

IOT BASED MULTI PARAMETER FOREST MONITORING SYSTEM

MEMBERS

180701264- Tarakesh K

180701291 - Vishnu R

Guide

Dr.Pramila

Abstract

- Traditional approaches to monitor forest provide useful, yet spatially constrained information. Remote sensing offers the prospect for large area characterizations of biodiversity in a systematic, repeatable, and spatially exhaustive manner. Information and monitoring systems for the forest sector are beneficial for effective policies and planning, valuation of forest resources and proficient investments. This project presents a system for monitoring forest fire with Comparative method by using Computer vision with IR Sensors and its vicinity based on IoT based wireless sensor network technology. The need to be able to accurately monitor forest parameters and quality is crucial to understanding the costs of deforestation. The monitoring of forest and the surrounding area can, however, still be considered an open research problem due to its substantial vast area. Even though sufficient manpower has been deployed, it is inefficient as it could be life-threatening. This project is an attempt to prevent forest and flood mishaps, the intrusion of animals in the surrounding forest areas, by using wireless sensor technology and eliminating manual power to the highest possible extent with inclusion of solar panel a redundant power source to charge the Batteries.

Introduction:

- Forests generate water supplies, biodiversity, pharmaceuticals, recycled nutrients for agriculture and flood prevention, and are central to the transition towards a Green Economy in the context of sustainable development and poverty eradication.
- Recent studies into the extent of illegal logging estimate that illegal logging accounts for 50-90 per cent of the volume of all forestry in key producer tropical countries and 15-30 per cent globally.
- At home and abroad there are forest fire preventions such as artificial way of looking, forest aircraft, FIRE-WATCH forest fire automatic warning systems and satellite circuit monitoring system, etc.
- As a result of analysis and comparison with existing systems to monitor logging activities and forest fire explosion based on reconnaissance satellites and remote sensing, we have determined several challenges of currently used systems.

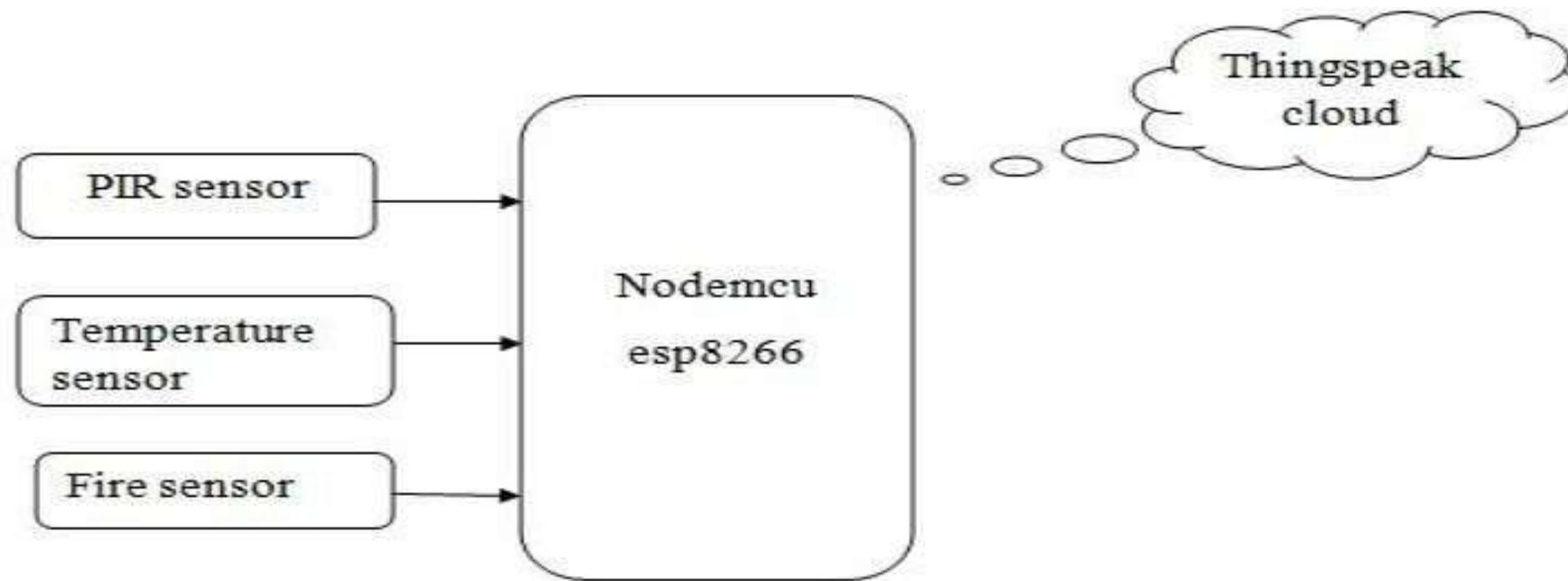
(Some Challenges)

- The over utilisation of ground water has drastically reduced the ground water level in the last 15 years.
- So, it is the need of hour to utilise each and every drop of water wisely so that it can also be used by our coming generations also.
- Also, we should develop some new methods that use the renewable sources of energy.
- The development of these new techniques is going to reach our goal of sustainable development as well as to cut off the emission of greenhouse gases to a minimum level.

