition of the territory before entering it.

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CHAPTER - I

INTRODUCTION

Most robots today are used for many actions which are dangerous for human life. Robot is for going into a building where there is a possibility of bomb. Robots are also used in cars, factories and electronics. There are six main types of robots. The system is to designed a spy robot with wireless camera mounted on it. The system is divided into two sections namely transmission and receiving section. A spy robot is mainly used for military applications. wireless camera collects images or videos and transmit it to the computer.

1.1 Embedded system implementation

Introduction:

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic control systems, etc.

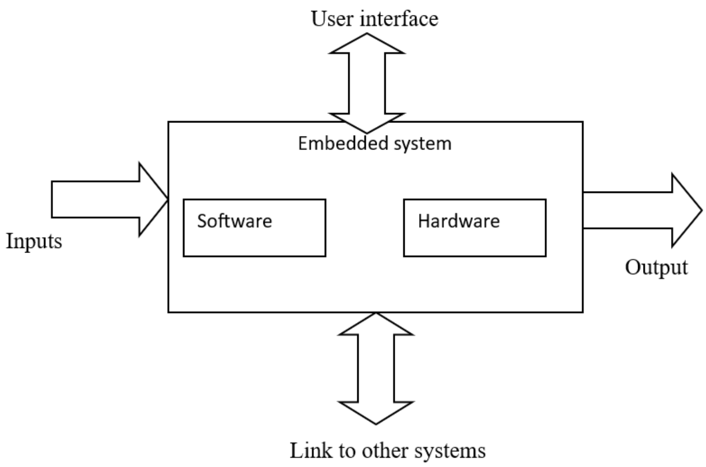


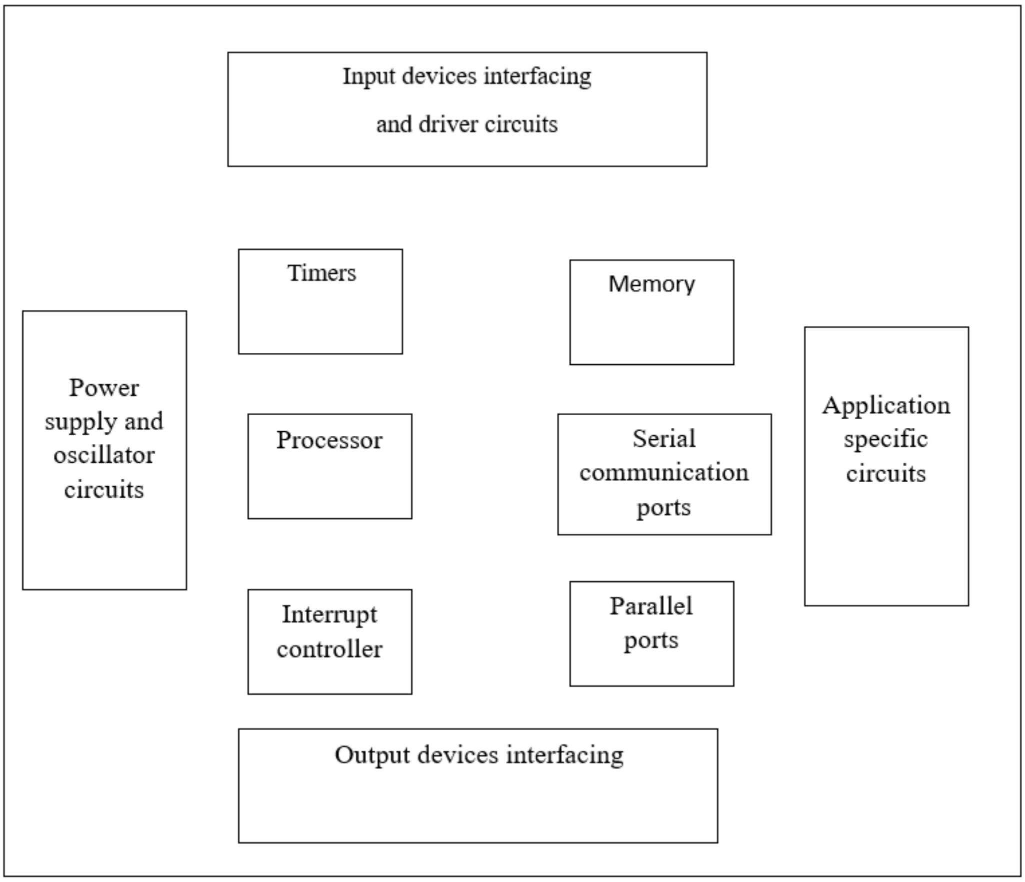
Fig: Overview of embedded system

1.2 Embedded System:

Embedded system includes mainly two sections, they are

1. Hardware

2. Software



1.3 Embedded System Hardware:

As with any electronic system, an embedded system requires a hardware platform on which it performs the operation. Embedded system hardware is built with a microprocessor or microcontroller. The embedded system hardware has elements like input output (I/O) interfaces, user interface, memory and the display. Usually, an embedded system consists of:

- Power Supply
- Processor
- Memory
- Timers
- Serial communication ports
- Output/Output circuits
- System application specific circuits

Embedded systems use different processors for its desired operation. Some of the processors used are

1. Microprocessor
2. Microcontroller
3. Digital signal processor

1.3.1 Microprocessor vs. Microcontroller

Microprocessor

- **CPU** on a chip.
- We can attach required amount of ROM, RAM and I/O ports.
- Expensive due to external peripherals.
- Large in size
- General-purpose

Microcontroller

- **Computer** on a chip
- fixed amount of on-chip ROM, RAM, I/O ports
- Low cost.
- Compact in size.
- Specific –purpose

1.4 Embedded System Software:

The embedded system software is written to perform a specific function. It is typically written in a high level format and then compiled down to provide code that can be lodged within a non-volatile memory within the hardware. An embedded system software is designed to keep in view of the three limits:

- Availability of system memory
- Availability of processor's speed
- When the system runs continuously, there is a need to limit power dissipation for events like stop, run and wake up.

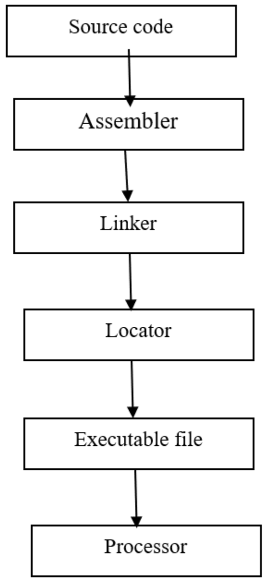
1.5 Bringing software and hardware together for embedded system:

To make software to work with embedded systems we need to bring software and hardware together .for this purpose we need to burn our source code into microprocessor or microcontroller which is a hardware component and which takes care of all operations to be done by embedded system according to our code.

Generally we write source codes for embedded systems in assembly language, but the processors run only executable files. The process of converting the source code representation of your embedded software into an executable binary image involves three distinct steps:

1. Each of the source files must be compiled or assembled into an object file.
2. All of the object files that result from the first step must be linked together to produce a single object file, called the re-locatable program.
3. Physical memory addresses must be assigned to the relative offsets within the re-locatable program in a process called relocation.

The result of the final step is a file containing an executable binary image that is ready to run on the embedded system.



Flow of burning source code to processor

1.6 Applications:

Embedded systems have different applications. A few select applications of embedded systems are smart cards, telecommunications, satellites, missiles, digital consumer electronics, computer networking, etc.

1.6.1 Embedded Systems in Automobiles

- Motor Control System
- Engine or Body Safety
- Robotics in Assembly Line
- Mobile and E-Com Access

1.6.2 Embedded systems in Telecommunications

- Mobile computing
- Networking
- Wireless Communications

Embedded Systems in Smart Cards

- Banking
- Telephone
- Security Systems

1.7 Implementation Flow:

Stage 1:

Considering the problems of existing methods and giving solution to that problem by considering the basic requirements for our proposed system

Stage 2:

Considering the hardware requirement for the proposed system

For this we need to select the below components:

1. Microcontroller
2. Inputs for the proposed system (ex: sensors, drivers etc..,)
3. Outputs (ex: relays, loads)

Stage 3:

After considering hardware requirements, now we need to check out the software requirements. Based on the microcontroller we select there exists different software for coding, compiling, debugging. we need to write source code for that proposed system based on our requirements and compile, debug the code in that software .

After completing all the requirements of software and hardware we need to bring both together to work our system. For this we need to burn our source code into microcontroller, after burning our source code to microcontroller then connect all input and output modules as per our requirement.

CHAPTER - II

LITERATURE SURVEY

- SPY ROBOT WITH WIRELESS CAMERA & METAL DETECTION Sudarshan Zodage, Pratik Waghmare, *D*.K. Shedge

- This system Long Range Spy Robot with Metal Detection is a very innovative system because we can operate it with use of DTMF. In this system the user doesn't have to worry about the distance in order to operate the robot. This system is based on the DTMF technology, so we can operate the system by making a call. It is based on the 8051 microcontrollers. The metal detector helps to detect metal and turn on the buzzer. The system makes use of night vision camera which is able to record the video. The user can operate the system via data commands send through the mobile phone as this system uses the DTMF technology

- Long Range Spy Robot with Metal and Obstacle Detection V. Nagalakshmi Vaishnavi, Snehal Shinde, Prerna Bhalerao, Dr. Gargi Phadke

In present time almost everything used basically is operated by remotes. The biggest limitation of remote controlling is its limited frequency level. This paper suggests a method for robotic control using the DTMF tone generated when the user gives commands using mobile phone keypad buttons connected with a remote mobile robot. This spy robot holds four technologies together, they are- Ultrasonic Sensor, Metal Detection, Night Vision Wireless Camera and DTMF. Robot motion is done by DTMF Technology. The system uses two mobile phones, one to control the robot that sends DTMF commands via call to another mobile phone mounted on the robot vehicle.

