

DESIGN AND TESTING OF SENSOR NETWORKS ON LAND SURFACES TO PREVENT LANDSLIDES

Submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in **Electronics and Communication Engineering** by

SHIRLEY.V (37130376)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade “A” by NAAC

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APRIL - 2021



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **SHIRLEY .V(37130376)** who carried out the project entitled "**DESIGN AND TESTING OF SENSOR NETWORKS ON LAND SURFACES TO PREVENT LANDSLIDES**" under our supervision from December 2020 to April 2021.

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DECLARATION

I SHIRLEY.V (Reg.No: 37130376) hereby declare that the Project Report entitled **“DESIGN AND TESTING OF SENSOR NETWORKS ON LAND SURFACES TO PREVENT LANDSLIDES”** done by me under the guidance of **Mrs. MARY SAJIN SANJU .I, M. Tech.,(Ph. D)** is submitted in complete fulfilment of the requirements for the award of Bachelor of Engineering degree in Electronics andCommunication Engineering.

DATE:

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ABSTRACT

Landslides are a common occurrence caused by loss of stability in mountain areas. It can lead to human losses and other property destruction. It cannot be controlled, but what can be done is prevent destructive aftermath by using real-time monitoring techniques. The most important criterion is real-time monitoring of environmental threats. Landslides will result in death of people, the destruction of crops, the loss of forest cover, and the disruption of communication routes. Landslide occurs due to the balance between weight of hill and hence the counter resistance forces is more in favour of gravity. This paper describes how an autonomous landslide detection system, supported by wsn works. Software programs that are autonomous and self-contained are embedded into these wireless sensor nodes. On integration with each other, the software programs continuously collecting and analyse data from the sensors, such as the sensor node positions along the slope and the observed ground movements. When movement is observed, the collected datasets are sent immediately to a linked server system for further analysis. This system for landslide detection as proposed in this paper is centrally available through the Internet and provide the real-time information on the current status of the slope that is monitored. we can view the sensor values remotely using the IoT in the webserver and the forest officials can track the landslide events and prevent the loss of life.

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CHAPTER 1

INTRODUCTION

A landslide is the downslope movement of a debris, rock mass or earth. Rainwater percolates during monsoons, creating hydraulic pressure that exceeds the elastic limit of the soil or rocks. As a result, the strain builds up, forcing the soil and rocks to loosen their adhesive strengths, resulting in landslides. Landslides devastate agricultural/forest lands, road transportation, and the environment as a whole, resulting in significant human loss. Landslides also refers to any gravity-driven downward displacement of soil and rock. It results in personal injury, property damage, and death. It has a long-term negative effect on various of resources such as water supplies, fisheries, sewage disposal systems, dams, and roadways. When hill slope becomes unstable condition, landslides occur. Many factors, together or separately, can cause changes in a slope's stability. Natural causes include groundwater pressure acting on destabilising the slope, river or ocean wave erosion at the bottom of slope, earthquakes adding loads to a barely stable slope, and earthquake-caused liquefaction destabilising slopes. Deforestation, cultivation, and construction, all of which destabilise the already fragile slopes, as well as vibrations from machinery, are examples of man-made causes. Landslides can be detected using data-driven methods using wireless sensor networks (WSN). The primary goal of studying landslide detection is to prevent natural disasters by detecting their early movement[11]. As a result, human losses from the avalanche would be minimised or eliminated. The goal is also to find a way for the sensing elements to respond quickly to rapid data changes and send the sensed data to a data analysis centre. The proposed WSN/Internet of Things i.e. (IoT) based landslide detection and monitoring system is low cost, reliable, and efficient in terms of delay.[1]

1.1 BLOCK DIAGRAM

1.1.1 Transmitter Section

The working of the transmitter and receiver section is as follows:

Three types of sensors such as seismic sensor, PIR sensor, humidity sensor is used here. Each sensor has its own unique features. Two Seismic sensors are placed in ground section. Humidity sensors check the soils humidity levels because landslides mostly occur during heavy rainfall. Seismic sensors check if any vibrations occur in the ground level. If it is occurring, then the buzzer will give immediate alert to nearby areas about land slide detection sensor checks if any person presence on that place.

These sensors send out an analog signal that is there after converted into a digital signal using an Analog-Digital Converter (ADC) because the compiler (HI-TECH C) accepts only digital signal in the process. This signal is fed to the microcontroller from where the information is carried to the IoT with the help of a UART cable which is then used for serial communication between peripheral devices.

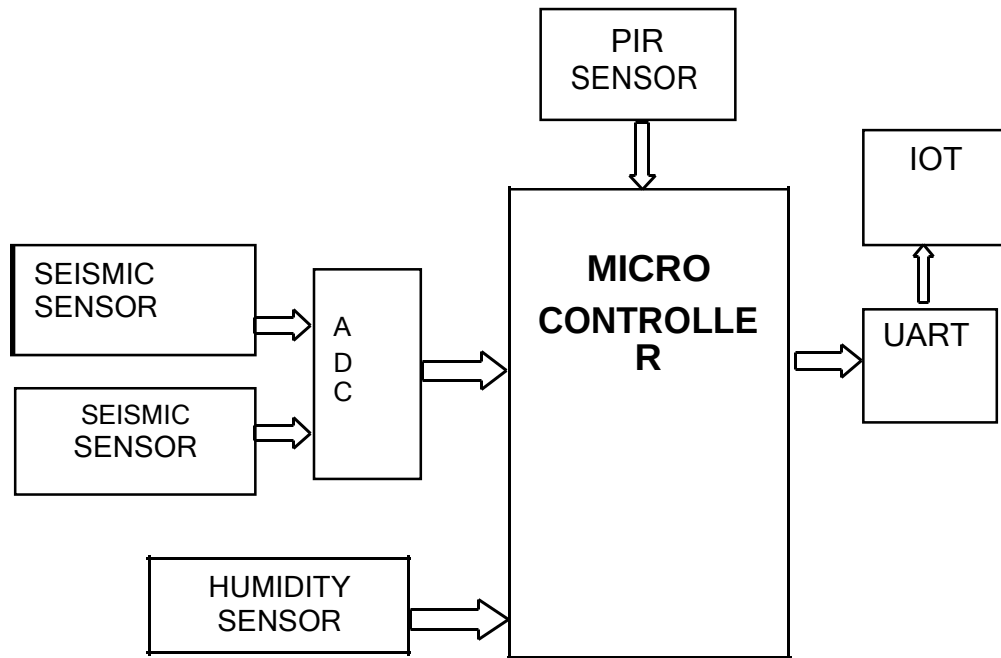


Fig: 1.1 : Block diagram of transmitter section

1.1.2 Receiver Section

All the information received from the sensors are gathered from ground section and it will be transmitted to receiver section through IOT unit. The SIM900 GPRS modem is used in this. The information in the IoT is transmitted to the receiver end IoT via WIFI where again with the help of UART cable communication is done between the IoT and the microcontroller[1]. The output is shown on the LCD panel and buzzer is activated according to the information received.

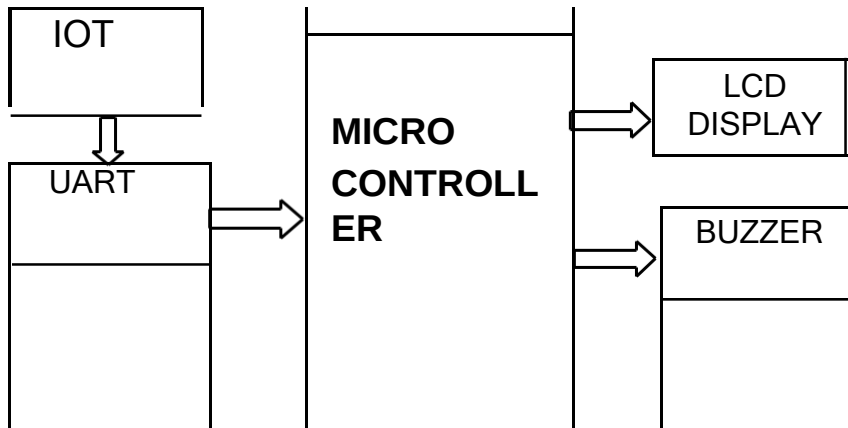


Fig: 1.2 : Block diagram of receiver section

1.2 PROBLEM DEFINITION

This project provides a solution to prevent landslides from causing damage to human lives and the destruction of properties. In the past few years, several solutions which provided a good deal of ideas on how to prevent landslides especially on steep slopes during rainfall. However, most of the solutions do not provide a beneficial and satisfactory result. To nullify this problem, in this system various sensors are used for detection. It uses a microcontroller that has a built-in ADC, from which the data is collected from the sensor. Then using the IOT module real-time monitoring of the sensor is done to compare the data and then alert the system accordingly.

CHAPTER 2

LITERATURE SURVEY

Adaptive Traffic Light Control of Multiple Intersections in WSN-Based ITS: Author: Binbin Zhou; Jiannong Cao; Hejun Wu[2]

To research the issue of adaptive traffic light control at multiple intersections, use the data obtained via real time by wi-fi networks (WSN). Previous research focused on maximising green signal cycles in set traffic sequences and overlooked traffic flow features and unique traffic conditions. In this post, an adaptive traffic signal management system is proposed that can change multi-intersection green light sequence based on real-time traffic (including traffic volume, waiting time, number of stops and stops, and vehicle density). The findings of the simulation demonstrate that this scheme produces relative to the three control methods. The results of the simulation show that this system achieves greater efficiency, lower average times of waiting and a lower time of stop compared with the three control methods: The optimal control of a regulated and adaptive control is a fixed time.

Empirical prediction of packet transmission efficiency in bio-inspired Wireless Sensor Networks

Author: Ahmed F. Abdelzaher; Bhanu K. Kamapantula; Preetam Ghosh; Sajal K. Das[3]

This article deals with a three-band handheld antenna. The resonance frequency of the antenna is 3.6 GHz, 5.6 GHz and 7.9 GHz. The triple-band antenna architecture has been miniaturised here. Due to its rigid structure and failure type, the substratum used here is FR-4 Epocyc resin. For the three-band simulation and measurement results, the antenna produced a return loss of less than -10 dB. This antenna has a VSWR value lower than 2 and the gain is 0.86 dB. This antenna's sizes are 13.6 x 13.6 mm² such that a circular substratum is used here.

Comparative Assesmentes of IEEE ZigBee an 6lowpan for Power Industrial Wsns in Realistic Scenarios

Author: S. Nej and A. Ghosh

This article is about a Patch antenna of a microstrip This antenna is ideal in MIMO applications for an antenna which is electrically small in dimension, with a thin folded wire or zig-zag form of structure, the values simulated for this antenna in relation to direction, front to back and radiation pattering are considered to be satisfactory. The substrate used is the FR4 Epoxy resin with a permeability of 4,4 and thickness of 1,4 mm. The antenna has a compact wavelength of $0.375 \mu\lambda$ 0.375λ , where λ is the wavelength of free space. A quadrangular substratum is used here. It would be ideal for MIMO applications because it is a small antenna design. [4]

Design of Meander Line Antenna for Wearable

Applications Author: E. Toscano, L. L. Bello

This report offers a complementary analysis and comparative assessment using experimental calculation on actual research benches, using the IEEE 802.15.4/ Zig Bee and 6LoWPAN protocols. We have done special work in order to make a realistic performance comparison to change the parameters of any protocol to enable it to work correctly in low-power mode and to make the measures in terms of flow and fuel consumption equal. After the modification process is resolved, the paper evaluate the protocol output obtained in the same network, workload and service cycle. The distinction concentrates on the effect on network efficiency of low-energy mechanisms. The experimental assessment shows the benefits and drawbacks in low-power modes of the two protocols. [3]

Design an Application of Wireless Sensor Network Webserver Based On S3c2410 and ZigBee Protocol

AUTHOR: Jiang Yongping, Feng Zehao, Xu Du

In the area of implementation of wi-fi technologies, the remote-control network is the subject of research. In the world of low cost, low-power devices ZigBee technology brings about the void in the wireless networking industry. This paper addresses the development and implementation of the S3C2410 and ZigBee protocol-based wireless sensor network server. The remote object can be motorised and controlled in real time on this server. Hardware and software are developed and core implementing innovations are applied using B/S architecture and modular methods of design. The server is stable and scalable and can be used extensively in smart homes, surveillance networks,

industrial controls and other areas. [4]

Smart Grid Initiative for Power Distribution Utility in India

AUTHOR: Arup Sinha; S. Neogi; R.N. Lahiri; S. Chowdhury; S. P. Chowdhury. Chakraborty[5]

The energy sector in India has undergone comprehensive changes since the 2003 "Electricity Act" was adopted in India, and electricity distribution companies are now being reformed to deal with regulatory changes to limit losses. Total technological and business improvement, stable power supply and energy efficiency Customer satisfaction improvement and market rationalisation for energy. In addition to the reorganisation and spin-off of the electricity market, "in-smart grid" technology is also needed to increase the distribution network's operational and technological reliability to meet the growing online energy demand of India. Domestic brutal commodity. Intelligent grids are complicated. New communications and control systems are used to provide digitally enhanced power systems with greater robustness, reliability and durability than existing power systems. The intelligent grid affects all electricity components, especially in the distribution stage. Smart metering/advanced measuring technology (AMI) etc. is one branch of smart grids. Both nodes must be interconnected in an intelligent network to exchange data as needed. In addition to giving users the opportunity and encouragement to join networks, the Smart Grid platform gives customers the option to decide their time and volume of power usage based on electricity prices. Network, energy efficiency improvement and adaptation of both energy generation and storage choices. In the intelligent grid, different properties like self-healing and adaptability are also envisaged. The product and technology portfolio of Smart Grid helps maximise device uptime, while allowing the utility to recover home and business electricity faster in the case of an interruption. In order to allow smart grid technologies inside Indian power distribution companies as part of its strategy to cater for smart grids in developing countries, India's Government recently formed a Smart Grid and Smart Grid Working Group. Demands like the US, Europe and so on. [5]

CHAPTER 3

AIM AND SCOPE OF PRESENT INVESTIGATION

3.1 EXISTING SYSTEM

The geographic distribution of landslides has been recorded to be very heterogeneous in some parts of countries, with areas of high incidence. At the time of a landslide, some countries were in charge of raising public consciousness and training in preventive systems, but this was not sufficient. A sliding field review is currently carried out to evaluate movement by using photographic instruments, such as Synthetic Aperture Radar (SAR), region-screening and movement checks, as there is no immediate reaction on the floors or surroundings in order to avoid these kinds of disasters.