Existing System:

- Now a days movement of animals from forest area to residential area is a big problem. The main reason for that problem is forest fire. The number of trees has reduced from the forest that creates worst environment for animals to survive in the forest. Arduino platform based IOT enabled early fire detector and monitoring system is the solution to this problem. In our project, fire detector using Arduino which is interfaced with some sensors. The LCD is the output device. The sensor values are displayed in the LCD display and data is stored on iot platform.

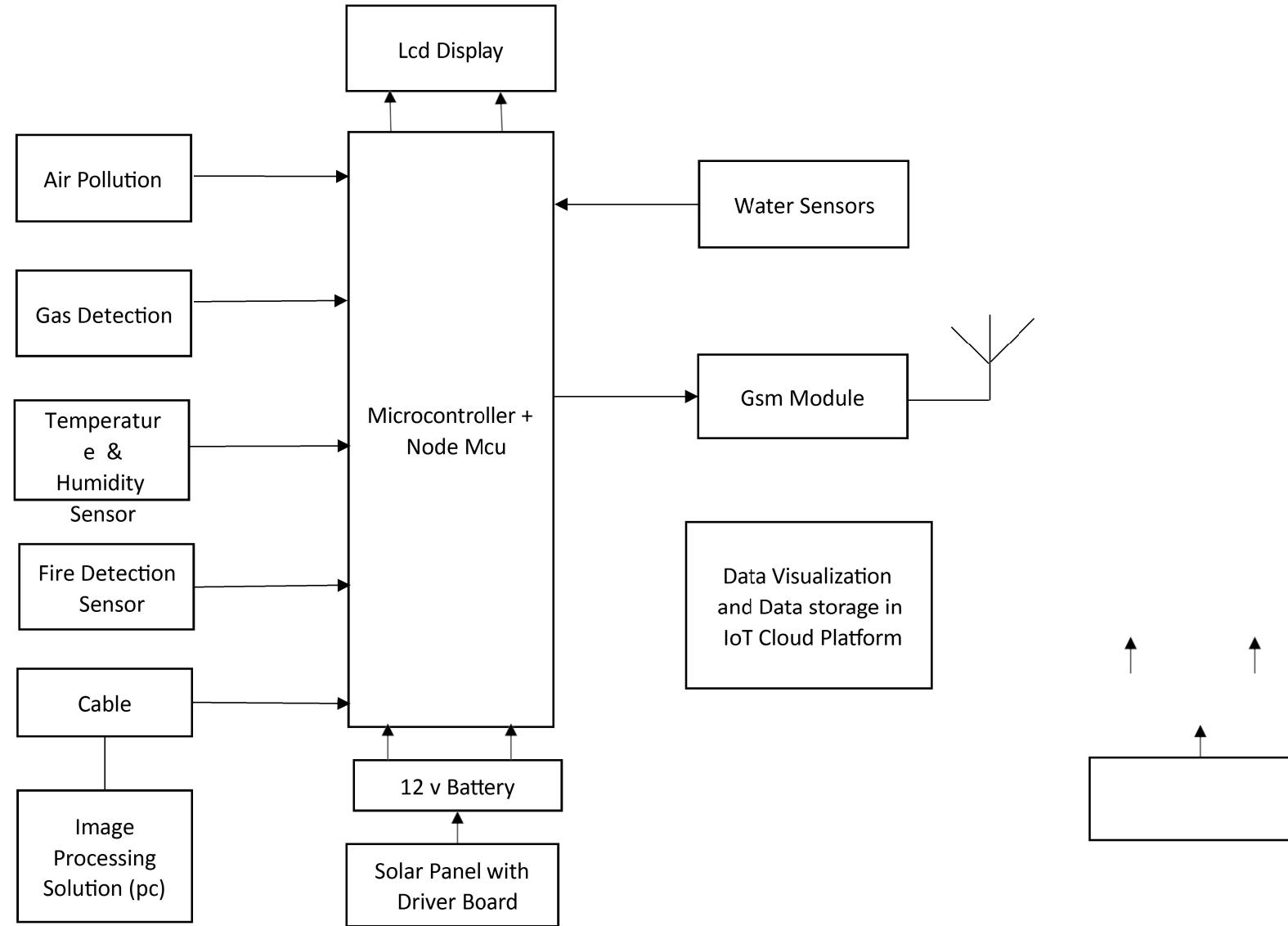
System Architecture of Existing System:



Proposed System:

- The line of sight and the early stage of the fire process and flood detection and monitoring forest problem could be solved with the sensors. A new technology called Internet of Things (IOT) is nowadays receiving more attention and has started to be applied in forest Solution Applications. The Wireless nodes integrate on the same printed circuit board, the sensors, the data processing, the Wifi Module and they all consume power from the same source- batteries. Unlike cell phones, WSN do not have the capability of periodic recharging. The sensors are devices capable of sensing their environment and computing data. The sensors sense physical parameters such as the temperature, Humidity, Air Pollution, harmful Gases and level of water with comparative alert based on computer vision and IR sensor for detecting Fire. The sensors operate in a self-healing and self-organising wireless networking environment. One type of wireless technology is Wifi Module (IoT) which is a new industrial standard based on IEEE 802.11 standard. This technology emphasises low-cost battery powered application and small solar panels and is suited for charging the batteries. Wireless Sensor Networks have seen rapid developments in a large number of applications. This kind of technology has the potential to be applied almost everywhere; this is why the research interest in sensor networks is becoming bigger and bigger every year.

System Architecture of Proposed System:



List of Modules:

MODULE 1: CONNECTING MICROCONTROLLER WITH OTHER SENSORS

We first have to connect all the modules together for better functionality than its intended purpose.

MODULE 2: FIRE DETECTION AND TEMPERATURE AND HUMIDITY SENSORS

The sensors are devices capable of sensing their environment and computing data. The sensors sense physical parameters such as the temperature, Humidity, Air Pollution, harmful Gases and level of water with comparative alert based on computer vision.

Temperature and Humidity is also measured using DHT 11 Sensors.

IR sensors can be used to detect heat with particular algorithms can detect hot-spots within a scene as well as flames for detection of fire.

MODULE 3: FLOOD SENSORS

Air quality sensor, Gas sensor and water sensor are used to sense physical parameters such as temperature, Humidity, harmful gases, level of water.

If the water reaches a predefined level, the system indicates with an Alert Message.

