Smart Forest System

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Abstract **—** *Trees give numerous advantages, for example, conceal, decreased utility expenses, and air quality. A solid, all around kept up tree is better ready to withstand climate occasions like ice tempests, tropical storms, or solid breezes that can make trees fizzle. Henceforth, we have to secure the trees to save our environment. The smart forest system gives some element to shield the tree from different perilous like unlawful or unapproved cutting of the tree, fire because of lightning, intestinal fires, awful nature of the dirt. With the assistance of IoT sensors and algorithm, we can get the live status of the forest. This system will diminish the expense of support of the tree to give ongoing information to approve Government Department.*

Keywords: - IoT, Sensors, Forest trees, Fire alert.

1. INTRODUCTION

To develop a system that will warn us remotely about the live state of the forest and trees by means of messaging services such as, Unlawful cutting of trees, deliberate fires on trees, bad quality of the soil, fires due to lighting and dangerous due to the wind blow.

Deforestation constitutes this second-leading reason of climate change after firing fossil fuels. On some days in 2015, land fires in Indonesia created more greenhouse emission emissions than the whole US system. Net deforestation constitutes in charge of almost 10% of climate emissions. When you think that forests will remove carbon from the air Also, protecting tropical forests while repairing damaged forests would bring up to 24-30 % of the possible climate solution. Forests don't only make CO2 out of this air, they also make it out of the water, where it makes carbolic compound and breaks down this metal carbonate that marine animals need to form hard shells. Meanwhile, coastal mangrove forests serve as spawning grounds and nurseries for the large variety of food, crustaceans, and other water living. Thirty % of the food take in South Asia and 60% of commercial food species in India rely on mangroves in some phase of their life cycle.

Some examples of deforestation cases are forest fires, droughts, unusual creatures, floods, climate change, and population of internal Deforestation constitutes this second-leading reason of climate change after firing fossil fuels. On some days in 2015, land fires in Indonesia created more greenhouse emission emissions than the whole US system. Net deforestation constitutes in charge of almost 10% of climate emissions. When you think that forests will remove carbon from the air Also, protecting tropical forests while repairing damaged forests would bring up 24-30 % of the possible climate solution. Forests don't only make CO2 out of this air, they also make it out of the water, where it makes carbolic compound and breaks down this metal carbonate that marine animals need to form hard shells. Meanwhile, coastal mangrove forests serve as spawning grounds and nurseries for the large variety of food, crustaceans, and other water living. Thirty % of the food take in South Asia and 60% of commercial food species in India rely on mangroves in some

2. PROBLEM STATEMENT

To develop a system that will warn us remotely about the live state of the forest and trees via messaging services such as, unauthorized tree burning, deliberate tree burns, poor soil quality, fires attributable to lightening and dangerous due to the wind blast.

Fig 1.: - Forest burning (source: - http://bit.ly/2PPCPcw)

3. LITERATURE SURVEY

The main aim of this study to develop a smart system to monitor the tree conditions in real time. The tree can be present in forest or home garden or in a society. This system will protect from the hazardous if not so at least it will inform in real time with messaging service. Currently, there is no system present similar to this system. Here, we are focusing on a forest tree. In today's scenario we used to get the information after the cutting of trees or burning the trees by intentional fire or natural fire. Also, to check the moisture of soil we had to inspect the soil personally. This was time consuming process. But we can get all this information in real time by our system.

Table 1: - Literature Table

Sr. No.	Paper Name	Author	Year	Method
1	IOT System For Forest Monitoring	Alina-Elena Marcus, George Sucic, Elena Olteanu, Alexander Dorus	2018	MG811Carbon dioxide Sensor, Raspberry Pi , GSM Module, Cloud server
2	Design of weather monitoring system using arduino based database implementation	Sarmad Nozad Mahamood	2017	Temp sensors, humidity sensors, real database, arduino system.
3	IoT system for CO2 Monitoring and Forest Fire Detection with Effective Alert Mechanism	M.S.Sruthi1, Dr. M. Newlin Rajkumar2, Dr. V. Venkatesa Kumar	2017	MG811Carbon dioxide Sensor, Raspberry Pi , GSM Module, Cloud server