3.2 DISADVANTAGES

- Real time monitoring is difficult
- Create more Accidents
- Loss of human life

3.3 PROPOSED SYSTEM

The purpose of the landslide monitoring system is to detect dangerous pitch changes in the early stages. When the pitch deformation is detected before the collapse, a possible earthquake is immediately notified by the system. Available for detailed diagnosis of sloping movement, the related measuring values collected from the slope are constantly kept. [6] We use embedded sensors here to locate the ruts. In the field segment there are two seismic sensors. Moisture sensors monitor soils' moisture levels, because landslides occur often in heavy rainfall. Seismic sensors will immediately warn surrounding areas to land slide detection if any movements are present on the ground floor if the buzzer occurs. All this information is collected from the ground area and transmitted via the IOT device to the receiver portion. PIR sensor controls any person's presence at the site. We can remotely monitor the sensor values via the IOT on a web server. Forest representatives can track the incidents and avoid loss of life

3.4 ADVANTAGES

- Prevent more accidents
- Ensure more safety on peoples who is living hills area
- Prevent human losses

3.5 PROBLEM DEFINITION

This project offers a way of avoiding landslides that harm human life and destroy buildings. In recent years, a number of solutions have given a number of ideas about how landslides can be prevented, especially in steep slopes during precipitation. But the most advantageous and satisfactory results are not seen in most remedies. In this device, various sensor types are used for detection, to overcome this issue. It uses an ADC-built microcontroller that collects data from the sensor. Then using the IOT module real-time monitoring of the sensor is done to compare the data and then alert the system accordingly.

CHAPTER 4

EXPERIMENTAL MATERIALS AND METHOD

4.1 HARDWARE REQUIREMENTS

- Micro Controller (PIC16F877A)
- ADC
- USART
- Seismic Sensor
- Humidity Sensor
- PIR Sensor
- LCD Display
- Buzzer
- IoT Board

4.2 MICROCONTROLLER (PIC16F877A)

The CMOS FLASH 8-bit microcontroller picks Microchips strong PIC architecture into a bundle of 40 PIC16C5X compatible, PIC12CXX and 16C7X PIC compatible . It's powerful, but simple to programme (only 35 single-word instructions). The PIC16F877A comprises 256 bytes of EEPROM data memory, a Self-Programming, a 3 Wire Serial Peripheral Interface (SAPI) and a Universal Asynchronous Receiver Sending Operator and a two Wire interintegrated circuit (I2CTM). This synchronous serial port can be configured using a three-wire Serial Peripheral Interface (SPITM) (USART).

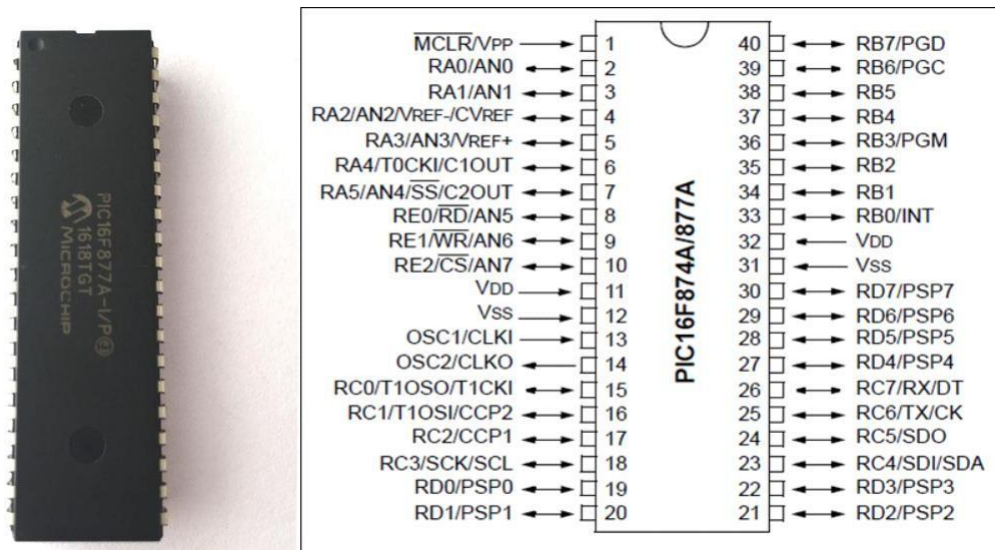


Fig: 4.1: PIC16F877A Microcontroller and Pin diagram

Table 4.1: PIC16F877A Pin Configuration[6]

Number of the Pin	Name of the Pin	Details
1	MCLR/Vpp	MCLR is mostly attached to the programmer during programming.
2	RA0/AN0	Analog pin- 0 or 0 th pin of PORTA
3	RA1/AN1	Analog pin-1 or 1 st pin of PORTA
4	RA2/AN2/Vref-	Analog pin- 2 or 2 nd pin of PORTA
5	RA3/AN3/Vref+	Analog pin -3 or 3 rd pin of PORTA
6	RA4/T0CKI/C1out	4 th pin of PORTA
7	RA5/AN4/SS/C2out	Analog pin -4 or 5 th pin of PORTA
8	RE0/RD/AN5	Analog pin -5 or 0 th pin of PORTE
9	RE1/WR/AN6	Analog pin -6 or 1 st pin of PORTE
10	RE2/CS/AN7	7 th pin of PORTE

11	Vdd	MCU's Ground pin
12	Vss	Positive pin - MCU (+5V)
13	OSC1/CLKI	External Oscillator (clock input pin)
14	OSC2/CLKO	External Oscillator (clock output pin)
15	RC0/T1OSO/T1CKI	0 th pin of PORT C
16	RC1/T1OSI/CCP2	1 st pin - POCTC or Timer/PWM pin
17	RC2/CCP1	2 nd pin - POCTC or Timer/PWM pin
18	RC3/SCK/SCL	3 rd pin - POCTC
19	RD0/PSP0	0 th pin - POCTD
20	RD1/PSP1	1 st pin - POCTD
21	RD2/PSP2	2 nd pin - POCTD
22	RD3/PSP3	3 rd pin - POCTD
23	RC4/SDI/SDA	4 th pin - POCTC or Serial Data in pin
24	RC5/SDO	5 th pin - POCTC or Serial Data Out pin
25	RC6/Tx/CK	6 th pin - POCTC or Transmitter pin of Microcontroller
26	RC7/Rx/DT	7 th pin - POCTC or Receiver pin of Microcontroller
27	RD4/PSP4	4 th pin - POCTD
28	RD5/PSP5	5 th pin - POCTD
29	RD6/PSP6	6 th pin - POCTD
30	RD7/PSP7	7 th pin - POCTD
31	Vss	Positive pin -MCU (+5V)
32	Vdd	Ground pin - MCU
33	RB0/INT	0 th pin - POCTB or External Interrupt pin
34	RB1	1 st pin - POCTB
35	RB2	2 nd pin - POCTB
36	RB3/PGM	3 rd pin - POCTB or Logged in to programmer

37	RB4	4 th pin - POCTB
38	RB5	5 th pin - POCTB
39	RB6/PGC	6 th pin - POCTB or Logged in to programmer
40	RB7/PGD	7 th pin - POCTB or Logged in to programmer

Table 4.2: Detailed Features of PIC16F877A[6]

CPU	8-bit PIC
Architecture	8
Program Memory Size (Kbytes)	14
RAM (bytes)	368
EEPROM/HEF	256/HEF
Pin Count	40
Max. CPU Speed (MHz)	20
Peripheral Pin select (PPS)	No
Internal Oscillator	No
No. Of comparators	2
No. Of Operational Amplifier	0
No. Of ADC channels	14
Max ADC Resolution (bits)	10
ADC with Computation	No
Number of DAC Converter	0
Max DAC resolution	0
Internal Voltage Reference	Yes
Zero Cross Detect	No
No. Of 8-bit timers	2
No. Of 16-bit Timers	1

Signal Measurement Timer	0
Hardware Limit Timer	0
No. Of PWM outputs	0
Max PWM resolution	10
Angular Timer	No
Math Accelerator	No
No. Of UART module	1
No. Of SPI Module	1
No. Of I2C module	1
No. Of USB Module	0
Windowed Watchdog Timer (WWDT)	No
CRC/Scan	No
Numerically Controlled Oscillator	0
Cap. Touch Channels	11
Segment LCD	0
Minimum Operating Temperature (*C)	-40
Maximum Operating Temperature (*C)	125
Minimum Operating Voltage (V)	2
Maximum Operating Voltage (V)	5.5
High Voltage Capable	No

4.2.1 ADC - PIC16F877A

In PIC16F877A, the built-in ADC 10-bit approximation is doubled by 8 input pins. A / D is equipped for low and high voltage compare inputs, RA2 or RA3 VDD and VSS mixes. The resolution of Pic16f877a ADC with 5v as the Vref is as follows:

ADC Resolution = $V_{ref} (2^{10}-1) = 5/1023 = 0,004887 = 4,887\text{mv/s ADC Resolution}[7]$

The following table shows that the ADC pins are multiplied by other GPIO pins.

You should set the corresponding ACON1 register to allow the ADC pin.

When an ADC function is chosen, the ADC input is isolated from the other digital signals

Table 4.3: ADC Pin Configuration[7]

ADC Channel	PIN of PIC16f877a	Feature of pin
0	RA0	AN0
1	RA1	AN1
2	RA2	AN2/VREF-
3	RA3	AN3/VREF+
4	RA5	AN4
2	RE0	AN5
3	RE1	AN6
4	RE2	AN7

Table 4.4: ADC Register

ADC Register	Summary
ADCON0	To turn ON the ADC,select the sampling freq and also Start the conversion.

ADCON1	The gpio pins are for ADC configuration
ADRESH	Takes the larger ADC outcome byte
ADRESL	Holds the lowest ADC outcome byte

4.2.2 USART - PIC16F877A

Installed in the USART which can be used for synchronous communication is provided with the PIC16F877A. USART is a two-wire data flow networking system. USART is also a complete duplex communication and can be used in simultaneous communication with Peripheral machines include CRT and desktop computers.[6]

The USART can be customised in the following modes:

- Asynchronous (full-duplex)
- Synchronous - Master (half-duplex)
- Synchronous - Slave (half-duplex)

4.3 PIR SENSOR

PIR represents a radial pyroelectric or passive infrared sensor. PIR stands for PIR. PIR is an electronic sensor which measures infrared light variations over a certain distance in response to a sensed IR signal at its output. Any infrasound emitting objects such as people and animals can be detected when it is the sensor range or when it is out, or moving in the sensor range. A sensitive infrared (ir) crystal is divided into 2 areas of the pirated sensor module processing circuit

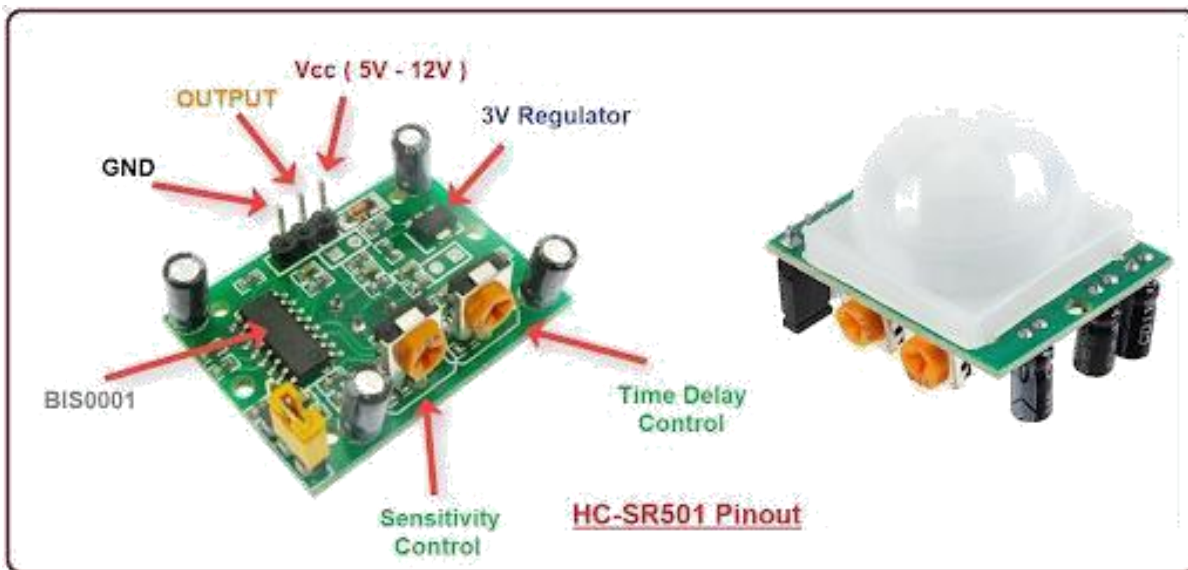


Fig 4.2 :PIR Sensor

The sensing activity of a pyroelectric infrared sensor is determined by the property or feature which changes the polarization of the material when the temperature changes occur. These sensors use a double or couple of sensors to sensor IR signals in two stages, ensuring that the unintended temperature fluctuations within the current EMI phase are cancelled. This two-step sensing method increases overall sensor stability and only allows IR signals to be detected from human presence.