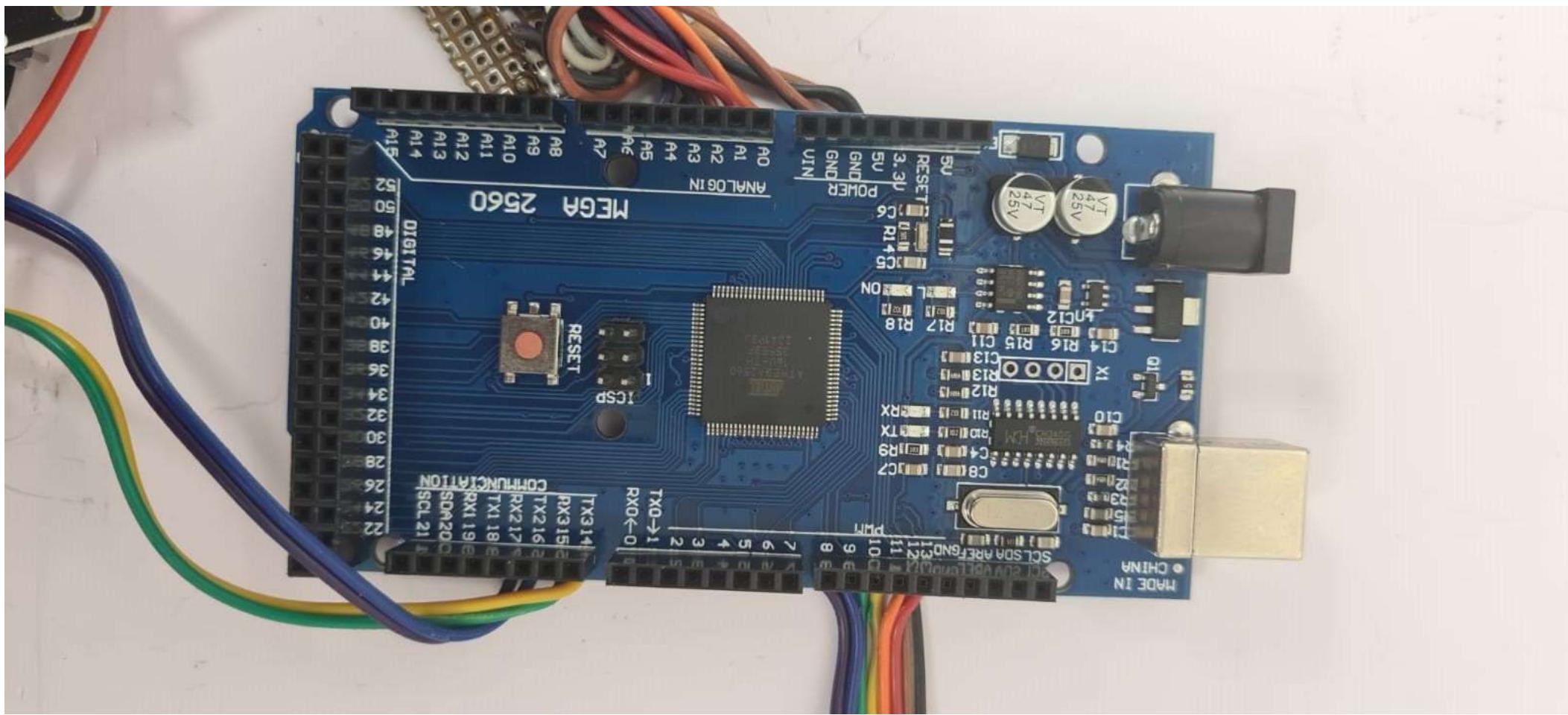
MODULE 4: DISPLAYING OUTPUT

The sensor values are displayed in the LCD display and data is stored in IOT Platform. Provides Rapid Alert System through GSM in case of any mishap.

MODULE 1: CONNECTING MICROCONTROLLER WITH OTHER SENSORS

Arduino MEGA 2560 Microcontroller for connecting all sensors

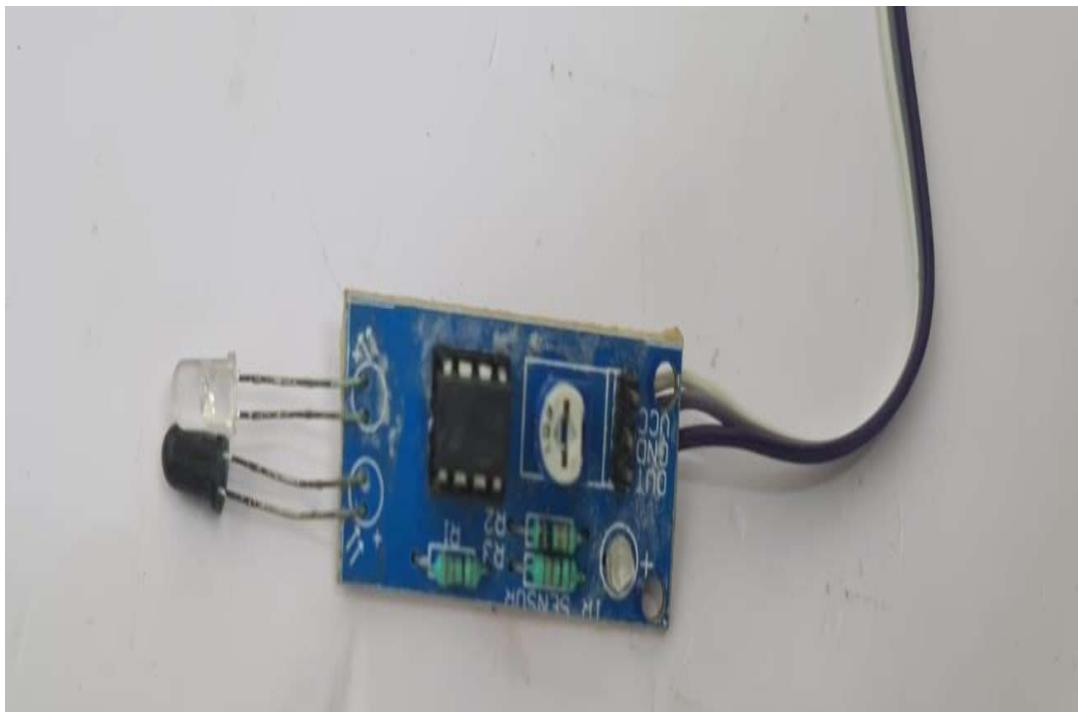
The Arduino Microcontroller is used to connect all the sensors together for better functionality than its intended purpose