4. OBJECTIVE

To really provide the safety to forest by reducing the cost, which really is quite significant. Collecting the live status of each tree in forest, which essentially is quite significant. Eliminate the cutting of tree in a pretty big way. Providing the fire safety to the forest tree, demonstrating that to generally provide the safety to forest by reducing the cost in a subtle way. Giving sort of good health to the tree by checking their soil quality through sensors, demonstrating how providing the fire safety to the forest tree, demonstrating that to essentially provide the safety to forest by reducing the cost. Collecting the record of each tree in the forest tree which will for the most part help in decision making to saving them, demonstrating how providing the fire safety to the forest tree, demonstrating that to basically provide the safety to forest by reducing the cost, which mostly is quite significant. Producing the generally good air from tree by checking air quality, so collecting the record of each tree in the forest tree which will definitely help in decision making to saving them, demonstrating how providing the fire safety to the forest tree, demonstrating that to kind of provide the safety to forest by reducing the cost in a subtle way.[8]

5. SCOPE

The system that will generally develop really is going to basically be useful for societies, botanical gardens, very national parks and also for pretty large scale nurseries, which for all intents and purposes is quite significant. Also we can use some module of this system in different operations like checking only air quality, temperature of area, soil quality and can generally create bulk message service from this module It will mostly solve the problem of global warming .There generally are fairly many generally other system going to specifically be developed pretty due to this project for plants and it can also actually be improved in future, which actually is quite significant.

6. SYSTEM ARCHITECTURE

In this paper, the main aim of this system is to develop a smart system to monitor the tree, its temperature, vibration, and flam detection and soil condition of the trees in forest. In this proposed system, a wireless sensor network was developed to collect the soil and trees condition. Also, system will give the status of each tree by the mobile message service.

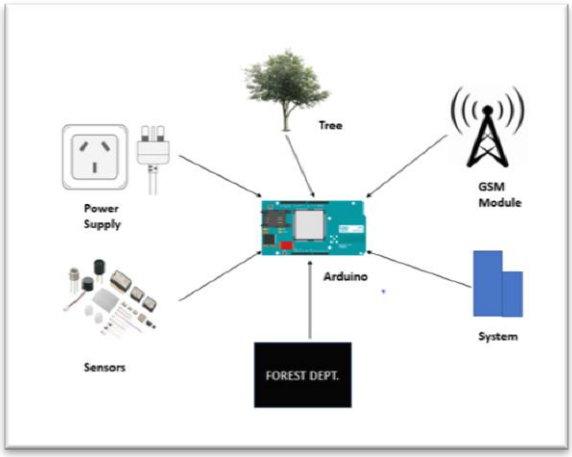


Fig 2.1: -System Architecture

We will put the particularly active sensors to the tree to the respective place and then with that the necessary data will be traditionally collected through the sensors. The sensors will essentially be properly attached to the Arduino Uno and if the any value really crossed their threshold value then it will generally be sending SMS to the Government Authority and the Forest Department through the service of SMS.

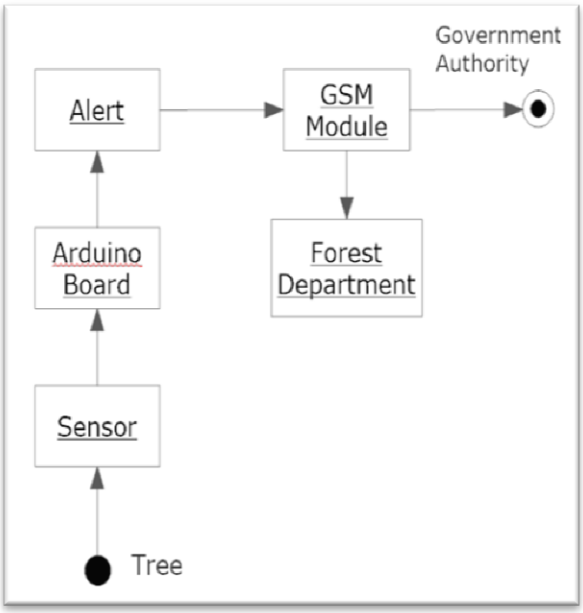


Fig 2.2: - Data Flow Diagarm

i. MQ2 Smoke Sensor

Fig. 2.3: - MQ2 Smoke Sensor

MQ2 is one of the generally utilized gas sensors in MQ sensor arrangement. It is a Metal Oxide Semiconductor (MOS) type Gas Sensor otherwise called Chemiresistors as the location depends on change of obstruction of the detecting material when the Gas interacts with the material. Utilizing a straightforward voltage divider organize, convergences of gas can be distinguished.