Range of sensitivity:

Detector field angle is approximately 110°. A stick is used to change sensitivity; we can differ perpendicular to sensor from 3 meters to 7 meters. When we pass both sides of the electrode, the sensitivity decreases.

Operating Temperature:

The working temperature of the HC-SR501 is remarkable, from -15 to +70°C.

Quiescent current:

When the sensor detects movement or is idle, the Quiescent current is the power absorbed from the supply. It uses less than 50 uA, making it easy to battery the sensor.

4.3.1 Internal Layout

A few serial IR sensing components can be seen on the left. A small IR signal amplifier is connected to the upper end of the series at the door of the integrated FET. The Rg pull-down resistor provides the necessary zero standby logic of the FET in the absence of an IR signal to hold the OFF fully off.

If the pair of sensing elements detects a moving IR signal, a pair of low logic signals is produced, as discussed above. The FET correctly amplify these pulses and repeat them through an attached circuit at its output pin for further processing.

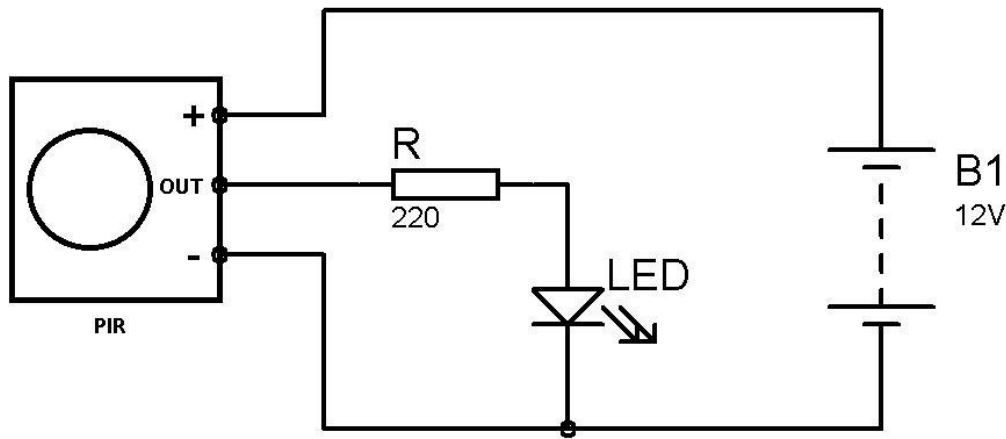


Fig 4.3: Internal Layout of PIR Sensor

4.4 Seismic Sensor

This circuit simulates a vibration/sound seismic tracker. It is highly sensitive and can sense vibration triggered by animal or human activity. It may be used for monitoring the entry in secured areas of unauthorised persons and animals. The circuit uses open components and a direct layout. For detecting vibrations/sounds because of pressure shifts, a conventional piezo sensor is used. The piezo factor functions as a small condenser with a few nano farads capacitance. Like a condenser, it can hold charges while its terminals have a potential. When disturbed, it

discharges through VR1.

For the testing of impact force, the vibration sensor is used. It has a high sensitivity to vibration measurement and a good potential to intervene in the atmosphere for signal suppression. When force is deployed over a crystal, a corresponding output is generated. The vibration sensor operates according to the patch electric effect theory. This performance is amplified in vibration sensors and is used.

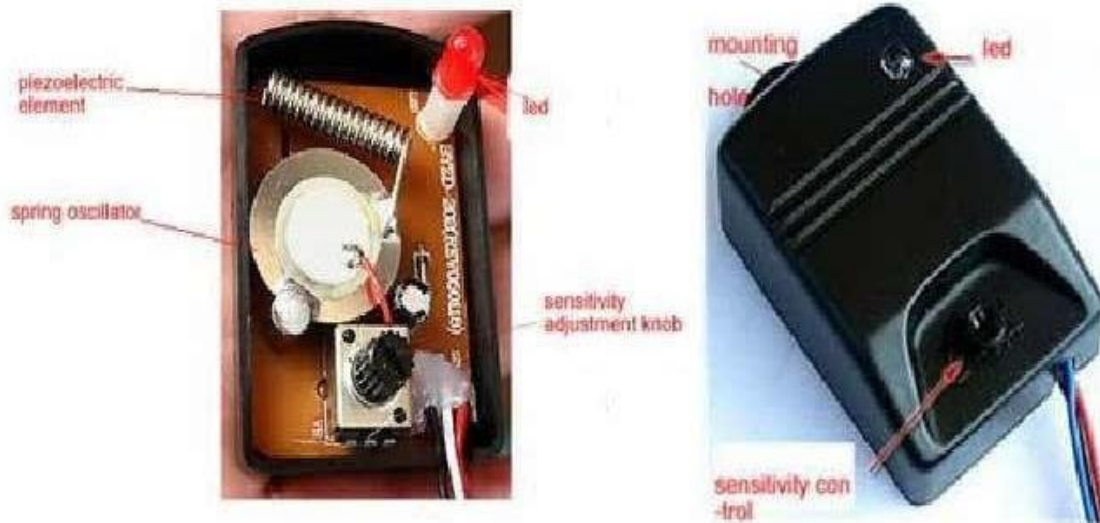


Fig 4.4 : Seismic sensor

It includes a piezo electrical part, a spring oscillator, and a sensitivity control button and an LED. We may control the nob to change the sensitivity, on the other hand, it decreases and the output warning signalling open-collector output transistor mode, you can connect directly to MCU with this sensor. The white line will be linked to the MCU's wireless I/O and upload code. Fix first the port and output pull-up resistor for the DC 12V as"1"(high) Set the MCU'S port as"1"(high) first and the output DC 12V pull-up resistor. If the vibratory signal is detected by the sensor, Q1 can break through. Drop the voltage between 12 and 0.1v and drop down the line up to 0.8v, though low voltage can be detected by MCU.

4.4.1 Specifications

- Power requirements: DC 12V

- Device type: Solid-state fan-wide control unit
- Operating temperature: 30C - 65C
- Dimensions: 45mm*38mm*20mm

4.5 HUMIDITY SESNOR

A humidity sensor are sensors, checks and moisture and temperature registered (or hygrometer). The air moisture ratio to maximum humidity at a given air temperature is known as a relative humidity. When looking for warmth, relative moisture becomes a critical factor.

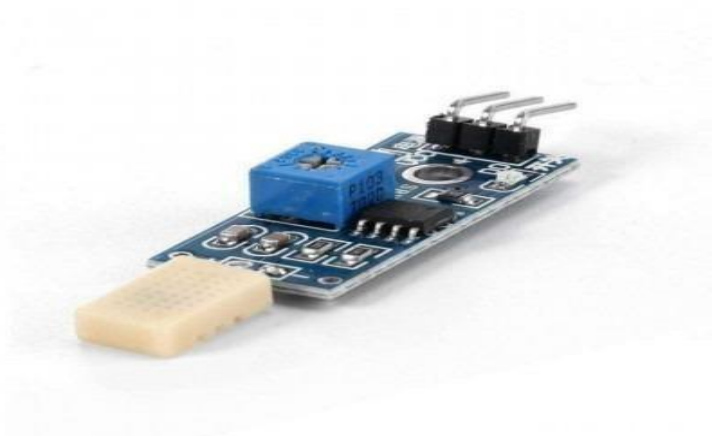


Fig : 4.5: Humidity sensor

Moisture sensors work by sensing variations that affect electrical currents or air temperature. There are three different moisture sensors. The sensors detect minute changes to air to determine moisture in the air.

- **Capacitive**

The electrical phenomenon humidness detector tests ratio by inserting a skinny strip of metal chemical compound between 2 electrodes. Metal oxide's electronic potential depends on ratio within the atmosphere. Climate, enterprise and industry are the primary areas of use. Relatively high humidity between 0 and 100 percent can be calculated using linear capacitive sensors. The capture here is a complex circuit and regular tuning. However, planners find it less difficult to precisely quantify and track atmospheric and process measurements. This are the only full-range relative moisture measuring devices down to 0% relative humidity.

- **Resistive**

For calculating the atomic impedance, resistive moisture metres use ions in salts. When moisture improves, electrode resistance rises from either side of the salt medium.

- **Thermal**

Resistive humidity metres use ions in salts to calculate atomic impedance. The resistance of the electrodes on either side of the salt medium increases with changes in humidity.

Table: 4.5: Electrical specifications

Parameter	Min.	Typical	Max.	Unit
Accuracy (25°C)	0	±4	0	%RH
Accuracy (0-50°C)	0	0	±5	%RH
Measurement range (25°C)	20	0	95	%RH
Response time: 1/e (63%) 25°C, 1m/s air	6	10	15	S

4.6 VIBRATION SENSOR

The vibration sensor is the measurement mechanism, machine or part of a given system, which measures the volume and frequency of the vibration. Such tests can be used to detect imbalances or other asset problems and to predict future failures.



fig:4.6: vibration sensor

Either the vibration sensor is directly connected to an asset, or wirelessly monitored. Once mounted, vibrations are detected from the asset through different methods based on the sensor type (more on that below). Over time, two forms of data will be received from the device:

- **Frequency**

The frequency or the occurrence of vibration is the first form of data. You can detect root causes by detecting when vibration spikes occur in a specific asset.

- **Intensity**

The second data point you will get is the speed of the pulse as it happens. The greater the vibration from a component of the device, the higher the amplitude measurements. Depending on the context, the term 'frequency' is used differently. This is how many vibration peaks happen here. The wavelength of the vibration may also be referred to in other contexts (which might reflect in intensity measurements). When these two types of data are obtained, the CMMS records them as a reference point in the history of the asset. If defects exist, they reflect on history, and by matching current data with historical patterns, the device can forecast possible defects and malfunctions. This sensor module produces logical conditions depending on its vibration and external force. The capacitive moisture sensor checks relative moisture by placing between two electrodes a small strip of metal oxide. The electrical potential of metal oxide depends on relative atmospheric humidity.

4.6.1 Features of The Vibration Sensor

- SW-420 vibration sensor types normally closed
- Performance of the comparator, clean signal, decent waveform, powerful driving ability, 15 ma
- Output form: digital output switch (0 and 1)
- fastened fast hole, easy mounting

4.7 PCB- Printed Circuit Board

The microcontroller could be a device that may perform bound tasks within the memory of the programme betting on the program/code burnt. Relevant gadgets found in several different uses, such as automobile, medical, battery storage, cell-phone appliances, motor and power drives, USB and wireless, etc. Microcontrollers are unique tools. PCB architecture is one of the most renowned producers of microcontrollers. They have the huge range of 8bit, 16, 32bit, SMD, as well as whole kit microcontrollers. This board is designed as a microcontroller with PIC16F877A. AC and dc can supply the input to the board. It uses an oscillator for frequency generation. A UART protocol ensures serial correspondence. This board is particularly intended to interfaced with serial communication devices, relay boards, etc. for connecting digital or analogue sensor that has input voltage range 5 or 12VDC. Both LCD and pc will track the display. Data EEPROM is used for the saving of user-defined files. If a variable is specified, the variable's value is saved in the programme memory and in Data EEPROM. To connect with other peripheral computers, including serial EEPROM, A/D and change records, synchronous serial ports are used. Draft PCB.

They have two modes:

1. SPI Serial .Peripheral. Interface
2. 2- I2C Inter-Integrated Circuit



Fig 4.7: PIC assembled PCB

FEATURES:

- Input Supply: Ac or Dc (9 to 12v) • Digital display 8bit • RS232 output • Analog channel: five sensing element inputs • Frequency crystal: 4mHz

4.8 IOT BOARD

. IoT has developed wireless, micro and Internet technology convergence. The word "Internet of Everything" is also used. Lumisense IoT Board has been optimised for a number of online interface specifications with significant advantages such that the integral device manufacturer can efficiently, fast and easily extend internet connectivity to its applications.

The UART notifications and controls on the module's web site make it ideal for online wireless applications such as biomedical tracks, environmental sensors and mobile network sensor performances.