MODULE 2: FIRE DETECTION AND TEMPERATURE AND HUMIDITY SENSORS

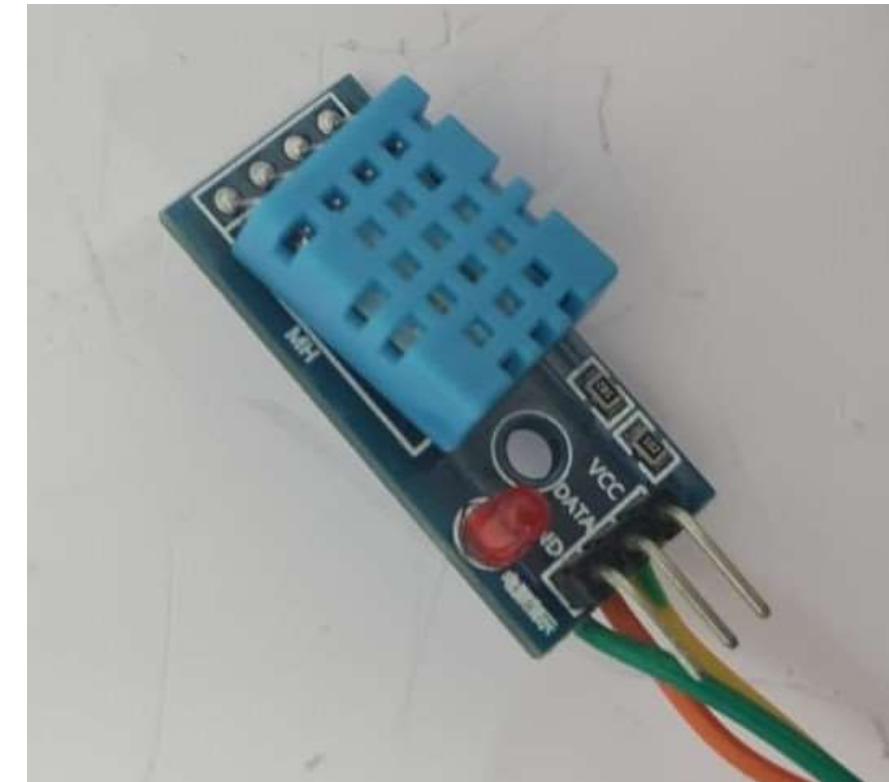
IR Sensors

It is generally used to detect fire and sends out a warning message



Temperature and humidity sensors

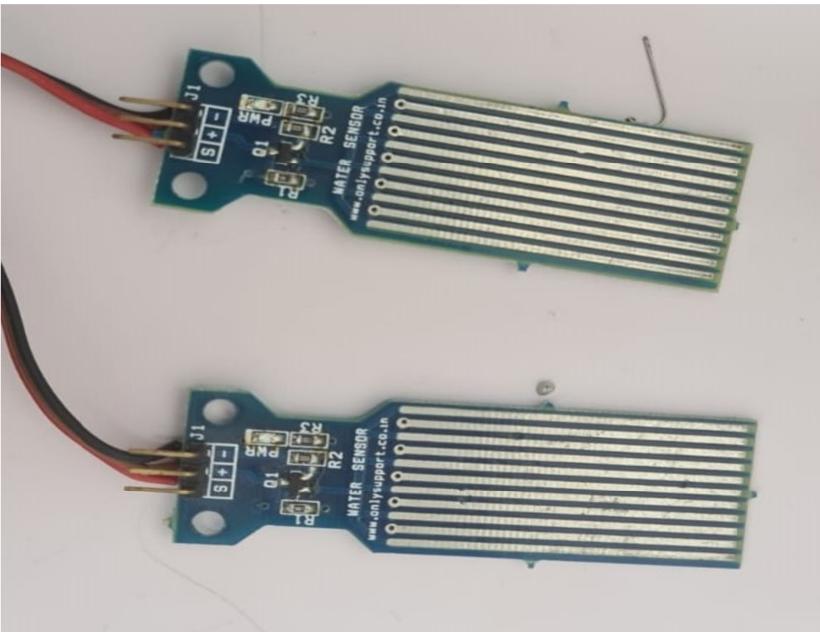
It generally is used to measure temperature levels and humidity levels.