- LONG RANGE SPY ROBOT WITH NIGHT VISION Pousia S

The primary intention behind the undertaking is to reconnaissance on war places, data from the foes line locales; this robot has a metal locator and night vision camera to discover and observation the bombs and people in the limited zones and communicate the data to the collector material. It accommodates and saves the existence of warriors, people groups. The robot which creates for the safeguards office will help for people and save our life. Know the foes data before the adversaries get carried out. The fundamental benefit of this government operative robot is a night vision camera and metal finder. The night vision camera taps the image or recordings and sends the data to the recipient. The metal indicator identifies the bombs and metal things in underground. These robots are exceptionally valuable in these days and the future. It diminishes the work and hazard of people groups and helps them from various perspectives. These government operative robots are controlled through versatile or telephone.

CHAPTER - III

EXISTING METHOD

In the previous system we used a metal detecting rod/Gadget to detect the metal in the underground. Which is a Risky Process for the Persons who use it?

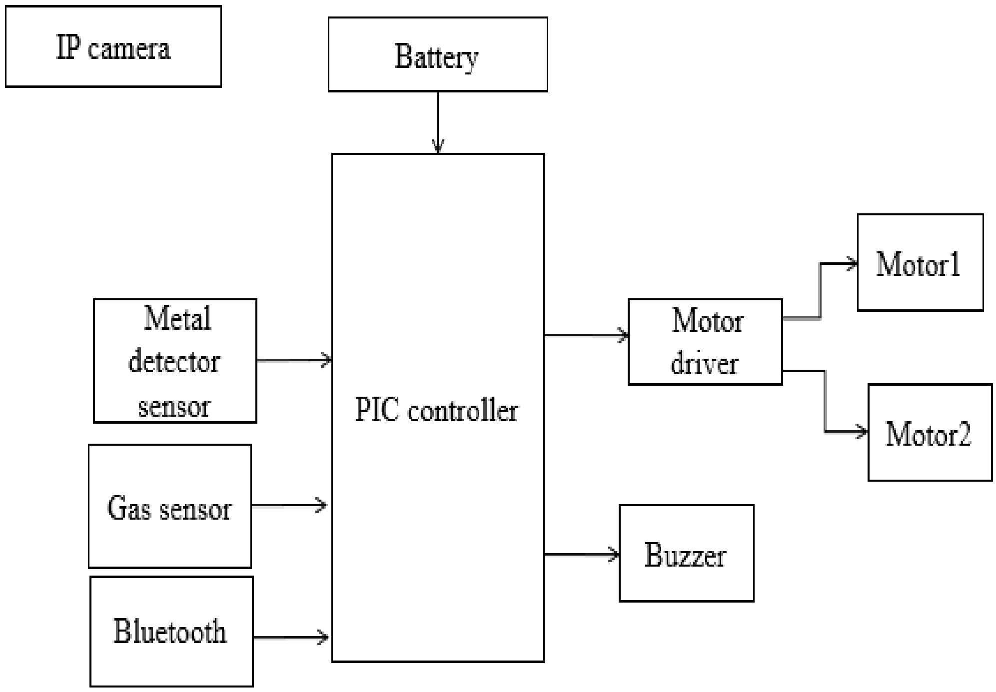
Disadvantages:

- Difficult to handle
- Risk during testing

3.1 PROPOSED METHOD

In the proposed method we are using IP camera to capture the videos wirelessly. Here we are using PIC as a main controller, to it we are connecting the metal detector sensor, Gas sensor to find the underground bombs, gas leakage. By using Bluetooth, we can control the robot-like right, left, front, back and stop. Based on the command we give the robot will move. Whenever the metal sensor detects or gas value increase then Buzzer will activate and give alerts.

3.2 Block Diagram:



CHAPTER - IV

HARDWARE REQUIREMENTS

4.1 PIC MICROCINTROLLER

PIC Introduction

Peripheral Interface Controllers (PIC) is one of the advanced microcontrollers developed by microchip technologies. These microcontrollers are widely used in modern electronics applications. A PIC controller integrates all types of advanced interfacing ports and memory modules. These controllers are more advanced than normal microcontrollers like 8051. The first PIC chip was announced in 1975 (PIC1650). As with a normal microcontroller, the PIC chip also combines a microprocessor unit called CPU and is integrated with various types of memory modules (RAM, ROM, EEPROM, etc), I/O ports, timers/counters, communication ports, etc.

All PIC microcontroller family uses Harvard architecture. This architecture has the program and data accessed from separate memories so the device has a program memory bus and a data memory bus (more than 8 lines in a normal bus). This improves the bandwidth (data throughput) over traditional von Neumann architecture where program and data are fetched from the same memory (accesses over the same bus). Separating program and data memory further allows instructions to be sized differently than the 8-bit wide data word. Now we will move to PIC16F877A.

4.2 PIC16F877A Introduction

Microcontroller **PIC16F877A** is one of the PICmicro Family microcontrollers which is popular at this moment, start from beginner until all professionals. Because very easy to use **PIC16F877A** and use FLASH memory technology so that can be write-erase until thousand times. The superiority this Risc Microcontroller compared to with another microcontroller 8-bit especially at a speed of and his code compression.

The 16F877A is a capable microcontroller that can do many tasks because it has a large enough programming memory (large in terms of sensor and control projects) of 8k words and 368 Bytes of RAM. This is enough to do many different projects.

Note: There is a more modern part (the 16F887) that has nearly the same functionality as the 16F877A but also includes an internal clock – like the 16F88 and the 18F4550. In addition, the 16F887 also has low power operation using nano watt™ technology.

Differences Between 16F877A and 16F887

Interface	16F877A	16F887	Description
RA4/T0CKI	Open drain	Normal CMOS	The pin is physically different so the input characteristics are changed.
Cost	Expensive	Cheaper	Modern devices are usually cheaper.
ADC	Yes	More useful	More controls although different registers are used.
Nano Watt™	No	Yes	16F88x - ultra low power operation (battery operation).
Internal Clock	No	Yes	8Mhz to 31kHz 1% accuracy.
External Gate	No	Yes	External Timer1 gate input (start Timer1 counter).
Volt reference	No	Yes	Internal 0.6V voltage reference.
RS485, LIN 2.0	No	Yes	Enhanced USART supports RS485 and LIN 2.0 operation.
Parallel Slave port	Yes	No	Acts as an 8 -bit processor interface i.e. another 8 bit processor can read and write to this interface controlling the 16F877A as a slave processor.

The four features that might make you use a 16F887 instead of a 16F877(A) are

- External gate.
- Volt Reference.
- Nano Watt™.
- Internal Clock.

The gate could be used to more accurately capture an input time e.g. for a reciprocal frequency counter.

The volt reference means you don't need an external reference although it will probably not be useful for highly accurate operation. It is definitely more useful in a battery-powered operation where you want to compare the input battery voltage to a known reference e.g. using the comparator and the internal 0.6V reference.

Nano Watt^{TM} could be useful for battery-powered operations.

The internal clock is useful for lab development (not for accuracy) and for general operation – it can also be set to 31kHz so consuming less power.

All the above depend on your specific application requirements.

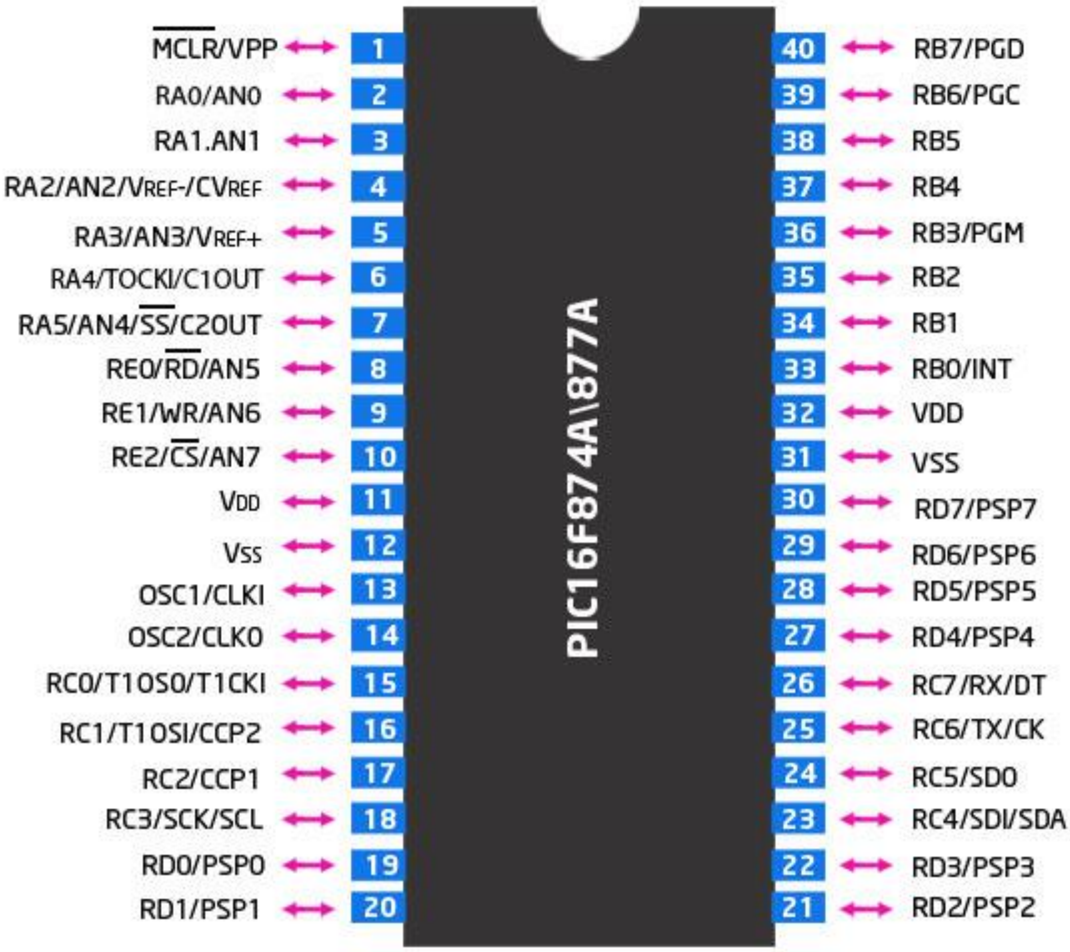
PIC16F877A has 40 pins by 33 paths of I/O. The 40 pins make it easier to use the peripherals as the functions are spread out over the pins. This makes it easier to decide what external devices to attach without worrying too much if there are enough pins to do the job.