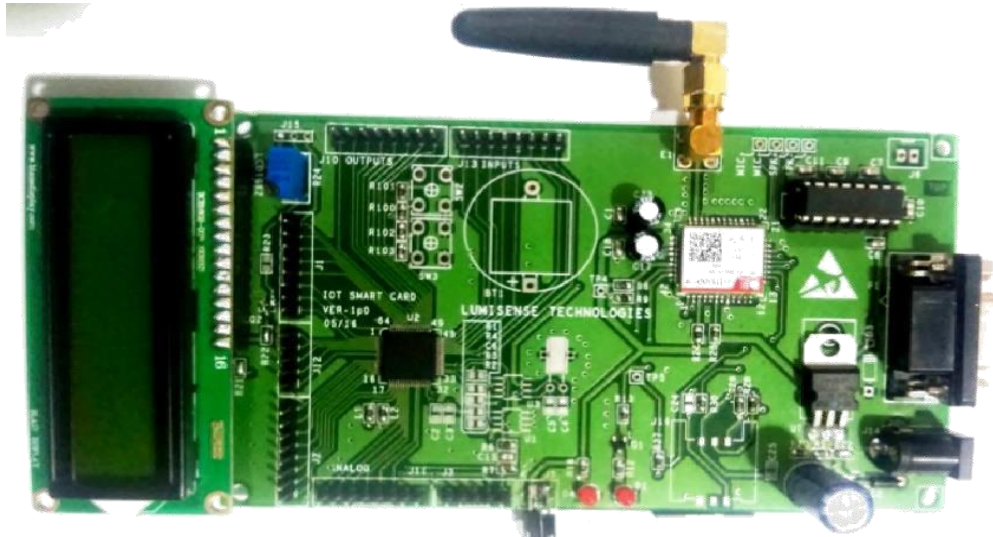


Fig 4.8 : lot Board

4.8.1 PIN Configuration

- J10- 8 Digital Outputs
- J11- 8 Channels ADC inputs
- J13- 8 Digital Inputs
- J1- Network Status LED
- J7- Power Supply out (+5v DC)

Input Specifications

Power Supply: DC +12v 1Amp.

Baud Rate : 9600

ADC : 0-5V DC Analog Input

Format : * message or Data # (Start with * and End with #)

Enter '\$' for help- you can get webpage details and control page of the board

- **Output Specifications**

Digital Output Port Pins: +5V DC

- **Features**

Dedicated Webpage and face book community page will be provided for every board.

Network connectivity status.

8 switched to control - 8 digital output pins available in the iot board.

4.9 LCD DISPLAY

Liquid crystal show stands for LCD. Many multinationals such as Philips Hitachi Panasonic are making their own LCDs to use in their devices. Either LCD'S feature is identical (special ASCII character display character numbers etc.). The 14 pins (0-13) or 16 pins are also set to use (0 to 15). In a wide variety of applications, alphanumeric displays like palmtop, word-processor, photocopying, terminal selling points, medical devices, mobile phone etc. are used. This is a designated LCD display. This is an E-blocks LCD display.

It is a 2-line alphanumeric 2-line LCD monitor with a 16-way D connector. The interface can thus be linked to most I/O ports of the e-block. The LCD monitor requires serial data which is detailed in the following user guide. A 5V power supply is also required for the show. Be careful not to exceed 5V because that causes system damage. The 5V is better generated from the E-blocks Multi or 5V fixed controlled power supply. A 16 x 2 clever alphanumeric dot matrix will represent a total of 224 characters and symbols.

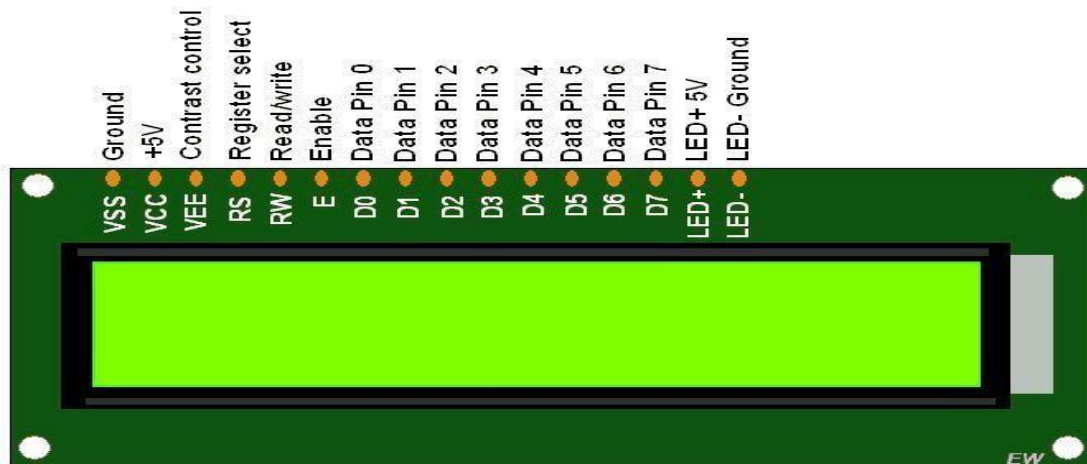


Fig 4.: 16*2 LCD display

4.9.1 Features

- Tension input: 5v
- Compliant e-blocks
- Costs are low
- Available in the e-building range for most I/O ports.
- Easier to use Flow language icons to build programming code[12]

4.10 BUZZER

A buzzer is a tiny but powerful part of our project/system to incorporate sound. It is an extremely small and lightweight 2-pin structure, and can also conveniently be used in the breadboard, on the PCB and also in PCBs.

Both styles are often accessible buzzers. The one here seen is an ordinary buzzer with a Continuous Beeeeep... sound when driven, the other kind is called a readymade buzzer that looks larger and produces a beep. Beep. Beep. Beep. Beep. Beep. Beep. Sound because of the internal circuit inside it. However, the one seen here is used most often because it can be conveniently adapted to our application with the aid of other circuits. This buzzer can be used easily by charging it with a 4V to 9V DC power supply. It can also use a basic 9V battery, but the regulated supply of +5V or +6V DC is preferred. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval. Usually, the buzzer is paired with an interval to turn on or off the buzzer at the appropriate moment.

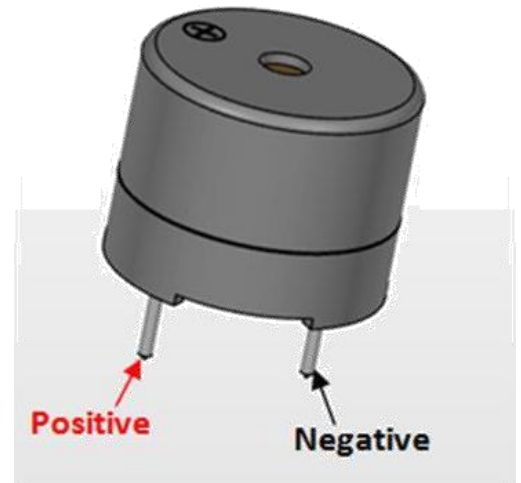


Fig 4.10: Active passive buzzer

4.10.1 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

Table 4.5: Buzzer Pin Configuration

Pin Number	Pin Name	Description
1	Positive	Identified by (+) symbol or longer terminal lead. Can be powered by 6V DC
2	Negative	Identified by short terminal lead. Typically connected to the ground of the circuit

4.11 POWER SUPPLY

The supply of power is a reference to an electricity source. A power supply unit or a PSU is a device or system providing electric power or other energy for the output load or load group. The word is most often used for electricity, less often mechanical, and occasionally for other supplies.[13]

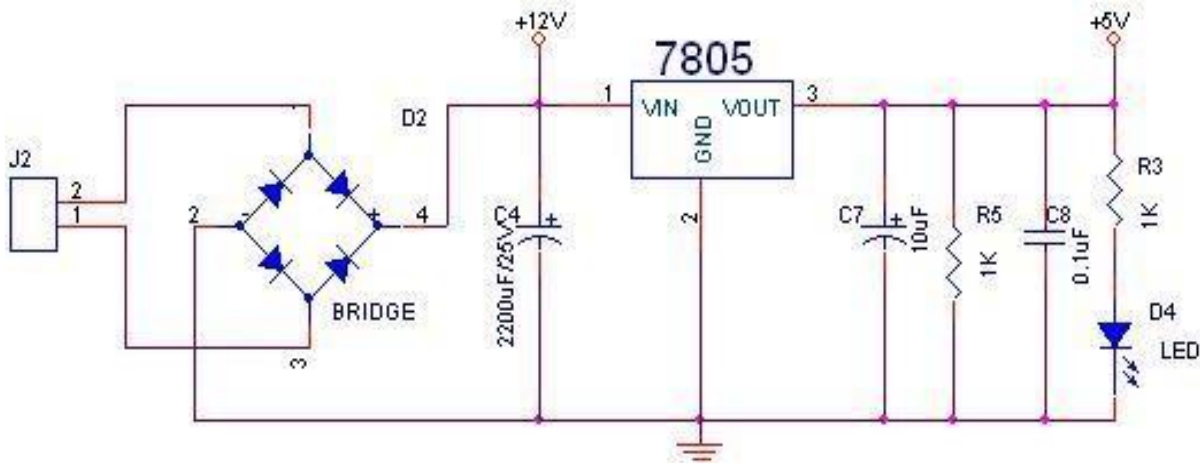


Fig 4.11: Power Supply

A 230v, 50Hz AC single phase power transformer is provided to supply 12V. This voltage is converted with a Bridge Rectifier to DC voltage. The pulse voltage is filtered through a condenser of 2200uf and then sent to a voltage control unit 7805 to achieve a constant supply of 5v. Both components in the circuit are supplied with this 5V supply. To discharge all the condensers quickly, an RC time constant circuit is added. A LED is attached for indication purposes to ensure the power supply.

4.12 NODE MCU

ESP-12E module containing ESP8266 chip, with the Tensilica Xtensa 32-bit LX106 RISC microprocessor, is included on the Node MCU ESP8266 development board. It supports RTOS and operates in a clock frequency from 80 to 160 MHz. NodeMCU's Flash memory stores data and programmes with 128 KB of RAM. Their high processing capacity is suitable for IoT ventures with built-in WI-FI / Bluetooth and deep sleep operations features.

Micro USB jack and VIN pin can be used to power NodeMCU (External Supply Pin). The UART, SPI and I2C interface are supported.[8]

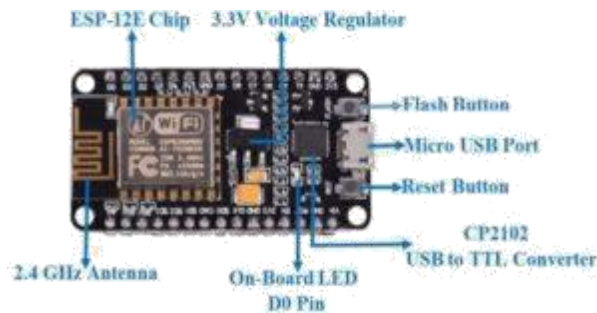


Fig 4.12: Node Mcu

4.13 SOFTWARE REQUIREMENTS

- Embedded C
- MPLAB IDE

4.14 EMBEDDED C

The most common use to programme the microcontroller is an embedded C language. It is the soul of each embedded device and of the processor.[9] The programme is embedded in all processors. The first part is the built-in software, which decides how the embedded system works. It is designed to run on an application in particular.

Embedded c which works with limited resources such as RAM, ROM and programme memory on microcontrollers. The system-dependent file that is compiled when c is compiled, but only on microcontrollers executes the integrated c-Code. Main microchip microcontroller is PIC16F877A.[9]

4.15 MPLAB IDE

MPLAB IDE is a Windows Operating System (OS) software programme used to build microcontroller and optical signal controller applications on a PC.MPLAB IDE is running on MS Windows as a 32-bit programme that is simple to use and provides a free software component to build and debug quickly.

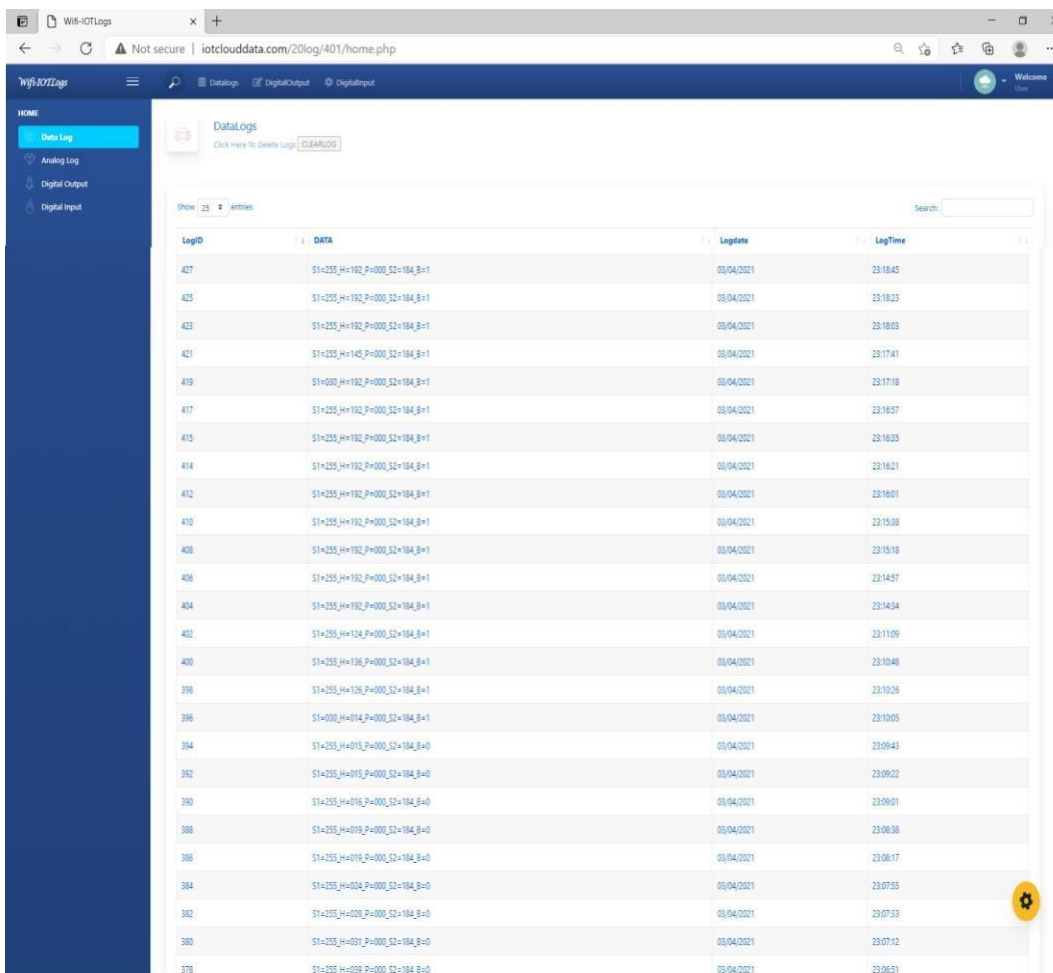
MPLAB IDE also behaves as seamless, graphical user interface for more software and hardware development tools from Microchip and third parties. It is a snap between tools, and upgrades to hardware debug and programming instruments are made in flash from the free software simulation, as MPLAB IDE contains the same user interface for all tools.