MODULE 3: FLOOD SENSORS AND AIR QUALITY AND GAS SENSORS

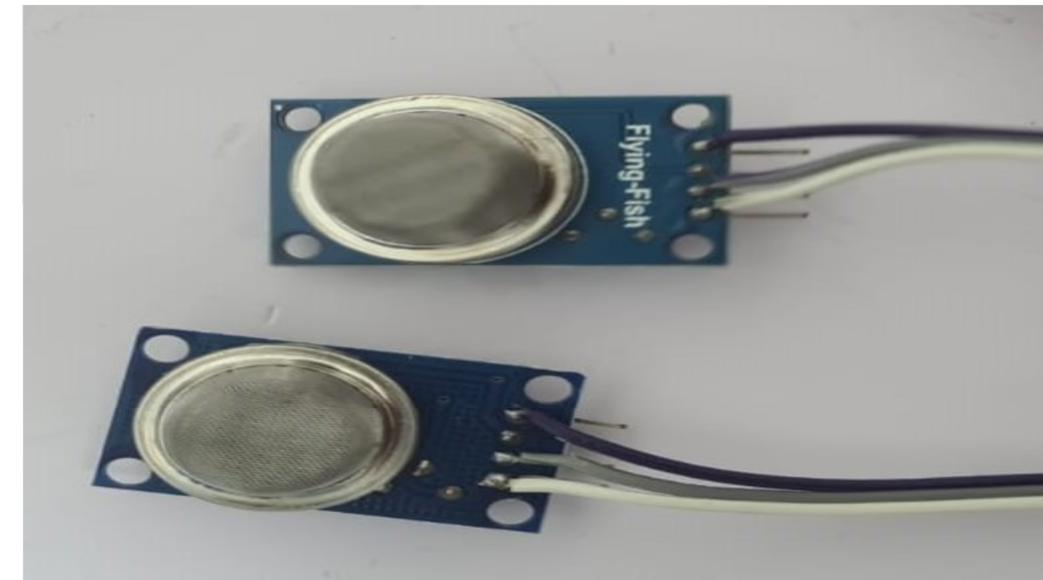
Water Sensor

It generally detects water level and indicates a message if it floods the forest



Air Quality and Gas Sensors

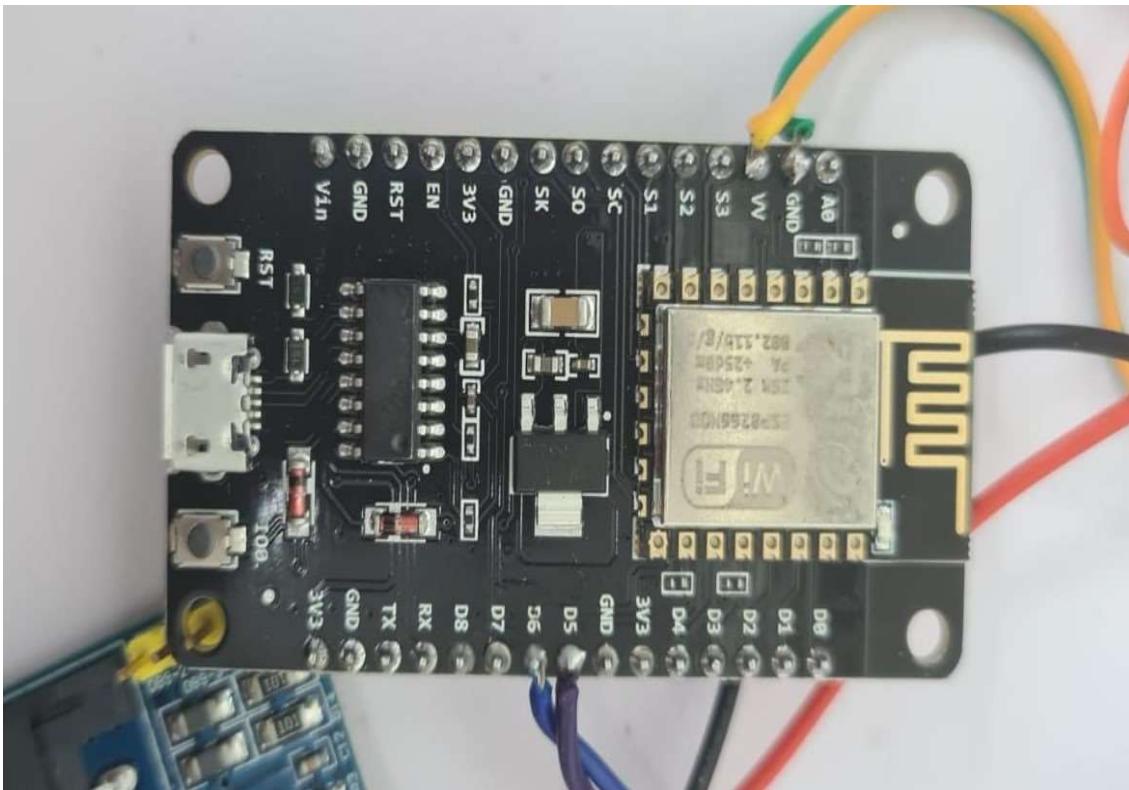
It is generally used to detect the quality of air level and detects any unnatural gas



MODULE 4: DISPLAYING OUTPUT

NODE MCU

Has inbuilt wifi and sends out warning message or data in cloud.



