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IOT BASED RAILWAY TRACK FAULT DETECTION BY USING PIC MICROCONTROLLER

Poondla Pradeep Rayudu [1] , Shaik Afrid [2], Shaik Afila [3], Kamanuru Reddy Basha [4], A.Surendra Reddy [5]

[1] BTech.Student,Department of ECE, Audisankara College Of engineering & Technology (AUTONOMOUS),Gudur , Andhra Pradesh ,India[2] BTech.Student,Department of ECE, Audisankara College Of engineering & Technology (AUTONOMOUS),Gudur , Andhra Pradesh ,India[3] BTech.Student,Department of ECE, Audisankara College Of engineering & Technoloy (AUTONOMOUS),Gudur, Andhra Pradesh ,India
[4] BTech.Student,Department of ECE, Audisankara College Of engineering & Technology (AUTONOMOUS),Gudur, Andhra Pradesh ,India
[5] Prof,Department of ECE, Audisankara College Of engineering & Technology (AUTONOMOUS),Gudur, Andhra Pradesh ,India

***Abstract*— Railway transportation requires constant inspections and immediate maintenance to ensure public safety. Traditional manual inspections are not only time consuming, and expensive, but the accuracy of defect detection is also subjected to human expertise and efficiency at the time of inspection. Computing and Robotics offer automated IOT based solutions where robots could be deployed on rail-tracks and hard to reach areas, and controlled from control rooms to provide faster inspection. In this project, robot will go on railway track and ultrasonic sensor is used for detectingthe defect in track. If any defect is detected it will send the location to mobile using GSM. It will track the location using GPS. The system provides ultrasonic sensor for defect detection, storage ofinformation that consist of location of the defected railway tracks, and robot localization within a range of 3-6 inches. The proposed system utilizes state of the art Machine Learning system and obtained from the tracks in order to classify them as normal or suspicious. Such locations are then marked and more careful inspection can be performed by a dedicated operator with very few locations to inspect (as opposed to the full track).**

***Index Terms*: Railway Track, GSM Module, GPS Module, Ultrasonic Sensor,PIC microcontroller,Buzzer.**

I. INTRODUCTION

Transportation plays an important role in our day-to-day life i.e., to transfer the goods and passengersfrom one place to another. As the railway is essential part of our life, the proper maintenance should be there. Sometimes in Naxalite areas, they purposefully burst the tracks which leads the human life in danger. Hence the effective solution over this problem is introduced in this project. The Ultrasonicsensor is used for crack detection and global positioning system (GPS) and global system for mobile communication (GSM) are used to know exact location of crack as well as for communication purpose respectively.