One of the main advantages is that each pin is only shared between two or three functions so it's easier to decide what the pin function (other devices have up to 5 functions for a pin).

A slight disadvantage of the device is that it has no internal oscillator so you will need an external crystal or another clock source. However the internal oscillator is only 1% accurate and adding a crystal (max 20MHz crystal – for 5MHz internal instruction cycle) and two 15pF capacitors is not a great chore – the accuracy will be 100ppm depending on the crystal used.

4.3 Pinout

The pinout of the 16F877A is:



4.3.1 Features of PIC16F877A (PIC16F877A Introduction)

The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx, and PIC16C7x devices. It features 200 ns instruction execution, 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, an asynchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port.

4.4 High-Performance RISC CPU

- Lead-free; RoHS-compliant
- Operating speed: 20 MHz, 200 ns instruction cycle
- Operating voltage: 4.0-5.5V
- Industrial temperature range (-40° to +85°C)

- 15 Interrupt Sources
- 35 single-word instructions
- All single-cycle instructions except for program branches (two-cycle)

4.4.1 Special Microcontroller Features

- Flash Memory: 14.3 Kbytes (8192 words)
- Data SRAM: 368 bytes
- Data EEPROM: 256 bytes
- Self-reprogrammable under software control
- In-Circuit Serial Programming via two pins (5V)
- Watchdog Timer with on-chip RC oscillator
- Programmable code protection
- Power-saving Sleep mode
- Selectable oscillator options
- In-Circuit Debug via two pins

4.4.2 Peripheral Features

- 33 I/O pins; 5 I/O ports
- 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
  - 16-bit Capture input; max resolution 12.5 ns
  - 16-bit Compare; max resolution 200 ns

- 10-bit PWM
- Synchronous Serial Port with two modes:
  - SPI Master
  - I2C Master and Slave
- USART/SCI with 9-bit address detection
- Parallel Slave Port (PSP)
  - 8 bits wide with external RD, WR, and CS controls
- Brown-out detection circuitry for Brown-Out Reset

Analog Features

- 10-bit, 8-channel A/D Converter
- Brown-Out Reset
- Analog Comparator module
  - 2 analog comparators
  - Programmable on-chip voltage reference module
  - Programmable input multiplexing from device inputs and internal VREF
  - Comparator outputs are externally accessible

CHAPTER - V

MQ2 SENSOR

In current technology scenario, monitoring of gases produced is very important. From home appliances such as air conditioners to electric chimneys and safety systems at industries monitoring of gases is very crucial. Gas sensors are very important part of such systems. Small like a nose, gas sensors spontaneously react to the gas present, thus keeping the system updated about any alterations that occur in the concentration of molecules at gaseous state.

Gas sensors are available in wide specifications depending on the sensitivity levels, type of gas to be sensed, physical dimensions and numerous other factors. This Insight covers a methane gas sensor that can sense gases such as ammonia which might get produced from methane. When a gas interacts with this sensor, it is first ionized into its constituents and is then adsorbed by the sensing element. This adsorption creates a potential difference on the element which is conveyed to the processor unit through output pins in form of current.

The **gas sensor module** consists of a steel exoskeleton under which a sensing element is housed. This sensing element is subjected to current through connecting leads. This current is known as heating current through it, the gases coming close to the sensing element get ionized and are absorbed by the sensing element. This changes the resistance of the sensing element which alters the value of the current going out of it.

5.1 Image Showing Various Parts of a Gas Sensor

Image 01 shows externals of a standard gas sensor module: a steel mesh, copper clamping ring and connecting leads. The top part is a stainless steel mesh which takes care of the following:

1. Filtering out the suspended particles so that only gaseous elements are able to pass to insides of the sensor.
2. Protecting the insides of the sensor.
3. Exhibits an anti-explosion network that keeps the sensor module intact at high temperatures and gas pressures.

In order to manage above-listed functions efficiently, the steel mesh is made into two layers. The mesh is bound to rest of the body via a copper plated clamping ring.

5.2 Steel Mash Used In Gas Sensor

The connecting leads of the sensor are thick so that sensor can be connected firmly to the circuit and sufficient amount of heat gets conducted to the inside part. They are casted from copper and have tin plating over them. Four of the six leads (A, B, C, D) are for signal fetching while two (1, 2) are used to provide sufficient heat to the sensing element.

The pins are placed on a Bakelite base which is a good insulator and provides firm gripping to the connecting leads of the sensor.

Internal Features

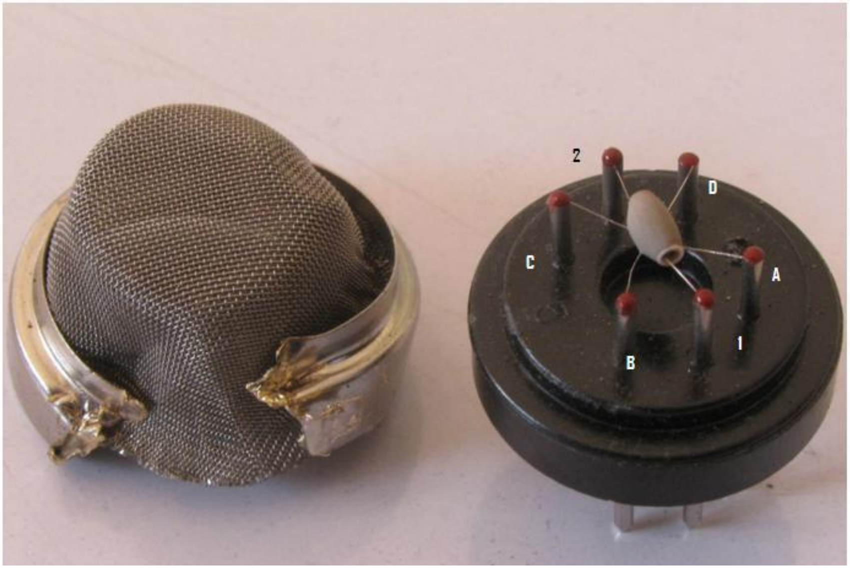
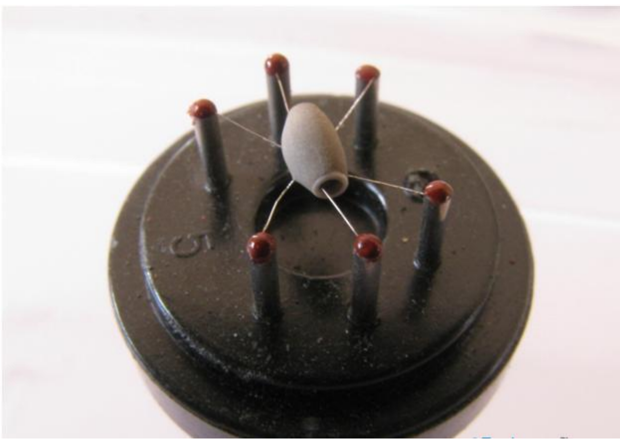


Fig. 4: Inside View of Gas Sensor after Removal of Steel Mash

The top of the gas sensor is removed off to see the internals parts of the sensor: sensing element and connection wiring. The hexapod structure is constituted by the sensing element and six connecting legs that extend beyond the Bakelite base.

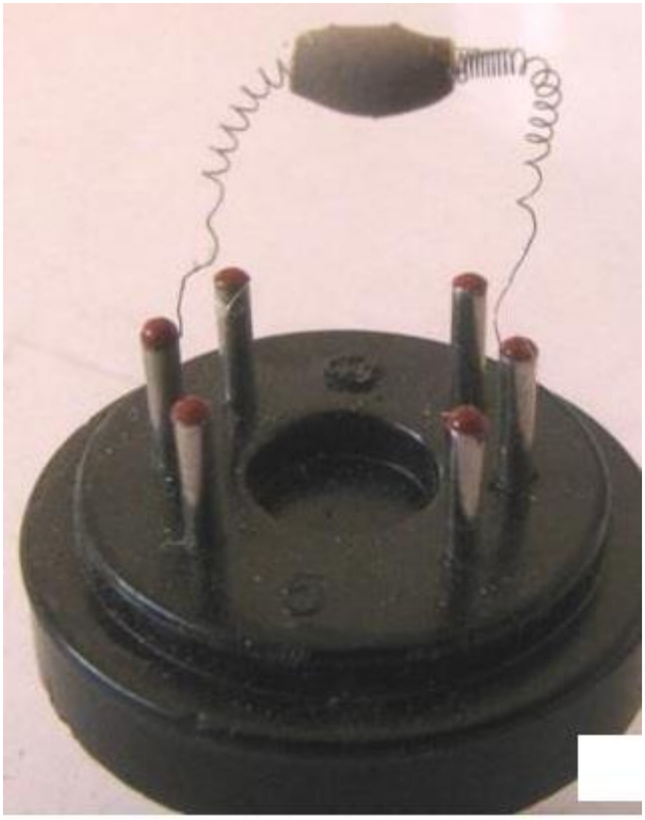


5.2.1 Image Showing Hexapod Structure inside a Gas Sensor

Image4 shows the hollow sensing element which is made up from Aluminum Oxide based ceramic and has a coating of tin oxide. Using a ceramic substrate increases the heating efficiency and tin oxide, being sensitive towards adsorbing desired gas' components (in this case methane and its products) suffices as sensing coating.

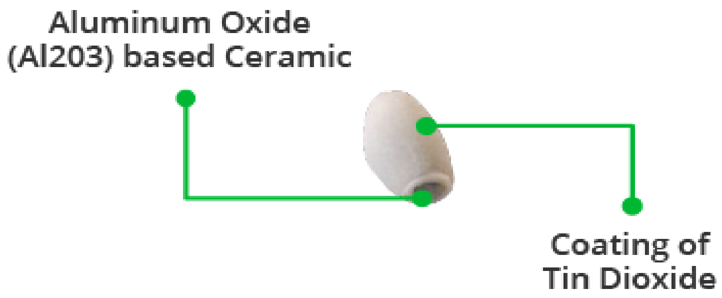
The leads responsible for heating the sensing element are connected through Nickel-Chromium, well known conductive alloy. Leads responsible for output signals are connected using platinum wires which convey small changes in the current that passes through the sensing element. The platinum wires are connected to the body of the sensing element while Nickel-Chromium wires pass through its hollow structure.