It includes a project manager which integrates and communicates between IDE and language tools, text editors, assembled object code converters and programme simulation Simulator for the editing or writing of programmes. For reliable programmes, it offers a versatile and rapidly changing world.[10]

CHAPTER-5 RESULT

RESULT

There are four sensors on the ground floor in the planned measuring setup. The sensors are initially configured by the calibration and rotation of the surface in various fields. The machine then compares the threshold values calibrated. The contribution of the sensor from all four sensors is observed on the LCD. SIM900 GPRS modem for the processing of all UART input Data based on GPRS that link to the Internet and is equipped with a system. Therefore, the land surface can be tracked on the webpage easily, quickly and in real time.



LogID	DATA	LogDate	LogTime
427	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:18:45
425	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:18:23
423	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:18:03
421	S1=255,H=145,P=000,S2=184,B=1	03/04/2021	23:17:41
419	S1=000,H=182,P=000,S2=184,B=1	03/04/2021	23:17:18
417	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:16:57
415	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:16:35
414	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:16:21
412	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:16:01
410	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:15:38
408	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:15:18
406	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:14:57
404	S1=255,H=182,P=000,S2=184,B=1	03/04/2021	23:14:34
402	S1=255,H=124,P=000,S2=184,B=1	03/04/2021	23:11:09
400	S1=255,H=136,P=000,S2=184,B=1	03/04/2021	23:10:48
398	S1=255,H=126,P=000,S2=184,B=1	03/04/2021	23:10:26
396	S1=000,H=014,P=000,S2=184,B=1	03/04/2021	23:10:05
394	S1=255,H=015,P=000,S2=184,B=0	03/04/2021	23:09:43
392	S1=255,H=015,P=000,S2=184,B=0	03/04/2021	23:09:22
390	S1=255,H=016,P=000,S2=184,B=0	03/04/2021	23:09:01
388	S1=255,H=016,P=000,S2=184,B=0	03/04/2021	23:08:38
386	S1=255,H=019,P=000,S2=184,B=0	03/04/2021	23:08:17
384	S1=255,H=004,P=000,S2=184,B=0	03/04/2021	23:07:55
382	S1=255,H=009,P=000,S2=184,B=0	03/04/2021	23:07:33
380	S1=255,H=001,P=000,S2=184,B=0	03/04/2021	23:07:12
378	S1=255,H=008,P=000,S2=184,B=0	03/04/2021	23:06:51

Fig :5: real time monitoring

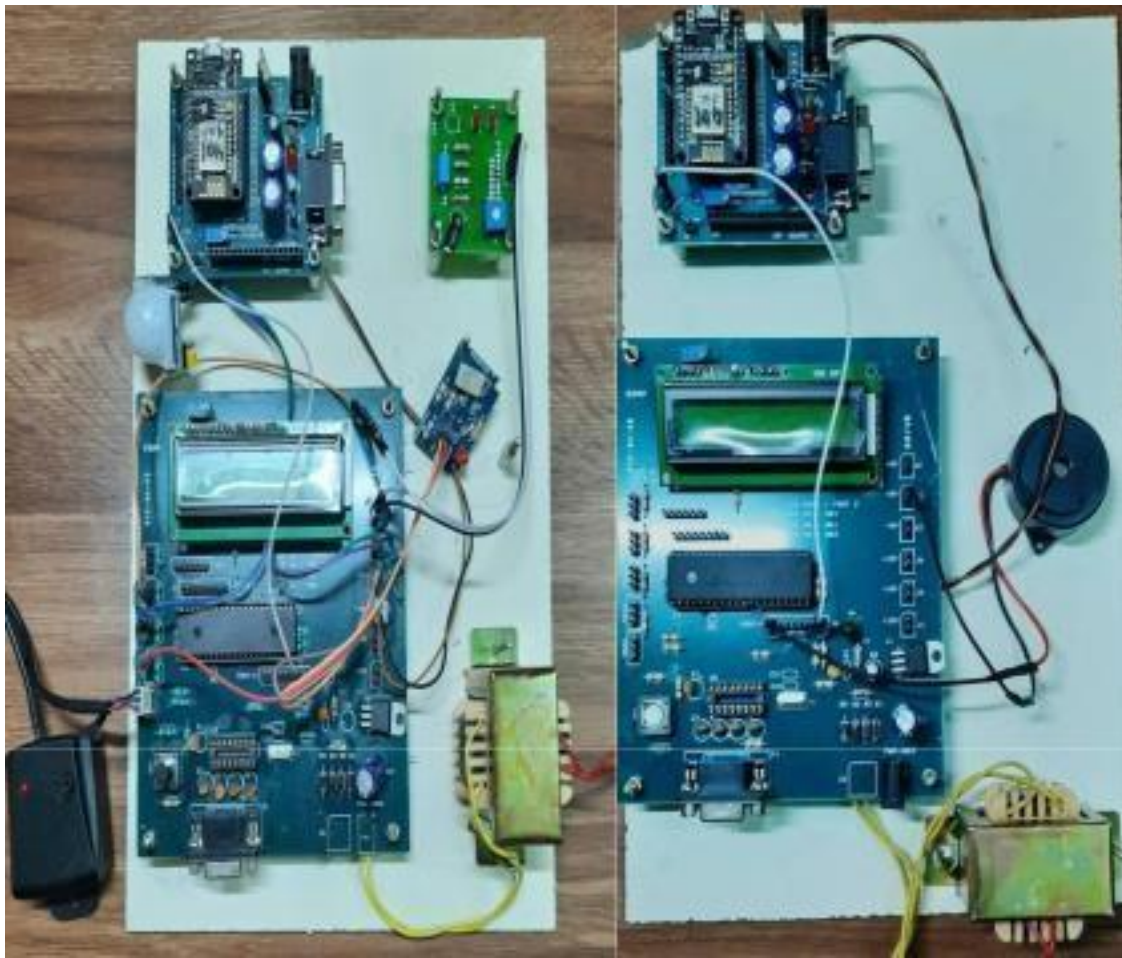


Fig : 5.1 transmitter and receiver section

CHAPTER-6 CONCLUSION

One of the most challenging areas of geophysical research currently available is the wireless earth slide sensor device using sensors. In hilly and mountainous areas landslides have become a big concern. Many people risk their lives and their homes due to the catastrophe of landslides and thunderstorms. It uses real-time tracking Mcu nodes interfaced with sensors, IOT and lcd computers. The data from these sensors is transmitted and the parameter state appears on LCD. The findings will then be provided with IOT support. Therefore, it is useful to use a sensor value for earth detection System to prevention of human loss before sliding.

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Plagiarisim Report

by Sarah P

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Submission ID: 1560844128

File name: landslide_report.docx (5.05M)

Word count: 5121

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CHAPTER 1

INTRODUCTION

A landslide is the downslope movement of a debris, rock mass or earth. During monsoons, rainwater percolates, causing water pressure that reaches the elastic limit of the soil or rocks. As a result, the pressure increases, causing the soil and rocks to loosen their elastic properties, resulting in landslides. They wreak havoc on agricultural and timber lands, as well as road traffic and the ecosystem as a whole, resulting in substantial human damage. Landslides also refers to any gravity-driven downward displacement of soil and rock. It results in personal injury, property damage, and death. It has a long-term negative effect on various of resources such as fisheries, water supplies, sewage disposal systems, roadways and dams. When hill slope becomes unstable condition, landslides occur. Many factors, together or separately, can cause changes in a slope's stability. Natural causes include groundwater pressure acting on destabilising the slope, river or ocean wave erosion at the bottom of slope, earthquakes adding loads to a barely stable slope, and earthquake-caused liquefaction destabilising slopes. Deforestation construction and cultivation, all of which destabilise the already fragile slopes, as well as vibrations from machinery, are examples of man-made causes. Landslides can be detected using data-driven methods using wireless sensor networks (WSN). The primary goal of studying landslide detection is to prevent natural disasters by detecting their early movement[11]. As a result, human losses from the avalanche would be minimised or eliminated. The aim is also to devise a method for the sensing elements to respond rapidly to rapid data changes and to send the sensed data to a data analysis centre. The proposed landslide detection and monitoring system based on WSN/Internet of Things (IoT) is low-cost, dependable, and efficient in terms of latency.[1]

1.1 BLOCK DIAGRAM

1.1.1 Transmitter Section

The functioning of the segment Sender and Recipient is:

Three sensor types including seismic sensor, PIR sensor, moisture sensor is used. The individual characteristics of each sensor are identical. The field is equipped with two seismic sensors. Moisture sensors monitor moisture levels in soils, so landslides occur often after heavy precipitation. Seismic sensors verify if there are waves in the earth. If this occurs, the buzzer immediately informs the surrounding areas about if a human is present at the slide sensor. These sensors transmit an analogue signal that is transformed into a digital signal with an ADC since the compiler which is HI-TECH C only

accepts a digital signal in the process. The signal is transmitted through a UART cable, which is then used for serial communication between peripheral systems, from where the information is transported onto the IoT.

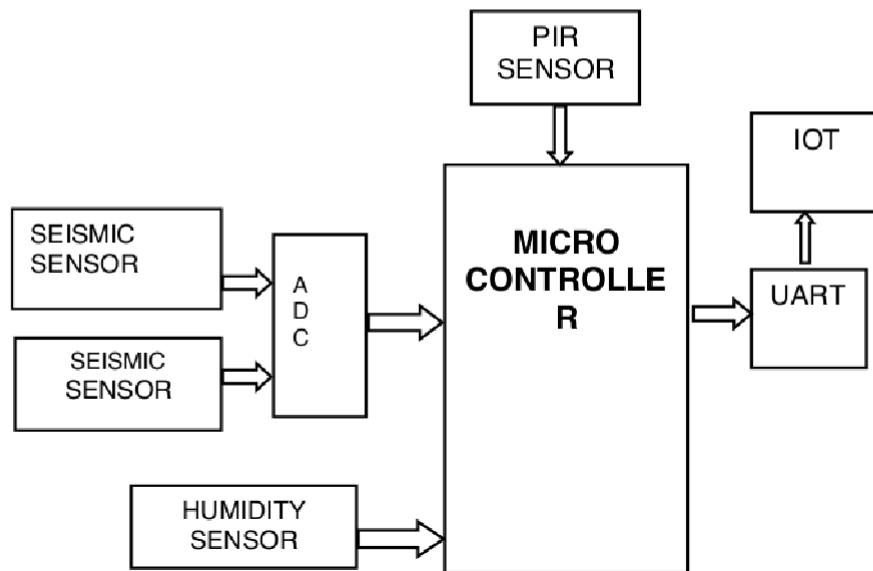


Fig: 1.1 : Block diagram of transmitter section

1.1.2 Receiver Section

The information gathered from the sensors is collected from ground section and transmitted to receiver section through IOT unit. SIM900 GPRS modem is being used in this. The data in the IoT is transmitted to the receiver end IoT through WIFI, where contact between the IoT and the microcontroller is achieved again with the help of a UART cable[1]. The output is displayed on the LCD screen, and a buzzer is triggered based on the information obtained.

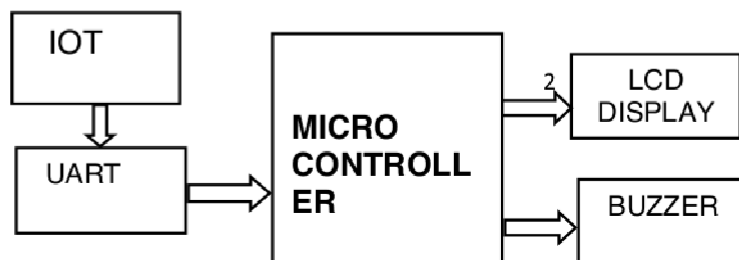


Fig: 1.2 : Block diagram of receiver section

1.2 PROBLEM DEFINITION

This project provides a solution to prevent landslides from causing damage to human lives and the destruction of properties. In the past few years, several solutions which provided a good deal of ideas on how to prevent landslides especially on steep slopes during rainfall. However, most of the solutions do not provide a beneficial and satisfactory result. To nullify this problem, in this system various sensors are used for detection. It uses a microcontroller that has a built-in ADC, from which the data is collected from the sensor. Then using the IOT module real-time monitoring of the sensor is done to compare the data and then alert the system accordingly.