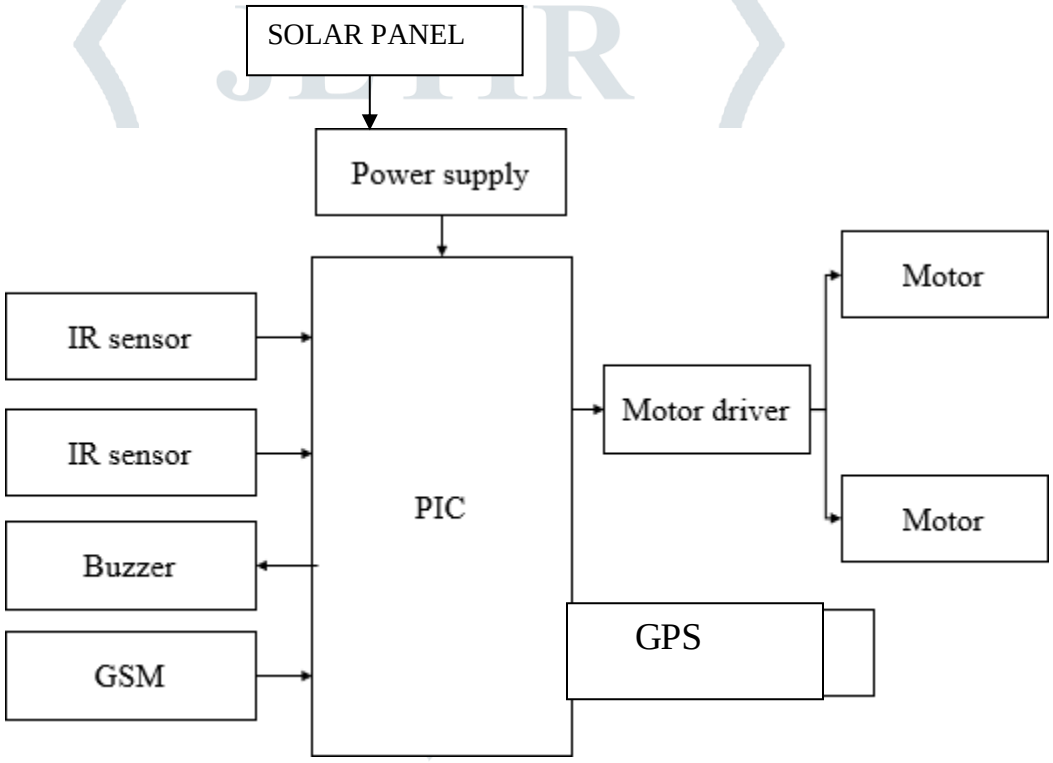
II. EXISTING METHOD

The existing conventional signaling system depends on the oral communication through telephonic and telegraphic conversations as input for the decision making in track allocation for trains. There is large scopefor miscommunication of the information or communication gap due to the higher human interference in the system. This miscommunication may lead to wrong allocation of the track for trains, which ultimately leadsto the train derailments.

III. PROPOSED SYSTEM

To overcome this drawback we proposed this project railway track fault detection. In this project, robot will go on railway track and IR sensor is used for detecting the defect in track. If any defect is detected it will sendthe location to mobile using GSM. It will track the location using GPS. The system provides IR sensor for defect detection, storage of information that consist of location of the defected railway tracks, and robot localization within a range of 3-6 inches.

IV.BLOCK DIAGRAM



V. HARDWARE REQUIREMENTS

PIC MICROCONTROLLER

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 advancedthan 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 accessedfrom 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.

IR sensor:

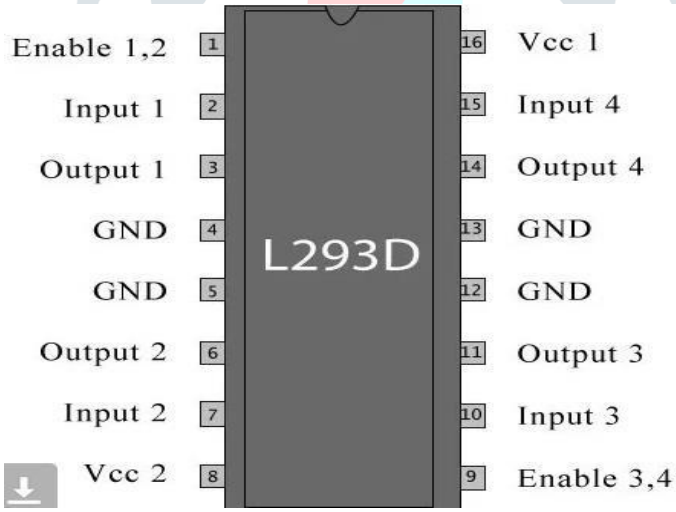
An infrared sensor is an electronic device, which emits in order to sense some aspects of the surroundings. AnIR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to oureyes, which can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

Solar Panel:

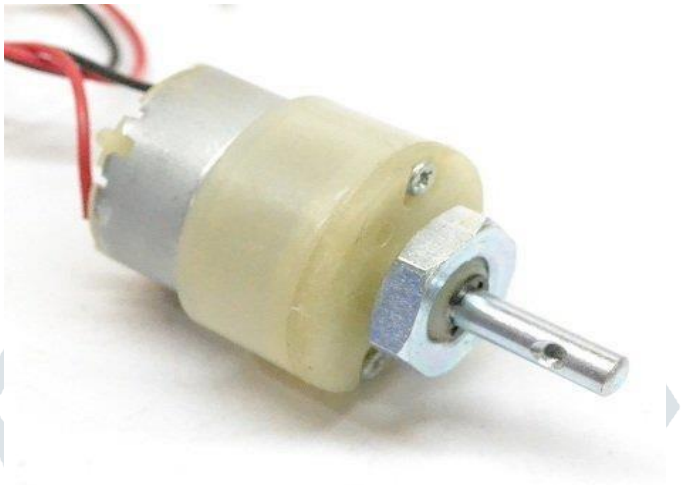
There are many different types of Solar Panels that people use to harness and use energy from the sun. 12v solar panels are small solar panels that can power an RV, marine equipment, or car battery maintenance. They are often used in field communication radios, golf cars and garden fittings like pond pumps or lights.