5.3 Ceramic Sensing Element



5.4 Ceramic Sensing Element Present Inside a Gas Sensor

While other wires are attached to the outer body of the element, Nickel-Chromium wires are placed inside the element in a spring shaped. Image 5 shows coiled part of the wire which is placed on the inside of the hollow ceramic.



5.5 Closer Look at the Ceramic Element

Image06 shows the ceramic with tin dioxide on the top coating that has good adsorbing property. Any gas to be monitored has specific temperature at which it ionizes. The task of the sensor is to work at the desired temperature so that gas molecules get ionized. Through Nickel-chromium wire, the ceramic region of the sensing element is subjected to heating current. The heat is radiated by the element in the nearby region where gases interact with it and get ionized. Once, ionized, they are absorbed by the tin dioxide. Adsorbed molecules change the resistance of the tin dioxide layer. This changes the current flowing through the sensing element and is conveyed through the output leads to the unit that controls the **working of the gas sensor**.

CHAPTER - VI

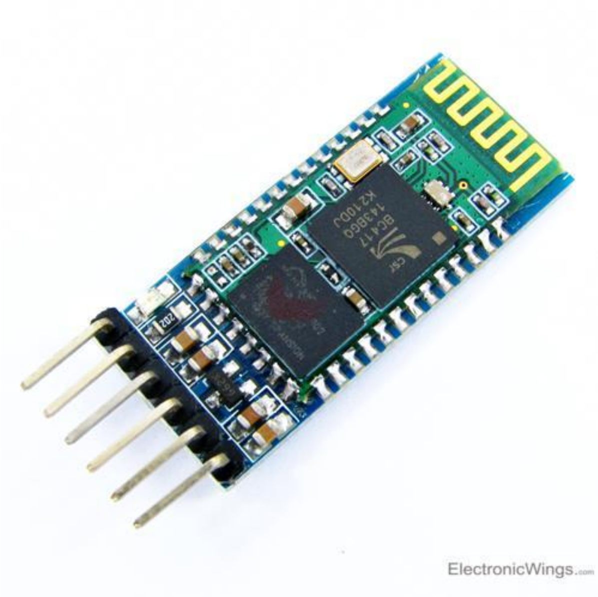
BLUETOOTH MODULE

6.1 Introduction

- It is used for many applications like wireless headset, game controllers, wireless mouse, wireless keyboard and many more consumer applications.
- It has range up to <100m which depends upon transmitter and receiver, atmosphere, geographic & urban conditions.
- It is IEEE 802.15.1 standardized protocol, through which one can build wireless Personal Area Network (PAN). It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over air.
- It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART).

6.2 HC-05 Bluetooth Module

- HC-05 is a Bluetooth module which is designed for wireless communication. This module can be used in a master or slave configuration.



HC-05 Bluetooth Module

Pin Description

Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.

It has 6 pins,

1. **Key/EN:** It is used to bring Bluetooth module in AT commands mode. If Key/EN pin is set to high, then this module will work in command mode. Otherwise by default it is in data mode. The default baud rate of HC-05 in command mode is 38400bps and 9600 in data mode.

HC-05 module has two modes,

1. **Data Mode:** Exchange of data between devices.
2. **Command Mode:** It uses AT commands which are used to change setting of HC-05. To send these commands to module serial (USART) port is used.

2. **VCC:** Connect 5 V or 3.3 V to this Pin.

3. **GND:** Ground Pin of module.

4. **TXD:** Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TXD pin)

5. **RXD:** Receive data serially (received data will be transmitted wirelessly by Bluetooth module).

6. **State:** It tells whether module is connected or not.

6.3 HC-05 module Information

- HC-05 has red LED which indicates connection status, whether the Bluetooth is connected or not. Before connecting to HC-05 module this red LED blinks continuously in a periodic manner. When it gets connected to any other Bluetooth device, its blinking slows down to two seconds.

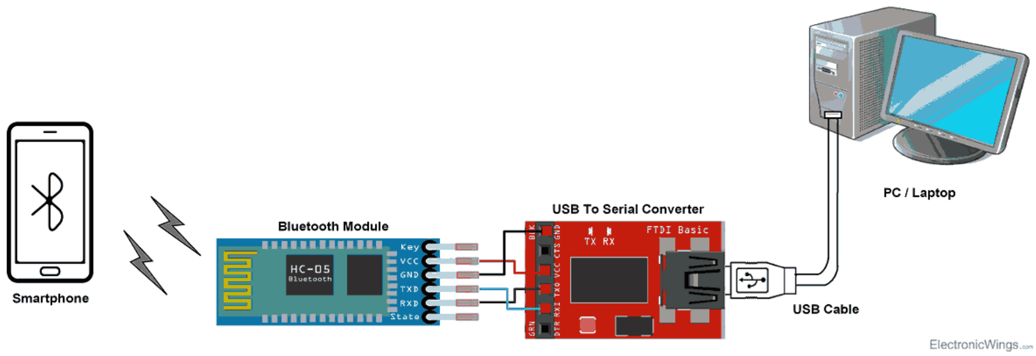
- This module works on 3.3 V. We can connect 5V supply voltage as well since the module has on board 5 to 3.3 V regulator.

- As HC-05 Bluetooth module has 3.3 V level for RX/TX and microcontroller can detect 3.3 V level, so, no need to shift transmit level of HC-05 module. But we need to shift the transmit voltage level from microcontroller to RX of HC-05 module.

6.4 Bluetooth communication between Devices

E.g., Send data from Smartphone terminal to HC-05 Bluetooth module and see this data on PC serial terminal and vice versa.

To communicate smartphone with HC-05 Bluetooth module, smartphone requires Bluetooth terminal application for transmitting and receiving data. You can find Bluetooth terminal applications for android and windows in respective app. store.



6.4.1 Bluetooth Module Serial Interface

So, when we want to communicate through smartphone with HC-05 Bluetooth module, connect this HC-05 module to the PC via serial to USB converter.

Before establishing communication between two Bluetooth devices, 1st we need to pair HC-05 module to smartphone for communication.

6.5 Pair HC-05 and smartphone:

1. Search for new Bluetooth device from your phone. You will find Bluetooth device with "HC-05" name.

2. Click on connect/pair device option; default pin for HC-05 is 1234 or 0000.

After pairing two Bluetooth devices, open terminal software (e.g. Teraterm, Realterm etc.) in PC, and select the port where we have connected USB to serial module. Also select default baud rate of 9600 bps.

In smart phone, open Bluetooth terminal application and connect to paired device HC-05.

It is simple to communicate, we just have to type in the Bluetooth terminal application of smartphone. Characters will get sent wirelessly to Bluetooth module HC-05. HC-05 will automatically transmit it serially to the PC, which will appear on terminal. Same way we can send data from PC to smartphone.

6.6 Command Mode

- When we want to change settings of HC-05 Bluetooth module like change password for connection, baud rate, Bluetooth device's name etc.
- To do this, HC-05 has AT commands.
- To use HC-05 Bluetooth module in AT command mode, connect "Key" pin to High (VCC).
- Default Baud rate of HC-05 in command mode is 38400bps.
- Following are some AT command generally used to change setting of Bluetooth module.
- To send these commands, we have to connect HC-05 Bluetooth module to the PC via serial to USB converter and transmit this command through serial terminal of PC.

Command	Description	Response
AT	Checking communication	OK
AT+PSWD=XXXX	Set Password e.g. AT+PSWD=4567	OK
AT+NAME=XXXX	Set Bluetooth Device Name e.g. AT+NAME=MyHC-05	OK
AT+UART=Baud rate, stop bit, parity bit	Change Baud rate e.g. AT+UART=9600,1,0	OK
AT+VERSION?	Respond version no. of Bluetooth module	+Version: XX OK e.g. +Version: 2.0 20130107 OK
AT+ORGL	Send detail of setting done by manufacturer	Parameters: device type, module mode, serial parameter, passkey,etc.

CHAPTER - VII

BUZZER

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power can be directly connected to a continuous sound, this section dedicated sensor expansion module and the board in combination, can complete a simple circuit design, to "plug and play.

Table 2 Buzzer Pin Configuration

Pin Number	Pin Name	Description
1	Positive	Identified by (+) symbol or longer terminal lead. Can be powered by 5V DC
2	Negative	Identified by short terminal lead. Typically connected to the ground of the circuit

7.1 Buzzer Features and Specifications

- Rated Voltage: 6V DC
- Operating Voltage: 4-8V DC
- Rated current: <30mA
- Sound Type: Continuous Beep
- Resonant Frequency: ~2300 Hz
- Small and neat sealed package
- Breadboard and Perf board friendly

7.2 How to use a Buzzer

A **buzzer** is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application.

This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

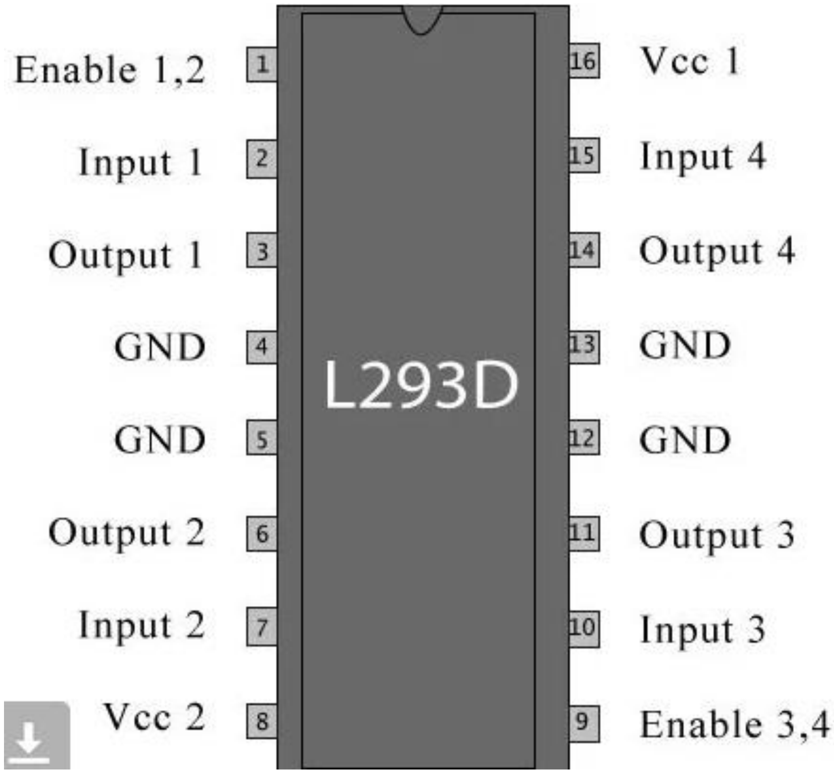
7.3 Applications of Buzzer

- Alarming Circuits, where the user has to be alarmed about something
- Communication equipment’s
- Automobile electronics

- Portable equipment's, due to its compact size

7.4 Motor Driver:

A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver act as an interface between Arduino and the motors. The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. We will be referring the motor driver IC as L293D only. L293D has 16 pins.