CHAPTER 2

LITERATURE SURVEY

Adaptive Traffic Light Control of Multiple Intersections in WSN-Based ITS: Author: Binbin Zhou; Jiannong Cao; Hejun Wu[2]

Using data collected in real time by Wi-Fi networks to investigate adaptive traffic light regulation at various intersections (WSN). Previous studies focused on maximising green signal cycles in sequential traffic and neglected traffic quality and uniqueness. A multiintersection green light series based on real-time traffic is proposed in this article for adaptive traffic signals management (including traffic volume, waiting time, number of stops and stops, and vehicle density). The results of the simulation show that the three control methods are related to this system. The results of the simulation show that this system achieves greater efficiency, lower average times of waiting and a lower time of stop compared with the three control methods: The optimal control of a regulated and adaptive control is a fixed time.

Empirical prediction of packet transmission efficiency in bio-inspired Wireless Sensor Networks

Author: Ahmed F. Abdelzaher; Bhanu K. Kamapantula; Preetam Ghosh; Sajal K. Das[3]

This article deals with a three-band handheld antenna. The resonance frequency of the antenna is 3.6 GHz, 5.6 GHz and 7.9 GHz. The triple-band antenna architecture has been miniaturized here. Due to its rigid structure and failure type, the substratum used here is FR-4 Epocyc resin. For the three-band simulation and measurement results, the antenna produced a return loss of less than -10 dB. This antenna has a VSWR value lower than 2 and the gain is 0.86 dB. This antenna's sizes are 13.6×13.6 mm² such that a circular substratum is used here.

Comparative Assesmentes of IEEE ZigBee an 6lowpan for Power Industrial Wsns in Realistic Scenarios

Author: S. Nej and A. Ghosh

This article is about a Patch antenna of a microstrip This antenna is ideal in MIMO applications for an antenna which is electrically small in dimension, with a thin folded wire or zig-zag form of structure, the values simulated for this antenna in relation to direction, front to back and radiation patterning are considered to be satisfactory. The substrate used is the FR4 Epoxy resin with a permeability of 4,4 and thickness of 1,4 mm. The antenna has a compact wavelength of $0.375 \mu \times 0.375 \mu$, where μ is the wavelength of free space. A quadrangular substratum is used here. It would be ideal for MIMO applications because it is a small antenna design. [4]

Design of Meander Line Antenna for Wearable Applications

Author: E. Toscano, L. L. Bello

This paper provides a parallel review and comparative evaluation by using the protocols IEEE 802.15.4/Zig Bee and 6LoWPAN on individual testing benches. We have worked specially to ensure that we can allow a practical comparison of results to adjust the parameters of any protocol in a low-power mode to ensure that flow and fuel consumption measurements are comparable. Once the mechanism of change has been decided, the paper evaluates the performance of the protocol in the same network, workload and operation cycle. The distinction concentrates on the effect on network efficiency of low-energy mechanisms. The experimental assessment shows the benefits and drawbacks in low-power modes of the two protocols. [3]

Design an Application of Wireless Sensor Network Webserver Based On S3c2410 and ZigBee Protocol

AUTHOR: Jiang Yongping, Feng Zehao, Xu Du

The remote-control network is the focus of research in the field of application of wi-fi technology. ZigBee technology creates a vacuum in the field of low-cost wireless networking equipment. This paper deals with the introduction and deployment of the wireless network sensor server S3C2410 and ZigBee protocol. On this server it is possible to motor and monitor the remote object in real time. Hardware and applications are developed and key technologies implemented using B/S architecture and modular design approaches have been implemented. The B/S architecture and modular approaches for construction are employed as the key applying technologies. The server is stable and

scalable and can be used extensively in smart homes, surveillance networks, industrial controls and other areas. [4]

Smart Grid Initiative for Power Distribution Utility in India

AUTHOR: Arup Sinha; S. Neogi; R.N. Lahiri; S. Chowdhury; S. P. Chowdhury. Chakraborty[5]

The energy sector in India has undergone comprehensive changes since the 2003 "Electricity Act" was adopted in India, and electricity distribution companies are now being reformed to deal with regulatory changes to limit losses. Total technological and business improvement, stable power supply and energy efficiency Customer satisfaction improvement and market rationalisation for energy. In addition to the reorganisation and spin-off of the electricity market, "in-smart grid" technology is also needed to increase the distribution network's operational and technological reliability to meet the growing online energy demand of India. Domestic brutal commodity. Intelligent grids are complicated. New communications and control systems are used to provide digitally enhanced power systems with greater robustness, reliability and durability than existing power systems. The intelligent grid affects all electricity components, especially in the distribution stage. Smart metering/advanced measuring technology (AMI) etc. is one branch of smart grids. Both nodes must be interconnected in an intelligent network to exchange data as needed. In addition to giving users the opportunity and encouragement to join networks, the Smart Grid platform gives customers the option to decide their time and volume of power usage based on electricity prices. Network, energy efficiency improvement and adaptation of both energy generation and storage choices. In the intelligent grid, different properties like self-healing and adaptability are also envisaged. The product and technology portfolio of Smart Grid helps maximise device uptime, while allowing the utility to recover home and business electricity faster in the case of an interruption. In order to allow smart grid technologies inside Indian power distribution companies as part of its strategy to cater for smart grids in developing countries, India's Government recently formed a Smart Grid and Smart Grid Working Group. Demands like the US, Europe and so on. [5]

CHAPTER 3

AIM AND SCOPE OF PRESENT INVESTIGATION

3.1 EXISTING SYSTEM

The geographic distribution of landslides has been recorded to be very heterogeneous in some parts of countries, with areas of high incidence. At the time of a landslide, some countries were in charge of raising public consciousness and training in preventive systems, but this was not sufficient. A sliding field review is currently carried out to evaluate movement by using photographic instruments, such as Synthetic Aperture Radar (SAR), region-screening and movement checks, as there is no immediate reaction on the floors or surroundings in order to avoid these kinds of disasters.

3.2 DISADVANTAGES

- Real time monitoring is difficult
- Create more Accidents
- Loss of human life

3.3 PROPOSED SYSTEM

The purpose of the landslide monitoring system is to detect dangerous pitch changes in the early stages. When the pitch deformation is detected before the collapse, a possible earthquake is immediately notified by the system. Available for detailed diagnosis of sloping movement, the related measuring values collected from the slope are constantly kept. [6] We use embedded sensors here to locate the ruts. In the field segment there are two seismic sensors. Moisture sensors monitor soils' moisture levels, because landslides occur often in heavy rainfall. Seismic sensors will immediately warn surrounding areas to land slide detection if any movements are present on the ground floor if the buzzer occurs. All this information is collected from the ground area and transmitted via the IOT device to the receiver portion. PIR sensor controls any person's presence at the site. We can remotely monitor the sensor values via the IOT on a web server. Forest representatives can track the incidents and avoid loss of life

3.4 ADVANTAGES

- Prevent more accidents
- Ensure more safety on peoples who is living hills area
- Prevent human losses

3.5 PROBLEM DEFINITION

This project offers a way of avoiding landslides that harm human life and destroy buildings. In recent years, a number of solutions have given a number of ideas about how landslides can be prevented, especially in steep slopes during precipitation. But the most advantageous and satisfactory results are not seen in most remedies. In this device, various sensor types are used for detection, to overcome this issue. It uses an ADC-built microcontroller that collects data from the sensor. Then using the IOT module real-time monitoring of the sensor is done to compare the data and then alert the system accordingly.

CHAPTER 4

EXPERIMENTAL MATERIALS AND METHOD

4.1 HARDWARE REQUIREMENTS

- Micro Controller (PIC16F877A)
- ADC
- USART
- Seismic Sensor
- Humidity Sensor
- PIR Sensor
- LCD Display
- Buzzer
- IoT Board

4.2 MICROCONTROLLER (PIC16F877A)

The CMOS FLASH 8-bit microcontroller picks Microchips strong PIC architecture into a bundle of 40 PIC16C5X compatible, PIC12CXX and 16C7X PIC compatible . It's powerful, but simple to programme (only 35 single-word instructions). The PIC16F877A comprises 256 bytes of EEPROM data memory, a Self-Programming, a 3 Wire Serial Peripheral Interface (SAPI) and a Universal Assynchronous Receiver Sending Operator and a two Wire interintegrated circuit (I2CTM). This synchronous serial port can be configured using a three-wire Serial Peripheral Interface (SPITM) (USART).

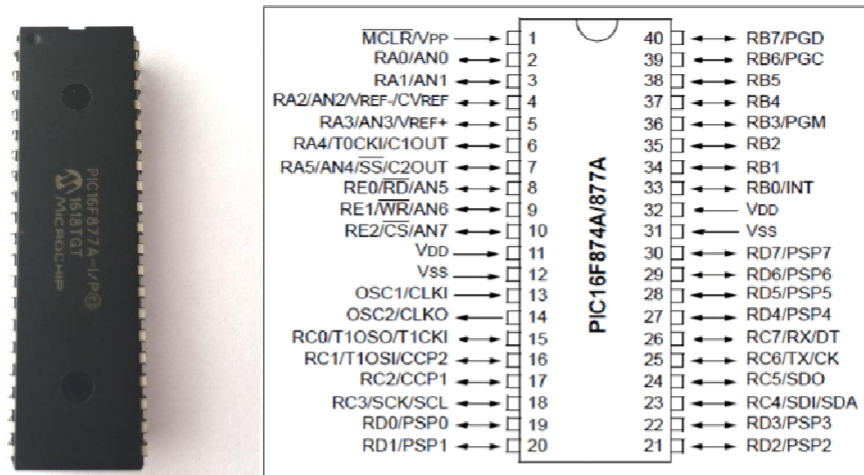


Fig: 4.1: PIC16F877A Microcontroller and Pin diagram

4.2.1 ADC - PIC16F877A

In PIC16F877A, the built-in ADC 10-bit approximation is doubled by 8 input pins. A / D is equipped for low and high voltage compare inputs, RA2 or RA3 VDD and VSS mixes. The resolution of Pic16f877a ADC with 5v as the Vref is as follows:

$$\text{ADC Resolution} = \frac{V_{\text{ref}}}{2^N - 1} = \frac{5}{1023} = 0.004887 = 4.887 \text{mv/s ADC Resolution}[7]$$

The following table shows that the ADC pins are multiplied by other GPIO pins.

You should set the corresponding ACON1 register to allow the ADC pin.

When an ADC function is chosen, the ADC input is isolated from the other digital signals

4.2.2 USART - PIC16F877A

Installed in the USART which can be used for synchronous communication is provided with the PIC16F877A. USART is a two-wire data flow networking system. USART is also a complete duplex communication and can be used in simultaneous communication with Peripheral machines include CRT and desktop computers.[6]

USART can be customised in the following modes:

- Asynchronous (full-duplex)
- Synchronous – Slave (half-duplex)
- Synchronous – Master (half-duplex)

4.3 PIR SENSOR

PIR represents a radial pyroelectric or passive infrared sensor. PIR stands for PIR. PIR is an electronic sensor which measures infrared light variations over a certain distance in response to a sensed IR signal at its output. Any infrasound emitting objects such as people and animals can be detected when it is the sensor range or when it is out, or moving in the sensor range. A sensitive infrared (ir) crystal is divided into 2 areas of the pirated sensor module processing circuit

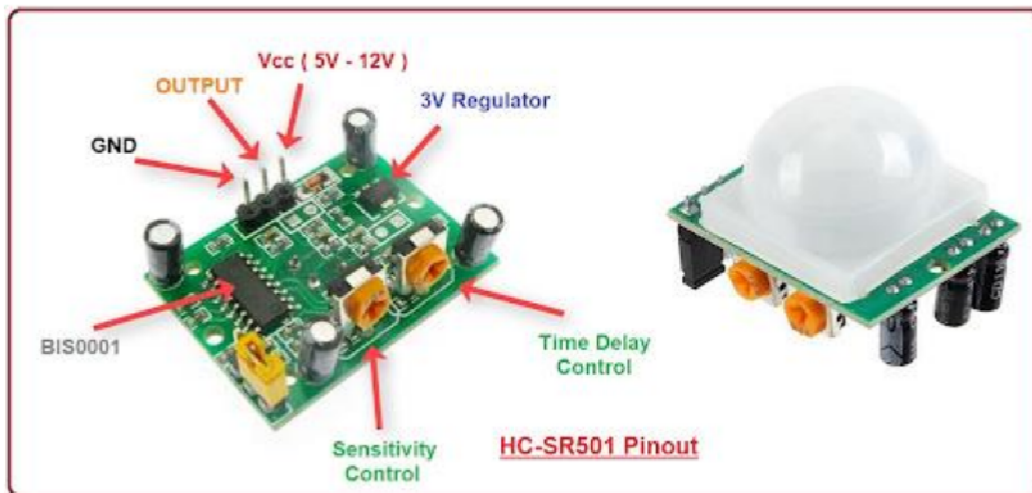


Fig 4.2 :PIR Sensor

The sensing activity of a pyroelectric infrared sensor is determined by the property or feature which changes the polarization of the material when the temperature changes occur. These sensors use a double or couple of sensors to sensor IR signals in two stages, ensuring that the unintended temperature fluctuations within the current EMI phase are cancelled. This two-step sensing method increases overall sensor stability and only allows IR signals to be detected from human presence.

Range of sensitivity:

Detector field angle is approximately 110° . A stick is used to change sensitivity; we can differ perpendicular to sensor from 3 meters to 7 meters. When we pass both sides of the electrode, the sensitivity decreases.

Operating Temperature:

The working temperature of the HC-SR501 is remarkable, from -15 to $+70^\circ\text{C}$.

Quiescent current:

When the sensor detects movement or is idle, the Quiescent current is the power absorbed from the supply. It uses less than $50\text{ }\mu\text{A}$, making it easy to battery the sensor.