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'sare 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 currentrated 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.



GPS:

Global Positioning System (GPS) is a satellite-based system that uses satellites and ground stations to measure and compute its position on Earth.GPS is also known as Navigation System with Time and Ranging (NAVSTAR) GPS.

GPS receiver needs to receive data from at least 4 satellites for accuracy purpose. GPS receiver does not transmit any information to the satellites.This GPS receiver is used in many applications like smartphones, Cabs, Fleet management etc.

GSM

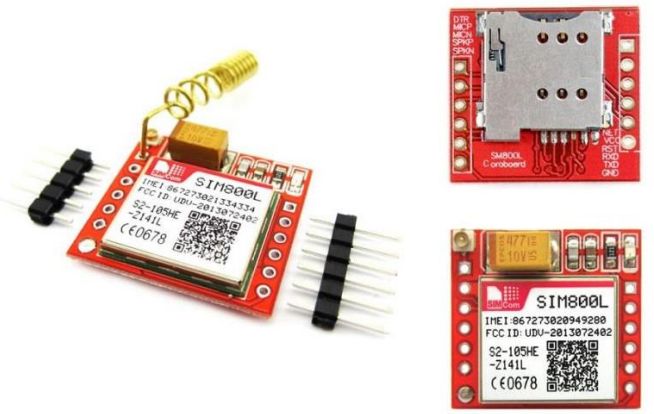
GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates.

There are various cell sizes in a GSM system such as macro, micro, pico and umbrella cells. Each cell varies as per the implementation domain. There are five different cell sizes in a GSM network macro, micro, pico and umbrella cells. The coverage area of each cell varies according to the implementation environment.

Time Division Multiple Access

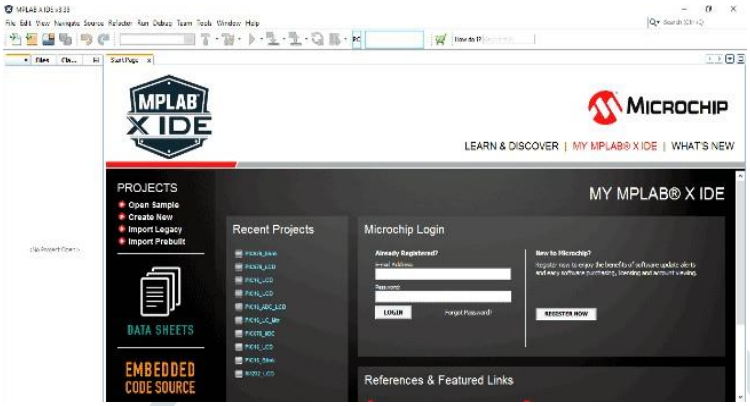
TDMA technique relies on assigning different time slots to each user on the same frequency. It can easily adapt to data transmission and voice communication and can carry 64kbps to 120Mbps of data rate.