The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin for each motor. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor.

Pin Number	Pin Name	Description
1	Enable 1,2	This pin enables the input pin Input 1(2) and Input 2(7)
2	Input 1	Directly controls the Output 1 pin. Controlled by digital circuits
3	Output 1	Connected to one end of Motor 1
4	Ground	Ground pins are connected to ground of circuit (0V)
5	Ground	Ground pins are connected to ground of circuit (0V)
6	Output 2	Connected to another end of Motor 1
7	Input 2	Directly controls the Output 2 pin. Controlled by digital circuits
8	Vcc2 (Vs)	Connected to Voltage pin for running motors (4.5V to 36V)
9	Enable 3,4	This pin enables the input pin Input 3(10) and Input 4(15)
10	Input 3	Directly controls the Output 3 pin. Controlled by digital circuits
11	Output 3	Connected to one end of Motor 2
12	Ground	Ground pins are connected to ground of circuit (0V)
13	Ground	Ground pins are connected to ground of circuit (0V)
14	Output 4	Connected to another end of Motor 2
15	Input 4	Directly controls the Output 4 pin. Controlled by digital circuits
16	Vcc2 (Vss)	Connected to +5V to enable IC function

7.5 Working of L293D

There are 4 input pins for l293d, pin 2, 7 on the left and pin 15, 10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.

In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

7.6 L293D Logic Table.

Let's consider a Motor connected on left side output pins (pin 3, 6). For rotating the motor in clockwise direction the input pins has to be provided with Logic 1 and Logic 0.

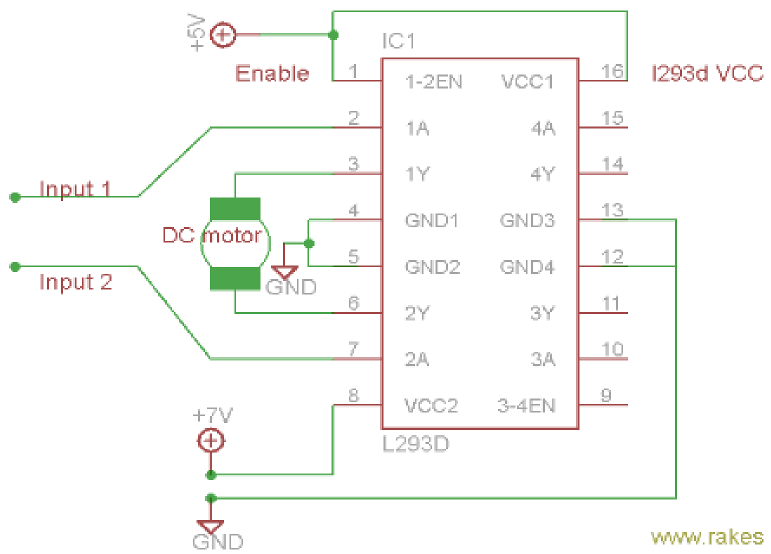
Pin 2 = Logic 1 and Pin 7 = Logic 0 | Clockwise Direction

Pin 2 = Logic 0 and Pin 7 = Logic 1 | Anticlockwise Direction

Pin 2 = Logic 0 and **Pin 7 = Logic 0** | Idle [No rotation] [Hi-Impedance state]

Pin 2 = Logic 1 and **Pin 7 = Logic 1** | Idle [No rotation]

Circuit Diagram for l293d motor driver IC controller



7.7 Voltage Specification

VCC is the voltage that it needs for its own internal operation 5v; L293D will not use this voltage for driving the motor. For driving the motors it has a separate provision to provide motor supply VSS (V supply). L293d will use this to drive the motor. It means if you want to operate a motor at 9V then you need to provide a Supply of 9V across VSS Motor supply.

The maximum voltage for VSS motor supply is 36V. It can supply a max current of 600mA per channel. Since it can drive motors Up to 36v hence you can drive pretty big motors with this l293d. VCC pin 16 is the voltage for its own internal Operation. The maximum voltage ranges from 5v and up to 36v.

7.7.1 What is a DC Motor?

A direct current (DC) motor is a type of electric machine that converts electrical energy into mechanical energy. DC motors take electrical power through direct current, and convert this energy into mechanical rotation.

DC motors use magnetic fields that occur from the electrical currents generated, which powers the movement of a rotor fixed within the output shaft. The output torque and speed depends upon both the electrical input and the design of the motor.

7.7.2 How DC motors work

The term ‘DC motor’ is used to refer to any rotary electrical machine that converts direct current electrical energy into mechanical energy. DC motors can vary in size and power from small motors in toys and appliances to large mechanisms that power vehicles, pull elevators and hoists, and drive steel rolling mills.

7.7.3 But how do DC motors work?

DC motors include two key components: a **stator** and an **armature**. The stator is the stationary part of a motor, while the armature rotates. In a DC motor, the stator provides a rotating magnetic field that drives the armature to rotate.

A simple DC motor uses a stationary set of magnets in the stator, and a coil of wire with a current running through it to generate an electromagnetic field aligned with the centre of the coil. One or more windings of insulated wire are wrapped around the core of the motor to concentrate the magnetic field.

The windings of insulated wire are connected to a commutator (a rotary electrical switch), that applies an electrical current to the windings. The commutator allows each armature coil to be energised in turn, creating a steady rotating force (known as torque).

When the coils are turned on and off in sequence, a rotating magnetic field is created that interacts with the differing fields of the stationary magnets in the stator to create torque, which causes it to rotate. These key operating principles of DC motors allow them to convert the electrical energy from direct current into mechanical energy through the rotating movement, which can then be used for the propulsion of objects.

Who invented the DC motor?

This amazing piece of electrical equipment has revolutionised our lives in many ways, but who invented the DC motor? As with all major innovations, there are many people who had a role to play through the development of similar mechanisms.

In the US, Thomas Davenport is widely celebrated as the inventor of the first electric motor, and undoubtedly he was the first to patent a useable electric motor in 1837. Davenport, however, was not the first person to build an electric motor, with various inventors in Europe having already developed more powerful versions by the time Davenport filed his patent.

In 1834, Moritz Jacobi had presented a motor that was three times as powerful as the one Davenport would later patent, while Sibrandus Stratingh and Christopher Becker were the first to demonstrate a practical application for an electric motor, by running a small model car in 1835.

The first practical DC motor was invented some years later in 1886 by Frank Julian Sprague, whose invention lead to the first motor powered trolley system in 1887, and the first electric elevator in 1892. Sprague's DC motor was a hugely significant development, leading to a variety of applications which would reshape the face of industry and manufacturing.

7.8 Types of DC Motors

So far, this guide has broadly explained how DC motors work, the history of these mechanisms, and what they look like. While the principles are the same across variants, there are actually several different types of DC motors, which offer specific advantages and disadvantages over each other.

7.9 IP CAMERA

An IP camera is a video camera that is networked over a Fast Ethernet connection. The IP camera sends its signals to the main server or computer screen via an Internet or network link. It is mostly used in IP surveillance, closed-circuit television (CCTV) and digital videography. IP cameras are widely replacing analog cameras due to their digital zoom and remote surveillance options over the Internet.

An IP camera is also known as a network camera.

IP cameras are increasingly being used in surveillance circuit electronics, where they are replacing traditional CCTV cameras. They can be either wired or wireless, cutting the cost and maintenance required for regular cameras used in a CCTV surveillance circuit.

IP cameras tend to capture better quality images, which is especially helpful in the case of moving targets, as frame rates can be adjusted according to the bandwidth provided. They support two-way communication and hence can send customized alert signals in case of suspicious activity or other predefined occurrences. Hundreds of gigabytes of video and image data can be stored in video servers, which can be retrieved at any time.

Benefits of IP camera over analog technology include:

- Remote administration from any location.
- Digital zoom.
- The ability to easily send images and video anywhere with an Internet connection.

- Progressive scanning, which enables better quality images extracted from the video, especially for moving targets.
- Adjustable frame rates and resolution to meet specific needs.
- Two-way communication.
- The ability to send alerts if suspicious activity is detected.
- Lower cabling requirements.
- Support for intelligent video.

7.10 Metal detector sensor:

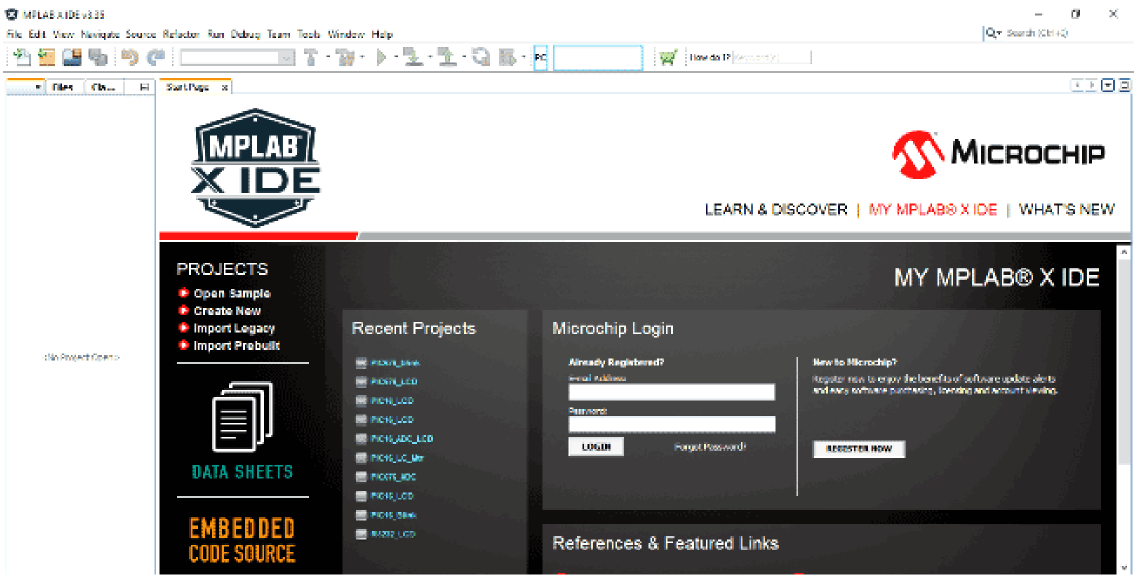
• A metal detector is an electronic instrument which detects the presence of metal nearby. Metal detectors are useful for finding metal inclusions hidden within objects, or metal objects buried underground. They often consist of a handheld unit with a sensor probe which can be swept over the ground or other objects.