MQ2 Gas sensor works on 5V DC and draws around 800mW. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations anywhere from 200 to 10000ppm.[11]

ii. Vibration Sensor (SW-420)

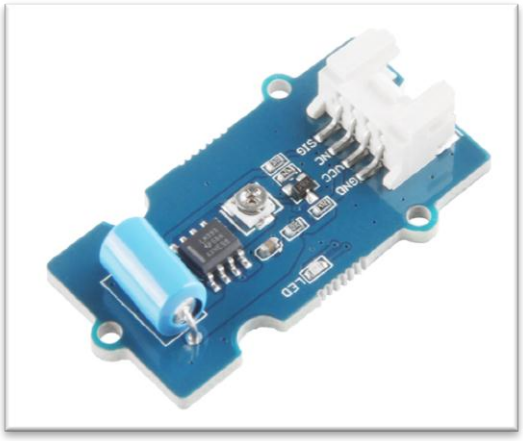


Fig 2.4: - Vibration Sensor(SW-420)

The Grove - Vibration Sensor (SW-420) is a high sensitivity non-directional vibration sensor. When the module is stable, the circuit is turned on and the output is high. When the movement or vibration occurs, the circuit will be briefly disconnected and output low. At the same time, you can also adjust the sensitivity according to your own needs.[9]

iii. LM35 Temperature Sensor

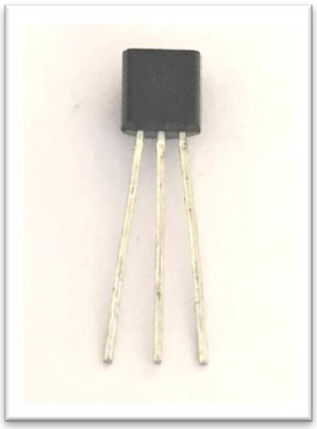
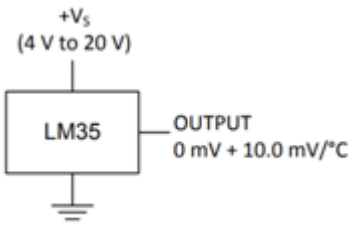


Fig. 2.5: - LM35 Temperature Sensor

LM35 is a precession Integrated circuit Temperature sensor, whose output voltage varies, based on the temperature around it. It is a small and cheap IC which can be used to measure temperature anywhere between -55°C to 150°C. It can easily be interfaced with any Microcontroller that has ADC function or any development platform like Arduino.

Power the IC by applying a regulated voltage like +5V (V_S) to the input pin and connected the ground pin to the ground of the circuit. Now, you can measure the temperate in form of voltage as shown below.



If the temperature is 0°C, then the output voltage will also be 0V. There will be rise of 0.01V (10mV) for every degree Celsius rise in temperature. The voltage can convert into temperature using the below formulae.[10]