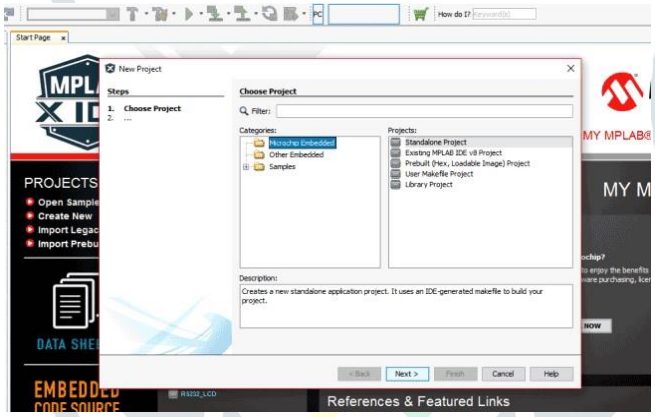
VI.SOFTWARE REQUIREMENTS

MPLAB

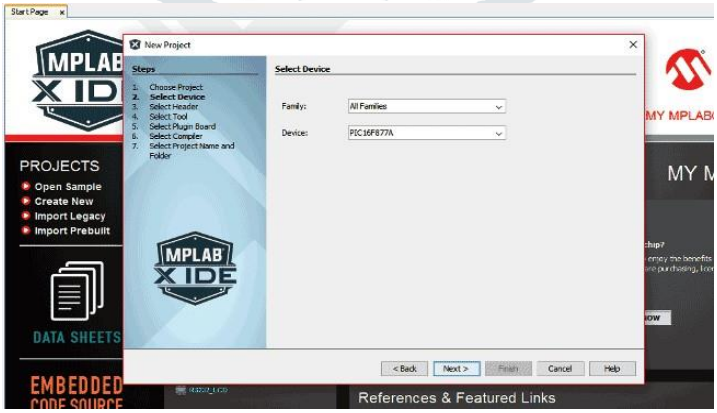
Step 1: Launch the MPLAB-X IDE that we installed in the previous class, once loaded it should look something like this.



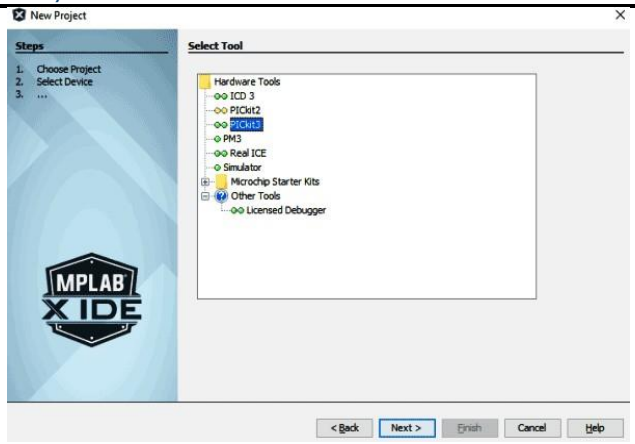
Step 2: Click on Files -> New Project, or use the hotkey Ctrl+Shift+N. You will get the following POP-UP, from which you have to select *Standalone Project* and click Next.



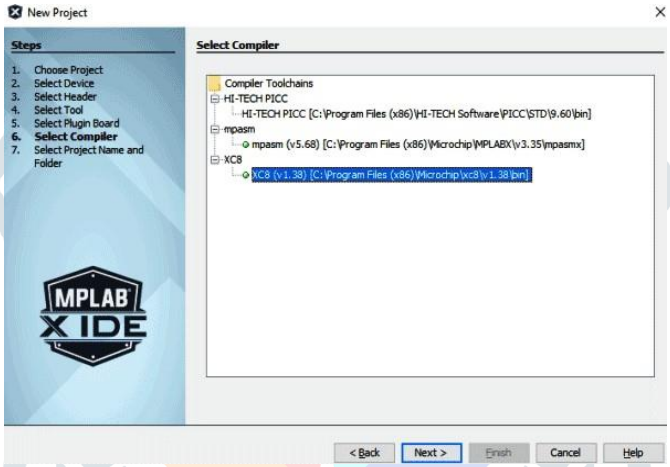
Step 3: Now we have to select our Device for the project. So type as PIC16F877A over the *Select Device* dropdown section. Once done it should be like this and then Click on Next.



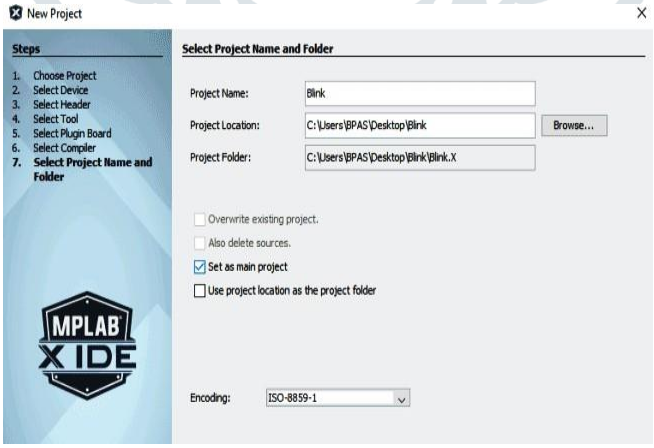
Step 4: The next page will allow us to select the tool for our project. This would be PicKit 3 for our project. Select PicKit 3 and click on next