CHAPTER – VIII

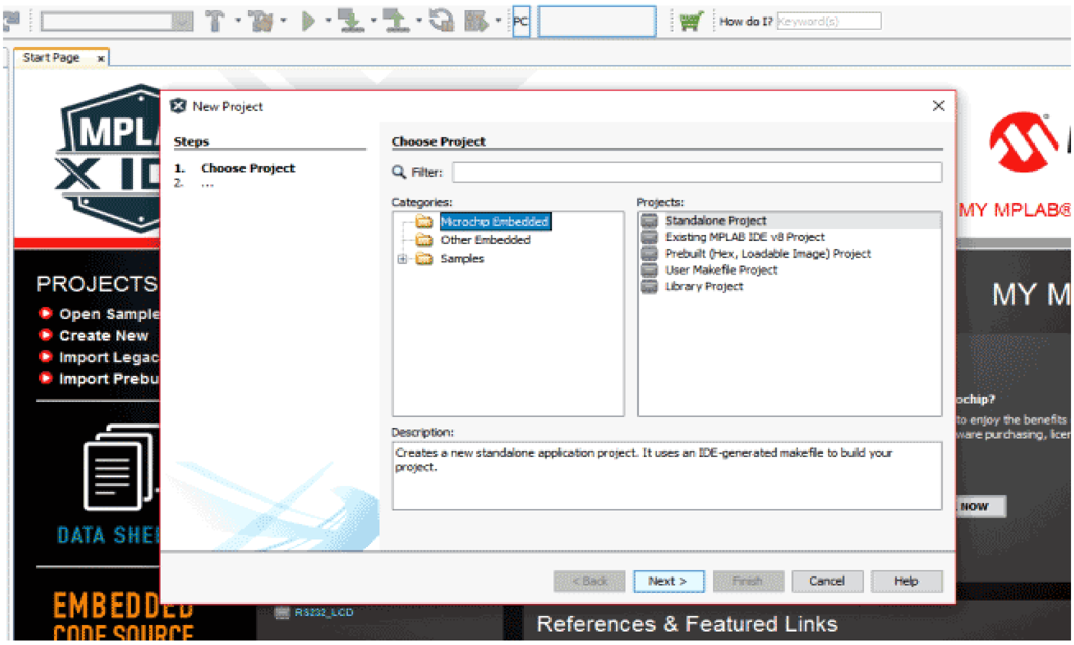
SOFTWARE REQUIREMENTS

8.1 MPLAB

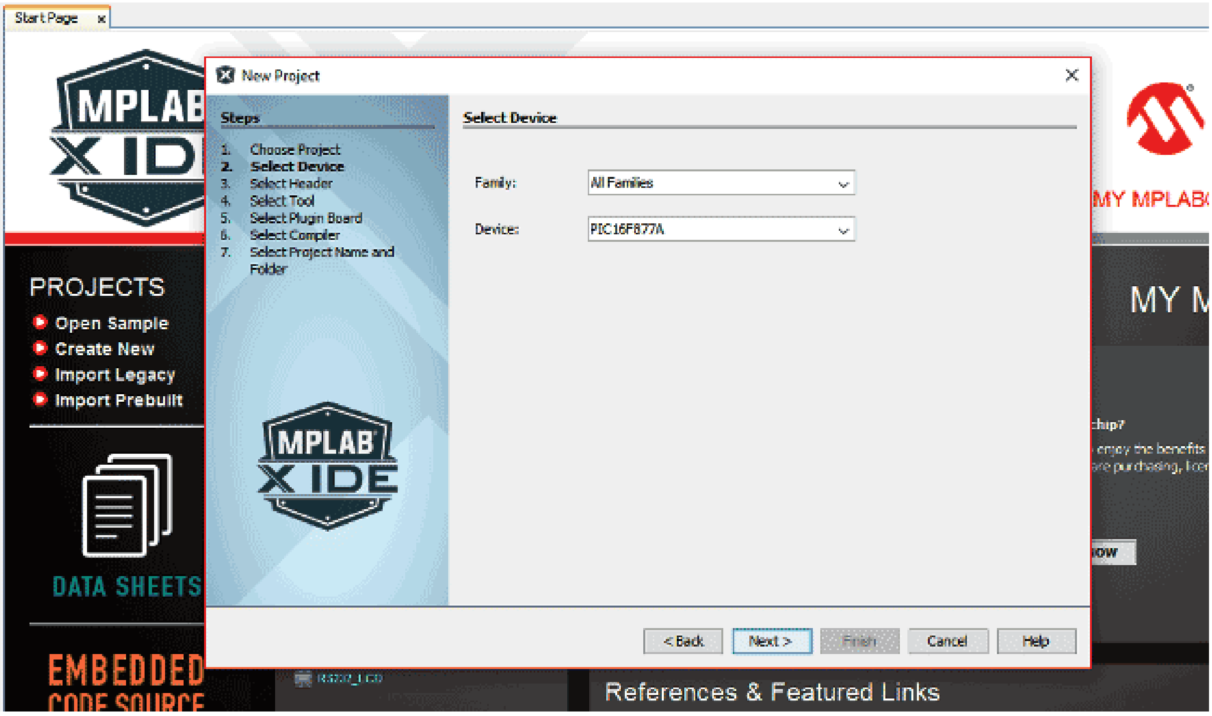
Step 1: Launch the MPLAB-X IDE that we installed in the previous class, once loaded it should look something like this.



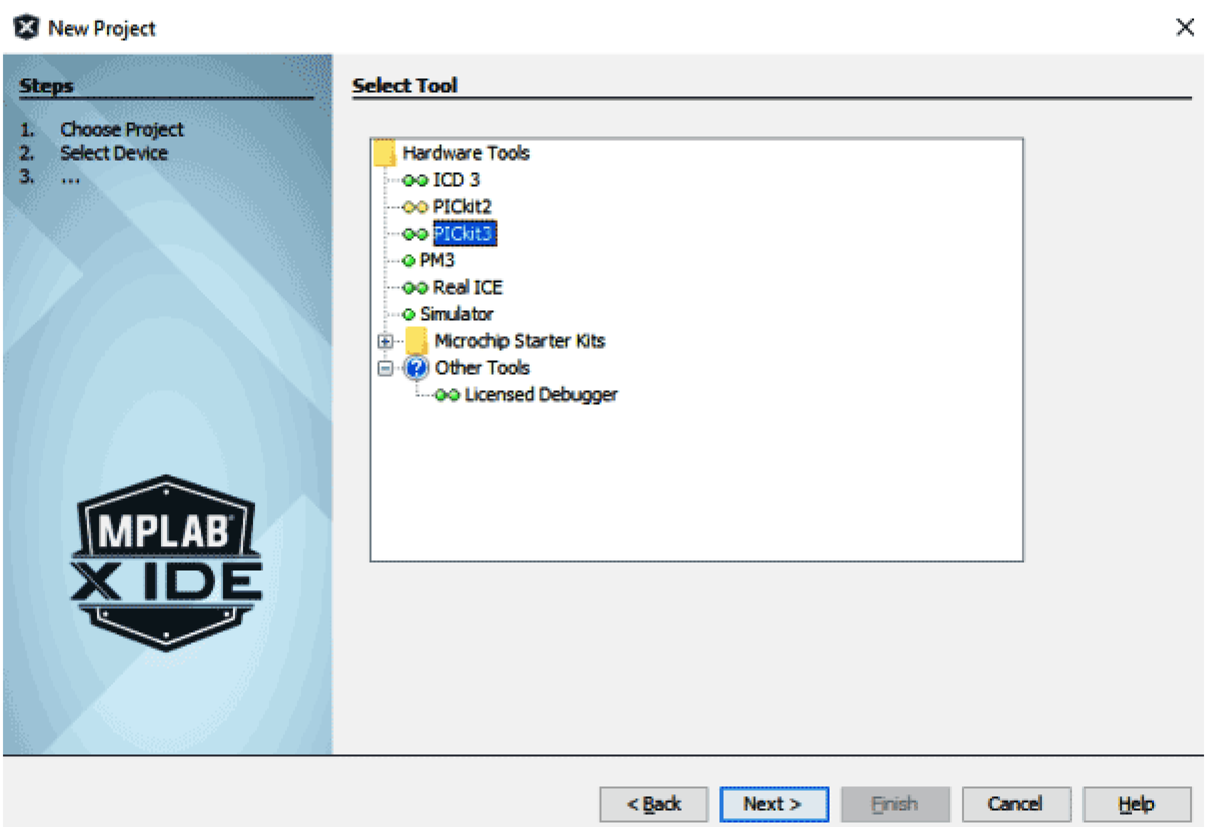
Step 2: Click on Files -> New Project, or use the hotkey Ctrl+Shift+N. You will get the following POP-UP, from which you have to select *Standalone Project* and click Next.