GSM Module

It sends out a message to a mobile phone in form of SMS in case of backup or Node MCU failure



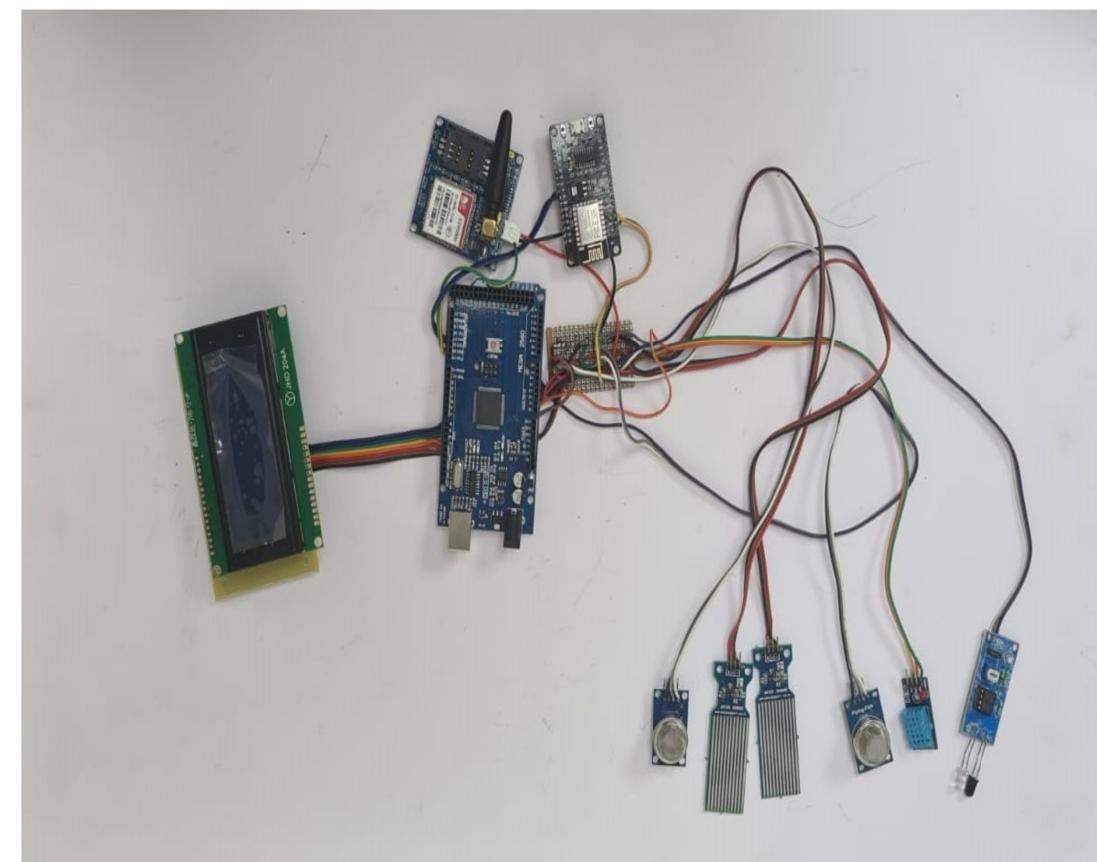
LCD Display

Then finally in case of a second backup the warning message is displayed in the 20x4 LCD Display.