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

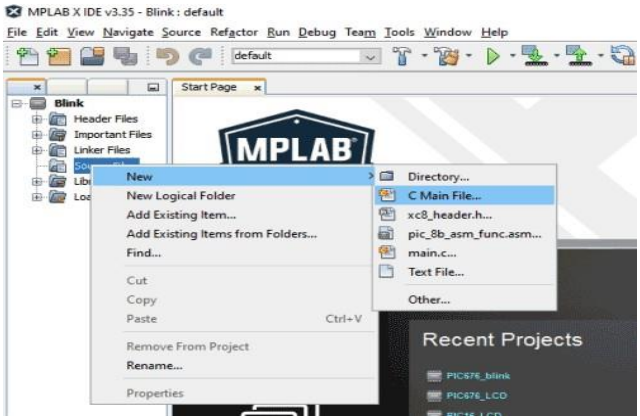


Step 6: In this page we have to name our project and select the location where the project has to be saved. I have named this Project as **Blink** and saved it on my desktop. You can name and save it in your preferable way. Our project will be saved as a folder with the Extension **.X**, which can be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

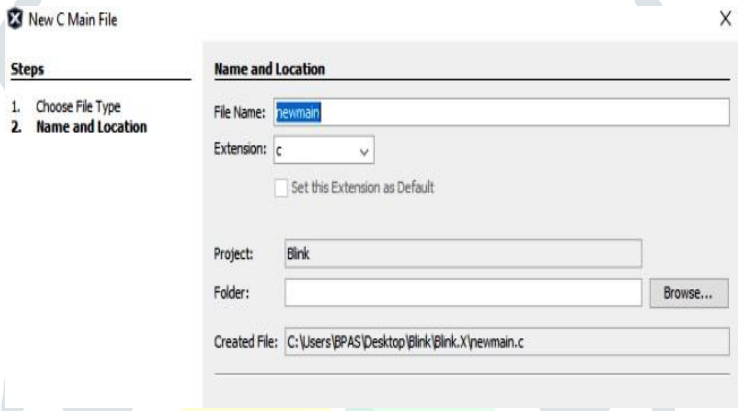


Step 7: That's it!!! Our project has been created. The left most window will show the project name (Here Blink), click on it so that we can view all the directories inside it.

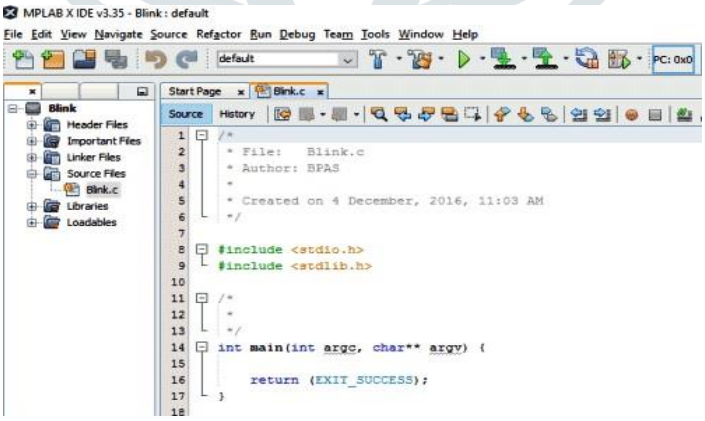
In order to start programming we need to add a C Main file, inside our Source file directory. To do this simply right click on the source file and select New -> C Main File, as shown in the image below.



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.

VII. ADVANTAGES

- The auto crack detection method is more efficient in the technical field
- Quick response is achieved
- Simple in construction
- Easy to maintain and repair
- Cost of the unit is less when compared to other

VIII. CONCLUSION/FUTURE SCOPE

The defect information which includes GPS value is wirelessly transmitted to the railway safety management center through GSM Module and the alert can be given to the next approaching train. The proposed scheme possesses many advantages such as fast monitoring and reporting system, low cost, low power consumption and less analysis time. Also, the easy availability of the components makes an ideal project for industrial use with very little initial investment. So the current location device on rail track can easily be measured from home station. By this proposed model many lives can be saved by avoiding accidents.

IX. ACKNOWLEDGMENT

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X. REFERENCE

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