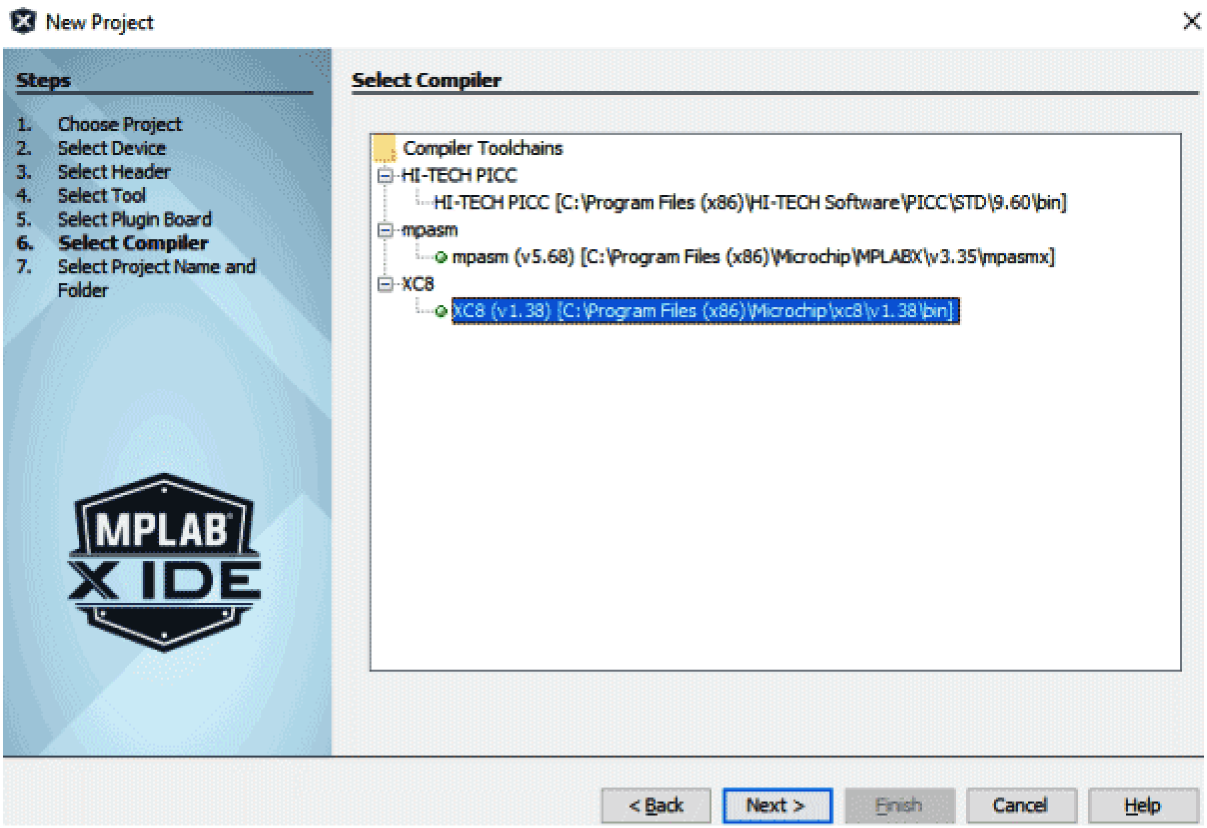
Step 3: Now we have to select our Device for the project. So type as PIC16F877A over the *Select Device* dropdown section. Once done it should be like this and then Click on Next.



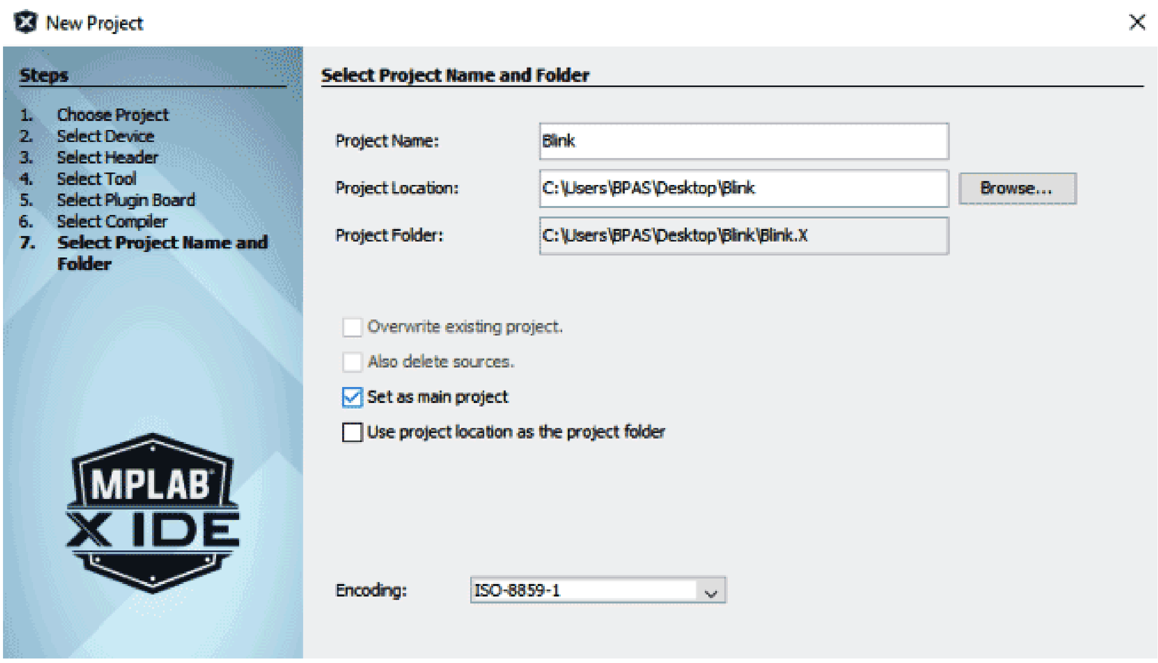
Step 4: The next page will allow us to select the tool for our project. This would be PicKit 3 for our project. Select PicKit 3 and click on next



Step 5: Next page will ask to select the compiler, select the XC8 Compiler and click next.

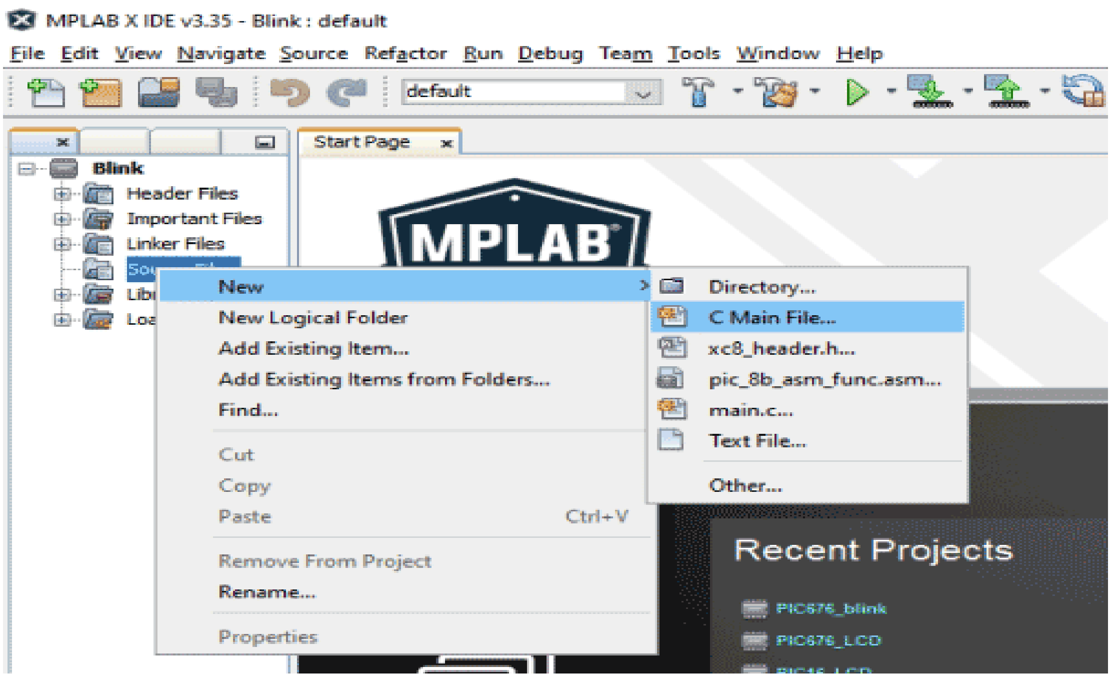


Step 6: In this page we have to name our project and select the location where the project has to be saved. I have named this Project as **Blink** and saved it on my desktop. You can name and save it in your preferable way. Our project will be saved as a folder with the Extension **.X**, which can be directly launched by MAPLB-X. Click Finish once done.

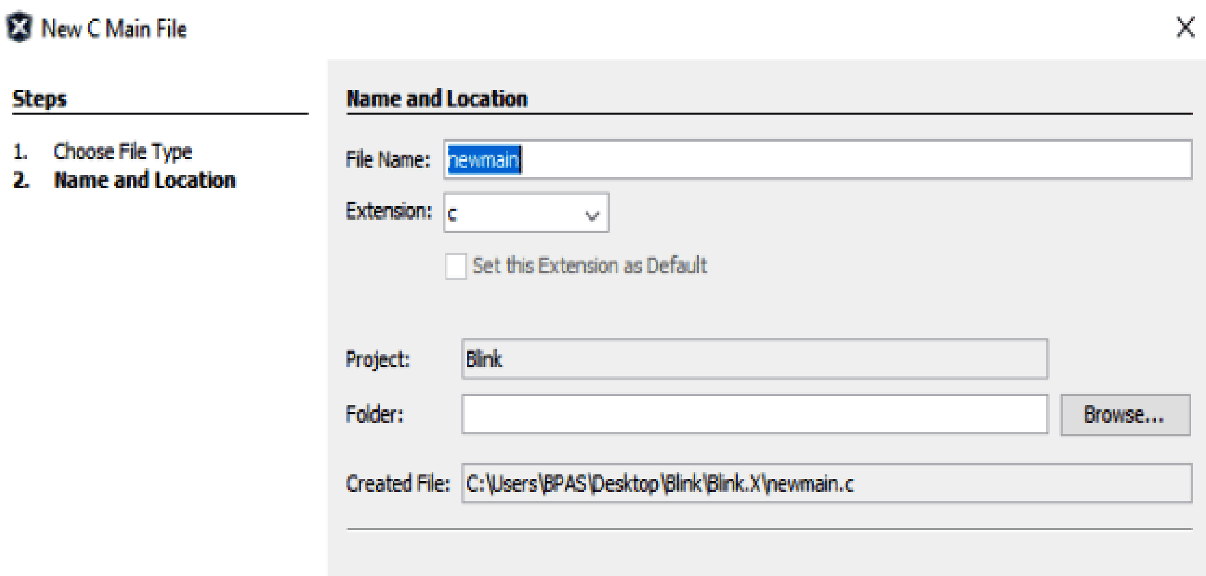


Step 7: That's it!!! Our project has been created. The left most window will show the project name (Here Blink), click on it so that we can view all the directories inside it.