4.3.1 Internal Layout

A few serial IR sensing components can be seen on the left. A small IR signal amplifier is connected to the upper end of the series at the door of the integrated FET. The R_g pull-down resistor provides the necessary zero standby logic of the FET in the absence of an IR signal to hold the OFF fully off.

If the pair of sensing elements detects a moving IR signal, a pair of low logic signals is produced, as discussed above. The FET correctly amplifies these pulses and repeats them through an attached circuit at its output pin for further processing.

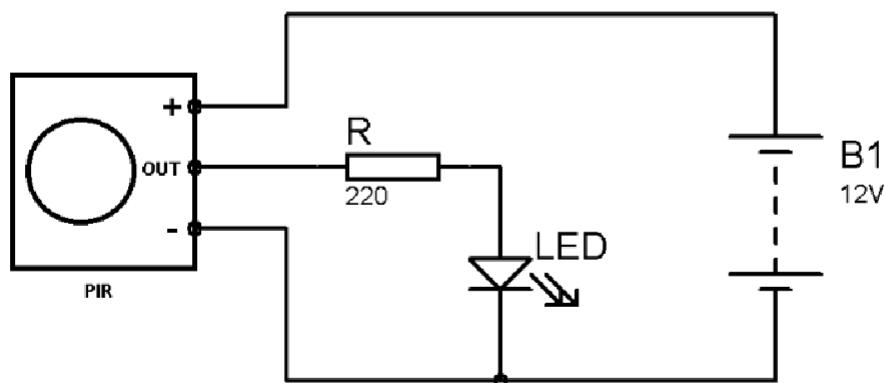


Fig 4.3: Internal Layout of PIR Sensor

4.4 Seismic Sensor

This circuit simulates a vibration/sound seismic tracker. It is highly sensitive and can sense vibration triggered by animal or human activity. It may be used for monitoring the entry in secured areas of unauthorised persons and animals. The circuit uses open components and a direct layout. For detecting vibrations/sounds because of pressure shifts, a conventional piezo sensor is used. The piezo factor functions as a small condenser with a few nano farads capacitance. Like a condenser, it can hold charges while its terminals have a potential. When disturbed, it discharges through VR1.

For the testing of impact force, the vibration sensor is used. It has a high sensitivity to vibration measurement and a good potential to intervene in the atmosphere for signal suppression. When force is deployed over a crystal, a corresponding output is generated. The vibration sensor operates according to the patch electric effect theory. This performance is amplified in vibration sensors and is used.



Fig 4.4 : Seismic sensor

It includes a piezo electrical part, a spring oscillator, and a sensitivity control button and an LED. We may control the nob to change the sensitivity, on the other hand, it decreases and the output warning signalling open-collector output transistor mode, you can connect directly to MCU with this sensor. The white line will be linked to the MCU's wireless I/O and upload code. Fix first the port and output pull-up resistor for the DC 12V as "1" (high) Set the MCU'S port as "1" (high) first and the output DC 12V pull-up resistor. If the vibratory signal is detected by the sensor, Q1 can break through. Drop the voltage between 12 and 0.1v and drop down the line up to 0.8v, though low voltage can be detected by MCU.

4.4.1 Specifications

- Power requirements: DC 12V
- Device type: Solid-state fang-wide control unit
- Operating temperature: 30C – 65C
- Dimensions: 45mm*38mm*20mm

4.5 HUMIDITY SESNOR

A humidity sensor are sensors, checks and moisture and temperature registered (or hygrometer). The air moisture ratio to maximum humidity at a given air temperature is known as a relative humidity. When looking for warmth, relative moisture becomes a critical factor.



Fig : 4.5: Humidity sensor

Moisture sensors work by sensing variations that affect electrical currents or air temperature. There are three different moisture sensors. The sensors detect minute changes to air to determine moisture in the air.

- **Capacitive**

The electrical phenomena humidity detector measures the ratio by placing a thin strip of metal chemical compound between two electrodes. Metal oxide's electronic potential depends on ratio within the atmosphere. Climate, enterprise and industry are the primary areas of use. Relatively high humidity between 0 and 100 percent can be calculated using linear capacitive sensors. The capture here is a complex circuit and regular tuning. However, planners find it less difficult to precisely quantify and track atmospheric and process measurements. This are the only full-range relative moisture measuring devices down to 0% relative humidity.

- **Thermal**

Ions in salts are used to measure atomic impedance in resistive humidity metres. The resistance of the electrodes on either side of the salt medium increases as humidity varies.

- **Resistive**

For calculating the atomic impedance, resistive moisture metres use ions in salts. When moisture improves, electrode resistance rises from either side of the salt medium.

4.6 VIBRATION SENSOR

The vibration sensor is the measurement mechanism, machine or part of a given system, which measures the volume and frequency of the vibration. Such tests can be used to detect imbalances or other asset problems and to predict future failures.



fig:4.6: vibration sensor

Either the vibration sensor is directly connected to an asset, or wirelessly monitored. Once mounted, vibrations are detected from the asset through different methods based on the sensor type (more on that below). Over time, two forms of data will be received from the device:

- **Frequency**

The frequency or the occurrence of vibration is the first form of data. You can detect root causes by detecting when vibration spikes occur in a specific asset.

- **Intensity**

The second data point you will get is the speed of the pulse as it happens. The greater the vibration from a component of the device, the higher the amplitude measurements. Depending on the context, the term 'frequency' is used differently. This is how many vibration peaks happen here. The wavelength of the vibration may also be referred to in other contexts (which might reflect in intensity measurements). When these two types of data are obtained, the CMMS records them as a reference point in the history of the asset. If defects exist, they reflect on history, and by matching current data with historical patterns, the device can forecast possible defects and malfunctions. This sensor module produces logical conditions depending on its vibration and external force. The capacitive moisture sensor checks relative moisture by placing between two electrodes a small strip of metal oxide. The electrical potential of metal oxide depends on relative atmospheric humidity.

4.6.1 Features of The Vibration Sensor

- SW-420 vibration sensor types normally closed
- Performance of the comparator, clean signal, decent waveform, powerful driving ability, 15 ma
- Output form: digital output switch (0 and 1)
- fastened fast hole, easy mounting

4.7 PCB- Printed Circuit Board

The microcontroller could be a device that may perform bound tasks within the memory of the programme betting on the program/code burnt. Relevant gadgets found in several different uses, such as automobile, medical, battery storage, cell-phone appliances, motor and power drives, USB and wireless, etc. Microcontrollers are unique tools. PCB architecture is one of the most renowned producers of microcontrollers. They have the huge range of 8bit, 16, 32bit, SMD, as well as whole kit microcontrollers. This board is designed as a microcontroller with PIC16F877A. AC and dc can supply the input to the board. It uses an oscillator for frequency generation. A UART protocol ensures serial correspondence. This board is particularly intended to interfaced with serial communication devices, relay boards, etc. for connecting digital or analogue sensor that has input voltage range 5 or 12VDC. Both LCD and pc will track the display. Data EEPROM is used for the saving of user-defined files. If a variable is specified, the variable's value is saved in the programme memory and in Data EEPROM. To connect with other peripheral computers, including serial EEPROM, A/D and change records, synchronous serial ports are used. Draft PCB.

They have two modes:

1. SPI Serial Peripheral Interface
2. 2- I2C Inter-Integrated Circuit

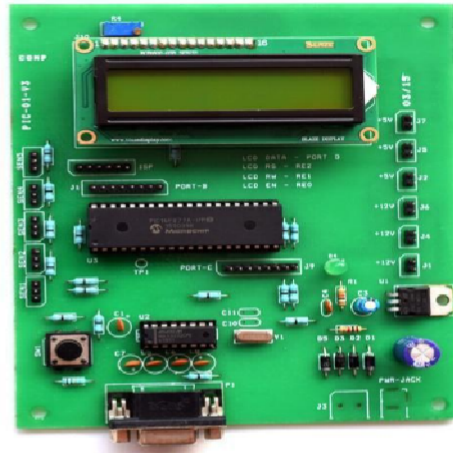


Fig 4.7: PIC assembled PCB

FEATURES:

- Input Supply: Ac or Dc (9 to 12v) • Digital display 8bit • RS232 output • Analog channel: five sensing element inputs • Frequency crystal: 4mHz

4.8 IOT BOARD

IoT has developed wireless, micro and Internet technology convergence. The word "Internet of Everything" is also used. Lumisense IoT Board has been optimised for a number of online interface specifications with significant advantages such that the integral device manufacturer can efficiently, fast and easily extend internet connectivity to its applications.

The UART notifications and controls on the module's web site make it ideal for online wireless applications such as environmental sensors ,biomedical tracks and mobile network sensor performances.

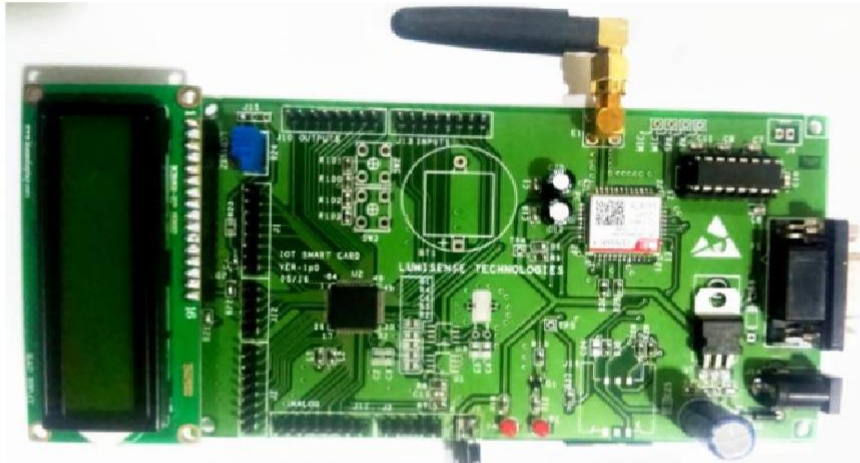


Fig 4.8 : lot Board

4.8.1 PIN Configuration

- J10- 8 Digital Outputs
- J11- 8 Channels ADC inputs
- J13- 8 Digital Inputs
- J1- Network Status LED
- J7- Power Supply out (+5v DC)

Input Specifications

Power Supply: DC +12v 1Amp.

Baud Rate : 9600

ADC : 0-5V DC Analog Input

Format : * message or Data # (Start with * and End with #)

Enter '\$' for help- you can get webpage details and control page of the board

- **Output Specifications**

Digital Output Port Pins: +5V DC

- **Features**

Each board will have its own website as well as a Facebook group page.

Network connection status.

8 switched to control - 8 digital output pins available in the iot board.

4.9 LCD DISPLAY

Liquid crystal show stands for LCD. Many multinationals such as Philips Hitachi Panasonic are making their own LCDs to use in their devices. Either LCD'S feature is identical (special ASCII character display character numbers etc.). The 14 pins (0-13) or 16 pins are also set to use (0 to 15). In a wide variety of applications, alphanumeric displays like palmtop, word-processor, photocopying, terminal selling points, medical devices, mobile phone etc. are used. This is a designated LCD display. This is an E-blocks LCD display.

It is a 2-line alphanumeric 2-line LCD monitor with a 16-way D connector. The interface can thus be linked to most I/O ports of the e-block. The LCD monitor requires serial data which is detailed in the following user guide. A 5V power supply is also required for the show. Be careful not to exceed 5V because that causes system damage. The 5V is better generated from the E-blocks Multi or 5V fixed controlled power supply. A 16 x 2 clever alphanumeric dot matrix will represent a total of 224 characters and symbols.

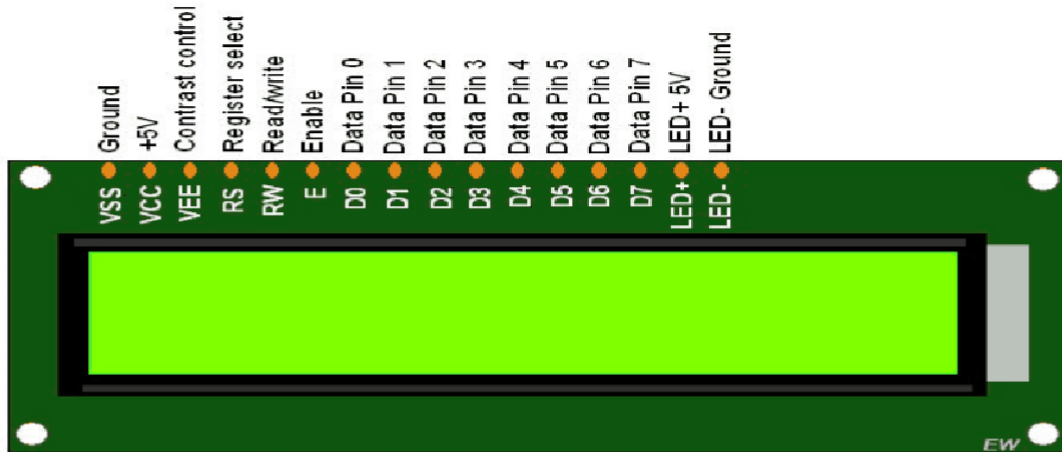


Fig 4.: 16*2 LCD display

4.9.1 Features

- Tension input: 5v
- Compliant e-blocks
- Costs are low
- Available in the e-building range for most I/O ports.
- Easier to use Flow language icons to build programming code[12]

4.10 BUZZER

A buzzer is a tiny but powerful part of our project/system to incorporate sound. It is an extremely small and lightweight 2-pin structure, and can also conveniently be used in the breadboard, on the PCB and also in PCBs.