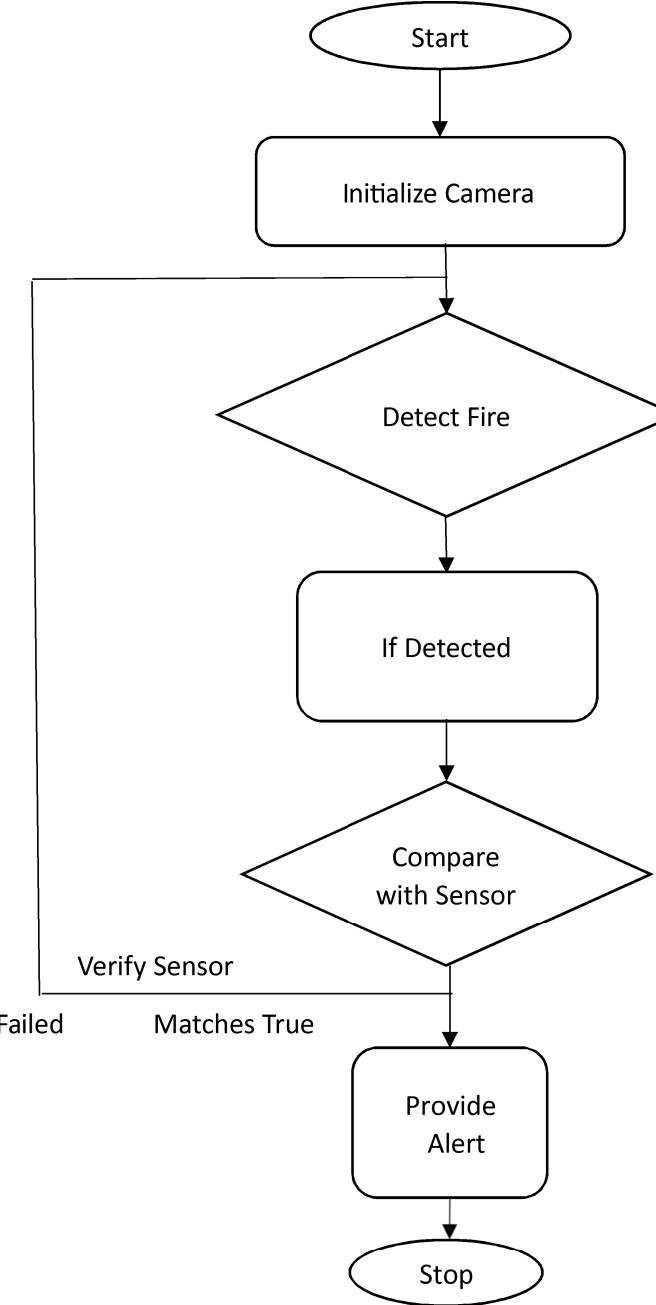


Final Configuration

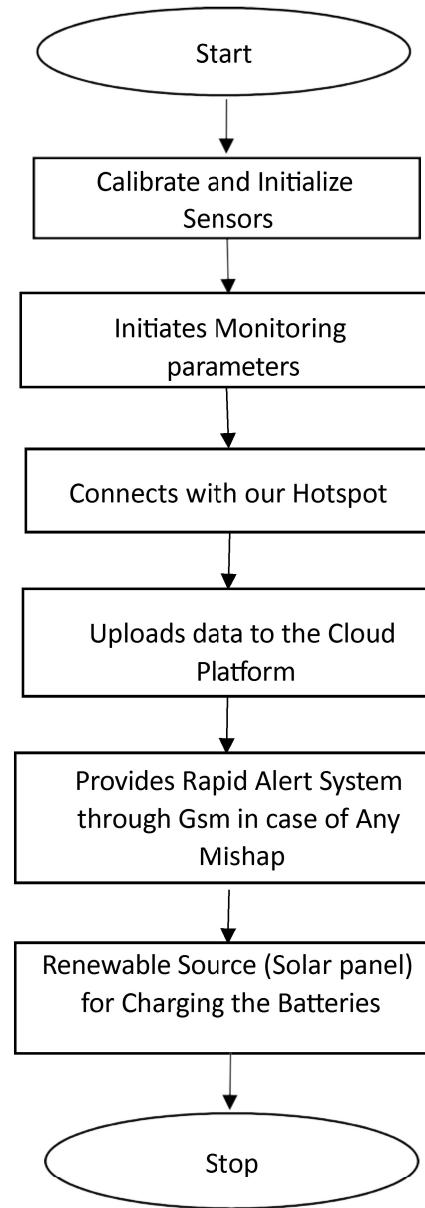
Then The final configuration after all the connections and setups would look like this



Software Flow Diagram:



Hardware Flow Diagram:



Algorithm Used: Haar Cascade Classifier.

Working of Algorithm:

In order to start the detection, we need to make the cascade file for detection of fire. To train a boosted cascade of weak classifiers, we need to use a bunch of positive and negative images. Positive images are the ones in which the images contain the object that we are trying to detect, while negative images are the ones which strictly does not contain the object that we are trying to detect.

Hardware Requirements:

- Arduino Microcontroller – arduino mega 2560
- Wifi module for sending information to cloud – Node MCU ESP8266
- Lcd Display – JHD204A 20x4 Display
- Air quality Sensor – MQ 135 Sensor
- Gas Sensor – MQ 4 Sensor
- Water Sensor – Conductivity sensor
- Fire Sensor – IR Sensor
- Temperature and Humidity Sensor - DHT 11 Sensor
- For Sending Emergency Message - Gsm Module
- 12V 1A Battery
- Common power supply board – for more no of pins

Software Requirements:

- Python IDLE
- Arduino IDLE

Cloud Platform:

Thingspeak IoT Cloud Platform

Programming Languages Used:

- Python
- Embedded ‘C’