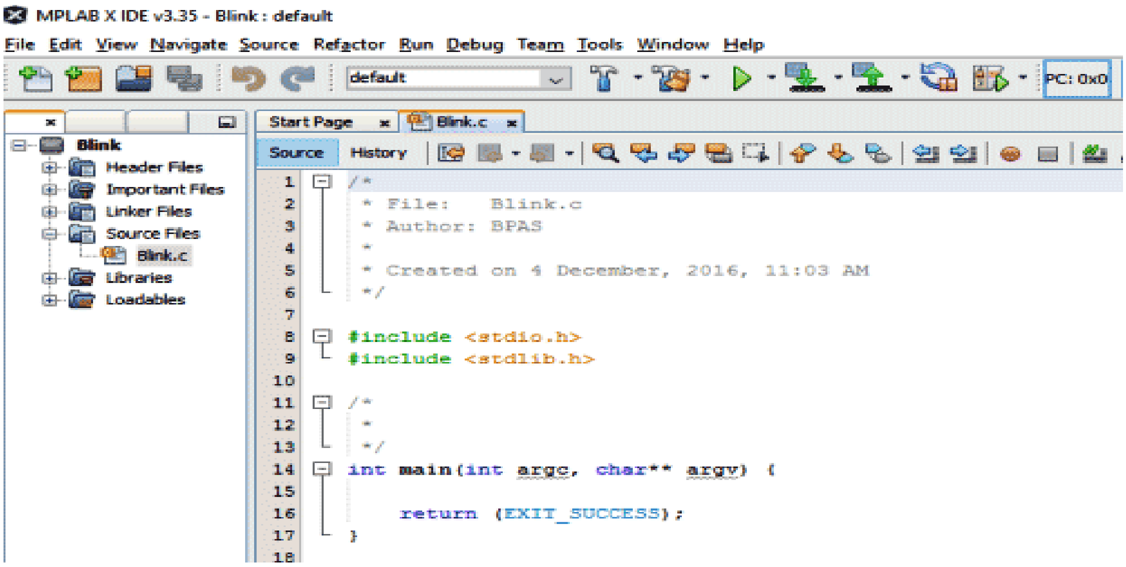
In order to start programming we need to add a C Main file, inside our Source file directory. To do this simply right click on the source file and select New -> C Main File, as shown in the image below.



Step 8: The following dialog box will appear in which the name of the C-file has to be mentioned. I have named in Blink again, but the choice is left to you. Name it in the File name column and click on finish.



Step 9: Once the C main File is created, the IDE will open it for us with some default codes in it, as shown below.



Step 10: That's it now we can start programming our code in the C-main File. The default code will not be used in our tutorials. So let's delete them completely.

8.2 ADVANTAGES AND APPLICATIONS

8.2.1 Advantages:

- It is movable surveillance system.
- It can be controlled remotely.
- Reduces man power.
- Accurate

8.2.2 Applications:

- Military
- Fire fighting
- Nuclear disposal
- Terrorist attack
- Bank security etc.,

CONCLUSION

In this paper, the model of robot can be described to build a robot using wireless camera. People can know about how to implement and control the robot through wireless commands. To minimize terror attacks and to assure better security in high-density places, it is wise to maintain world-class military technology in accordance with battle demands. To avert such calamities, technological power must be improved. This surveillance bot has the capacity to travel to places where humans cannot. This functionality makes our mini spy bot wireless camera extremely useful in the fields of military, security, and rescuing persons trapped beneath fallen structures.

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CODE

Programme of Micro Spybot With Wireless Camera

```
#include<pic.h>

#include<string.h>

__CONFIG(0xfff939);


#define lcd_data PORTB

#define lcd_rs RB0

#define lcd_en RB1


#define ir1 RD6

#define ir2 RD7

#define m1 RD0

#define m2 RD1

#define buzzer  RD5

#define m3 RD2

#define m4 RD3


unsigned char data, rcg,rcv,rcv1,rcv2,rcv3,rcv4,rcv5,msg1[30],msg2[15],r,k,pastnumber[11];

void delay(unsigned int time);


unsigned char msg4[]="f#";

unsigned char msg5[]="b#";
```

```
unsigned char msg6[]="r#";

unsigned char msg7[]="l#";

unsigned char msg8[]="s#";



void sertxc(unsigned char tx)

{

 TXREG = tx;

 while(!TRMT);

}

void sertxs(const unsigned char *txs)

{

 for(;*txs != '\0';txs++)

 {

  TXREG = *txs;

  while(!TRMT);

 }

}



unsigned char receive1()

{

 unsigned char rce;
```

```
 // CREN = 1;
   while(RCIF==0){if(OERR == 1)OERR=0;}

                    rce=RCREG;
 // CREN=0;
        RCIF=0;
 return rce;
}

void serialinitialisation()
{
 TRISC7 = 1;
 TRISC6 = 0;
//SPBRG = 12;//19200
 SPBRG = 25;//9600

 BRGH = 1;
 RCSTA=0x90;
 TXEN=1;
 SPEN=1;
}
```

```
void serial_interrupt()
{
  INTCON |= 0xc0; // SERIAL INTERRUPT Register
  RCIE=1;         // SERIAL INTERRUPT Bit


}


void serial_interruptdisable()
{
  INTCON = 0x00; // SERIAL INTERRUPT Register
  RCIE=0;         // SERIAL INTERRUPT Bit


}


void convert(unsigned int c)
{
   unsigned int a1,b1,a,b,d,e;
   a1=c/1000;
   a1=a1|0x30;
   lcddata(a1);
   b1=c%1000;
   a=b1/100;
   a=a|0x30;
```

```
   lcddata(a);
   b=c%100;
   d=b/10;
   d=d|0x30;
   lcddata(d);
   e=b%10;
   e=e|0x30;
   lcddata(e);
}

void ADC_Init()
{
  ADCON0 = 0x41; //ADC Module Turned ON and Clock is selected
  ADCON1 = 0xC0; //All pins as Analog Input
                 //With reference voltages VDD and VSS
}

unsigned int ADC_Read(unsigned char channel)
{
  if(channel > 7) //If Invalid channel selected
    return 0;     //Return 0

  ADCON0 &= 0xC5; //Clearing the Channel Selection Bits
```

```
 ADCON0 |= channel<<3; //Setting the required Bits
 delay(10);
 //__delay_ms(2); //Acquisition time to charge hold capacitor
 ADCON0 = (ADCON0 | 0x04);
 //GO_nDONE = 1; //Initializes A/D Conversion
 //while(GO_nDONE); //Wait for A/D Conversion to complete
while((ADCON0&0X04)==0X04);
return ((ADRESH<<8)+ADRESL); //Returns Result
}

void forward()
{
m1=1;m2=0;m3=1;m4=0;delay(10);
}
void backward()
{
m1=0;m2=1;m3=0;m4=1;delay(10);
}
void right()
{
m1=1;m2=0;m3=0;m4=0;delay(10);
}
void left()
```

```
{
m1=0;m2=0;m3=1;m4=0;delay(10);
}
void stop()
{
m1=0;m2=0;m3=0;m4=0;delay(10);
}
void main()
{
unsigned char mydata,count;
 unsigned int c1=0;
 unsigned int a1,a2,a3,a4;

  TRISA=0x2F;//make portA as input.
  PORTA=0X00;
TRISB=0x00;     //OUTPUT
TRISD=0x00;     //input
TRISC0=1;
TRISC1=1;
buzzer=1;
lcd_init();serialinitialisation();
ir1=1;
ir2=1;
```

```
ADCON1=0X8E;

 ADCON0=0X01;


 ADC_Init();


PORTD=0xF0;

delay(200);

serial_interrupt();CREN = 1;OERR=1;delay(300);



 delay(100);

  lcdcmd(1);

while(1)

     {


lcdcmd(0x83);

        a1 = ADC_Read(0);

        convert(a1);
```

```
        a2 = ADC_Read(1);


delay(200);

if(a1<20)

{

delay(20);

buzzer=0;


stop();

delay(200);

buzzer=1;


}

else if(a2<60)

{

delay(20);

buzzer=0;

//right();

stop();

delay(200);

buzzer=1;
```

```
}

    }
}

void delay(unsigned int time)
    {
      unsigned int p;
       unsigned int q;
        for(p=0;p<time;p++)
          for(q=0;q<164;q++);
    }
void  Data_Rec(void)  // Serial interrupt function
{

          if(RCIF)
          {
```

```
data = RCREG;
RCIF=0;

if(data == '*')
  {

rcv=receive1();

msg1[k++]=rcv;

lcdcmd(0x01);

lcdcmd(0xc0);
msgdisplay(msg1);delay(200);
k=0;
  }
```

```
if(strcmp(msg1,msg4)==0)
{

forward();

lcdcmd(1);
lcdcmd(0x80);

memset(msg1,0,strlen(msg1));

delay(200);

}
if(strcmp(msg1,msg5)==0)
{

backward();
lcdcmd(1);
lcdcmd(0x80);
msgdisplay("backward");delay(10);
memset(msg1,0,strlen(msg1));
```

```
delay(200);

}

if(strcmp(msg1,msg6)==0)
{

right();

memset(msg1,0,strlen(msg1));
delay(200);

}
if(strcmp(msg1,msg7)==0)
{
left();

memset(msg1,0,strlen(msg1));
delay(200);
```

```
}

if(strcmp(msg1,msg8)==0)
{

stop();

memset(msg1,0,strlen(msg1));
delay(200);

}

else
{

memet(msg1,0,strlen(msg1));
delay(200);

}
}
}
```