Both types are often buzzers open. The other kind of pump is called a ready-made pump and looks bigger and creates a beep. The other one here is a normal pump, which has a bee... The sound if pushed. Beep. Beep. Beep. Beep. The inner circuit inside it sounds. The present one is more often

used, however, since with the help of other circuits it can be easily tailored to our use. The 4V to 9V DC power supply can be conveniently used when loading this buzzer. A basic 9V battery can be also used, but the +5V or +6V DC controlled supply is preferable. The buzzer is usually connected to a switching circuit that turns the buzzer on and off at predetermined times and intervals. Usually, the buzzer is paired with an interval to turn on or off the buzzer at the appropriate moment.

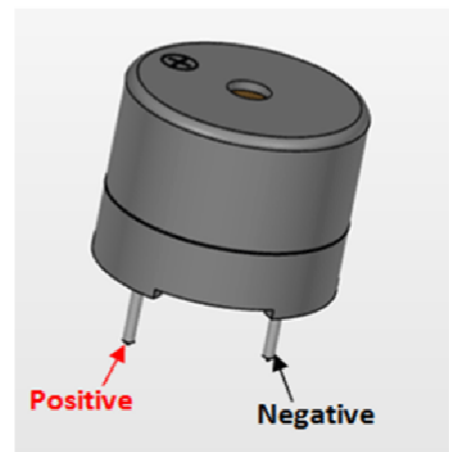


Fig 4.10: Active passive buzzer

4.10.1 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

Table 4.5: Buzzer Pin Configuration

Pin Number	Pin Name	Description
1	Positive	longer terminal lead or (+) and powered by 6V DC
2	Negative	short terminal lead and typically connected to the ground of the circuit

4.11 POWER SUPPLY

The supply of power is a reference to an electricity source. A power supply unit, also known as a PSU, is a system or device that supplies electric power or load group or other energy to an output load. The term is most often used for electricity, but it is also used for mechanical supplies and, on occasion, other materials. [13]

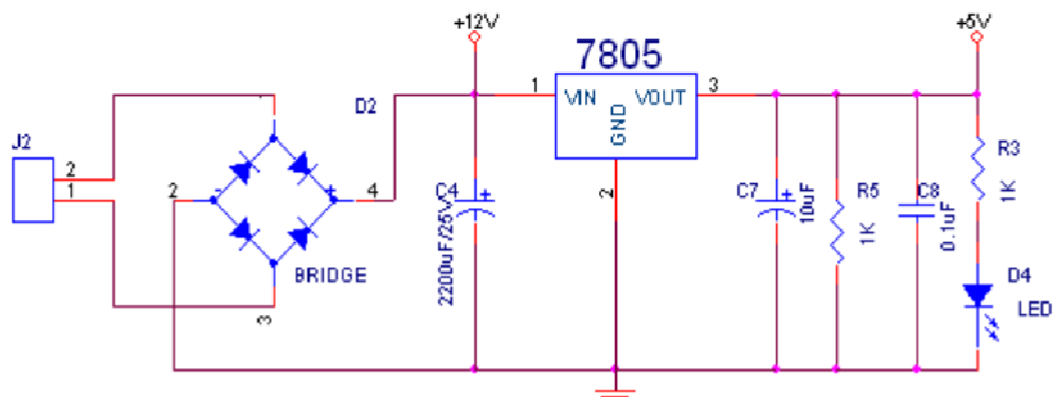


Fig 4.11: Power Supply

A 230v, 50Hz AC single phase power transformer is provided to supply 12V. This voltage is converted with a Bridge Rectifier to DC voltage. The pulse voltage is filtered through a condenser of 2200uF and then sent to a voltage control unit 7805 to achieve a constant supply of 5v. Both components in the circuit are supplied with this 5V supply. An RC time constant circuit is used to rapidly discharge all of the condensers. A LED is attached for indication purposes to ensure the power supply.

4.12 NODE MCU

The Node MCU ESP8266 production board includes ESP-12E module with a Tensilica Xtensa 32-bit LX106 RISC microprocessor and a ESP8266 chip. It supports RTOS and has a clock frequency range of 80 to 160 MHz. NodeMCU's Flash memory stores data and programmes with 128 KB of RAM. Their high processing capacity is suitable for IoT ventures with built-in WI-FI / Bluetooth and deep sleep operations features .[8]

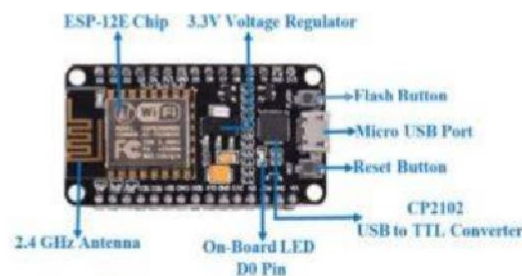


Fig 4.12: Node Mcu

4.13 SOFTWARE REQUIREMENTS

- Embedded C
- MPLAB IDE

4.14 EMBEDDED C

The most common use to programme the microcontroller is an embedded C language. It is the soul of each embedded device and of the processor.[9] The programme is embedded in all processors. The first part is the built-in software, which decides how the embedded system works. It is designed to run on an application in particular.

Embedded c which works with limited resources such as RAM, ROM and programme memory on microcontrollers. The system-dependent file that is compiled when c is compiled,

but only on microcontrollers executes the integrated c-Code. Main microchip microcontroller is PIC16F877A.[9]

4.15 MPLAB IDE

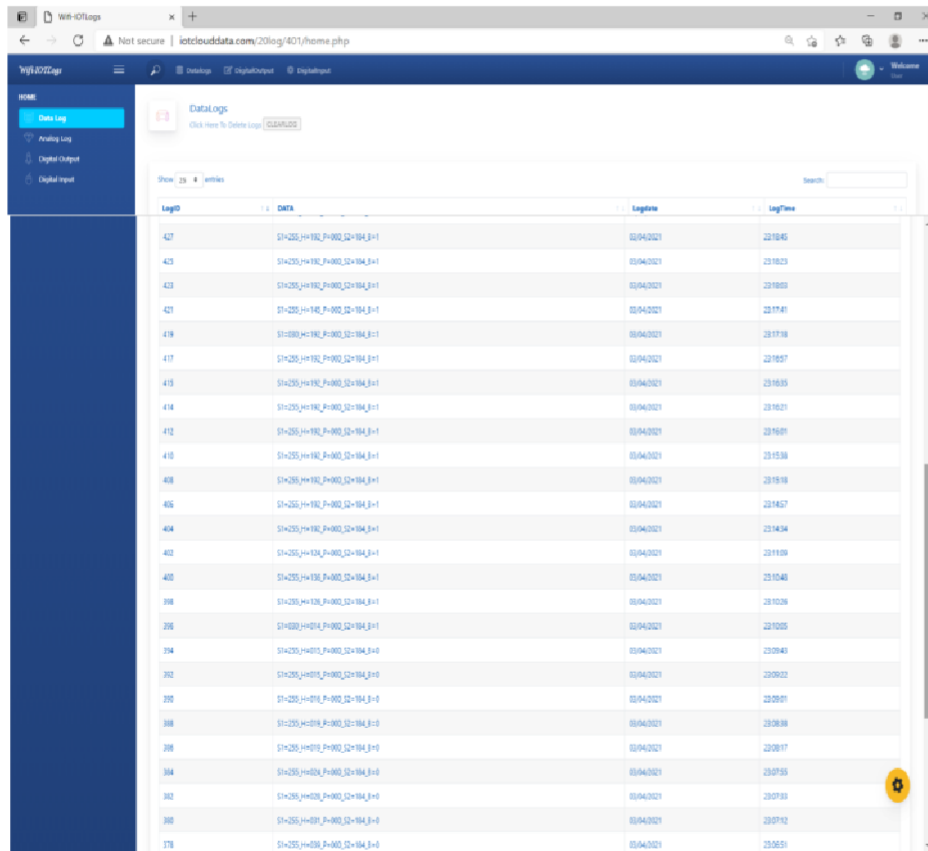
MPLAB IDE is a Windows - based OS software programme that allows you to create microcontroller and optical signal controller applications on your computer. MPLAB IDE is running on MS Windows as a 32-bit programme that is simple to use and provides a free software component to build and debug quickly. MPLAB IDE also behaves as seamless, graphical user interface for more software and hardware development tools from Microchip and third parties. It is a snap between tools, and upgrades to hardware debug and programming instruments are made in flash from the free software simulation, as MPLAB IDE contains the same user interface for all tools.

It includes a project manager which integrates and communicates between IDE and language tools, text editors, assembled object code converters and programme simulation Simulator for the editing or writing of programmes. For reliable programmes, it offers a versatile and rapidly changing world.[10]

CHAPTER-5 RESULT

RESULT

There are four sensors on the ground floor in the planned measuring setup. The sensors are initially configured by the calibration and rotation of the surface in various fields. The machine then compares the threshold values calibrated. The contribution of the sensor from all four sensors is observed on the LCD. SIM900 GPRS modem for the processing of all UART input Data based on GPRS that link to the Internet and is equipped with a system. Therefore, the land surface can be tracked on the webpage easily, quickly and in real time.



LogID	Data	LogTime	LogTime
427	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:10:45
428	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:10:53
429	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:10:55
421	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:11:41
418	S1=000,S2=100,P=000,S3=104,S4=1	02/04/2021	22:11:58
417	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:12:57
416	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:13:55
414	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:14:21
412	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:14:51
410	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:15:38
408	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:16:16
406	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:16:57
404	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:17:34
402	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:18:09
400	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:18:40
398	S1=200,S2=100,P=000,S3=104,S4=1	02/04/2021	22:19:06
396	S1=000,S2=010,P=000,S3=104,S4=1	02/04/2021	22:19:55
394	S1=200,S2=010,P=000,S3=104,S4=0	02/04/2021	22:20:02
392	S1=200,S2=010,P=000,S3=104,S4=0	02/04/2021	22:20:01
388	S1=200,S2=010,P=000,S3=104,S4=0	02/04/2021	22:20:36
386	S1=200,S2=010,P=000,S3=104,S4=0	02/04/2021	22:20:57
384	S1=200,S2=010,P=000,S3=104,S4=0	02/04/2021	22:21:55
382	S1=200,S2=010,P=000,S3=104,S4=0	02/04/2021	22:22:33
380	S1=200,S2=010,P=000,S3=104,S4=0	02/04/2021	22:22:52
378	S1=200,S2=010,P=000,S3=104,S4=0	02/04/2021	22:23:51

Fig :5: real time monitoring

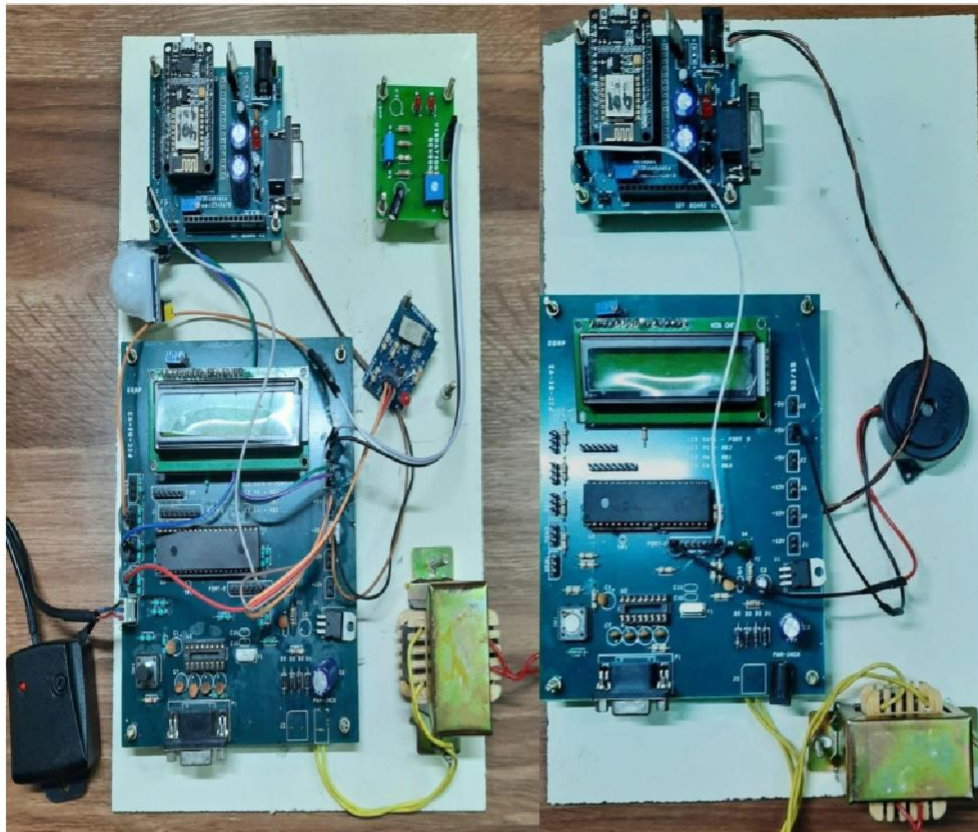


Fig : 5.1 transmitter and receiver section

CHAPTER-6 CONCLUSION

One of the most challenging areas of geophysical research currently available is the wireless earth slide sensor device using sensors. In hilly and mountainous areas landslides have become a big concern. Many people risk their lives and their homes due to the catastrophe of landslides and thunderstorms. It uses real-time tracking Mcu nodes interfaced with sensors, IOT and lcd computers. The data from these sensors is transmitted and the parameter state appears on LCD. The findings will then be provided with IOT support. Therefore, it is useful to use a sensor value for earth detection System to prevention of human loss before sliding.

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