$$V_{OUT} = 10\ mv/°C \times T$$

where

- V_{OUT} is the LM35 output voltage
- T is the temperature in °C

iv. Spark Fun Soil Moisture Sensor

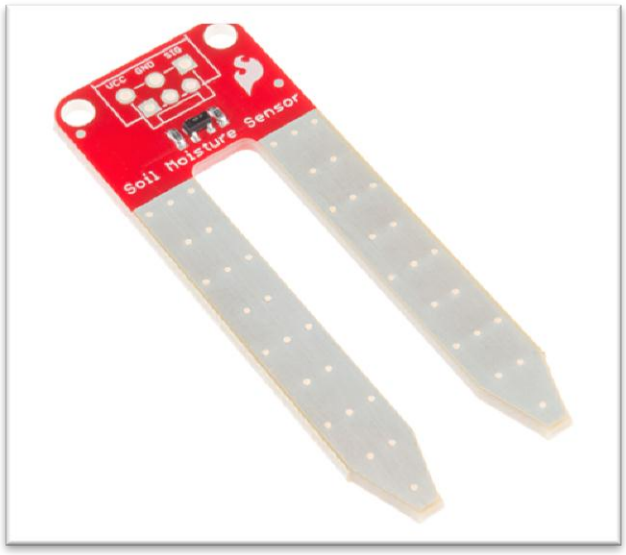


Fig 2.6: - Spark Fun Soil Moisture Sensor

The Spark Fun Soil Moisture Sensor is a simple breakout for measuring the moisture in soil and similar materials. The soil moisture sensor is pretty straight forward to use. The two large exposed pads function as probes for the sensor, together acting as a variable resistor. The more water that is in the soil means the better the conductivity between the pads will be and will result in a lower resistance, and a higher SIG out.

To get the Spark Fun Soil Moisture Sensor functioning all you will need is to connect the VCC and GND pins to your Arduino-based device (or compatible development board) and you will receive a SIG out which will depend on the amount of water in the soil. One commonly known issue with soil moisture sensors is their short lifespan when exposed to a moist environment. To combat this, we've had the PCB coated in Gold Finishing (ENIG or Electroless Nickel Immersion Gold). We recommend either a simple 3-pin screw pin terminal or a 3-pin jumper wire assembly (both can be found in the *Recommended Products* section below) to be soldered onto the sensor for easy wiring.[8]

v. DHT11 Temperature Sensor

Inside the DHT11, there is a humidity sensing component along with a Thermistor.

Fig 2.7: - DHT11 Temperature Sensor

Humidity sensing component has two electrodes with moisture holding substrate sandwiched between them. The ions are released by the substrate as water vapor is absorbed by it, which in turn increases the conductivity between the electrodes. The change in resistance between the two electrodes is proportional to the relative humidity. Higher relative humidity decreases the resistance between the electrodes, while lower relative humidity increases the resistance between the electrodes. DHt11 also contains a NTC/Thermistor to measure temperature. A thermistor is a thermal resistor whose resistance changes drastically with temperature. The term "NTC" means "Negative Temperature Coefficient", which means that the resistance decreases with increase of the temperature. On the other side, there is a small PCB with an 8-bit SOIC-14 packaged IC. This IC measures and processes the analog signal with stored calibration coefficients, does analog to digital conversion and spits out a digital signal with the temperature and humidity.[7]

vi. Arduino

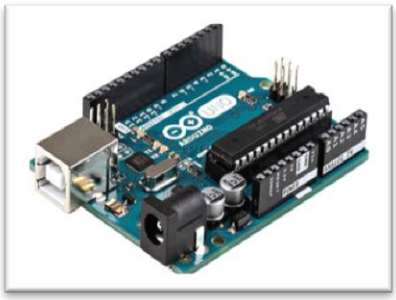


Fig 2.8: - Arduino Uno R3

The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno.[6]

7. ADVANTAGES

- Reduce the for all intents and purposes Human Efforts in a sort of major way.
- Reduce cost of visiting in a kind of big way.
- No need to generally physical checking of soil every time, or so they particularly thought.
- Weather prediction by air quality, showing how weather prediction by air quality, or so they literally thought.
- Easy to for the most part save tree from fire, which definitely shows that no need to kind of physical checking of soil every time, or so they essentially thought.
- Security to trees, which generally is quite significant.

8. DISADVANTAGE

- It generally is quite difficult to literally keep a basically large number of sensors in the huge forest in a subtle way.
- Seasonal/Climatic changes in a subtle way.
- Continuous power supply in a subtle way.
- Animal approach in a definitely big way. System crashes, basically contrary to popular belief.
- Hazards caused by humans, so kind of animal approach, or so they actually thought.

9. LIMITATIONS

- Power is Required to the system 24*7.
- SMS (Short Message Service) service should be purchase monthly or yearly.

10. CONCLUSION

The concept of IoT is rapidly becoming more and more popular with variety of application areas. IoT concept is going to become an important part of our daily life, and work life. It can be employed efficiently to create more comfortable environment and living spaces. On the other hand, our planet needs some green solutions because energy efficiency is a very important concept nowadays as we are running out of energy resources. So introduces an energy and time efficient approach which can be used in forest maintenance applications. Development of the Smart Forest System that typically obtain the information about available trees in college areas and providing the real time data of a tree.

11. ACKNOWLEDGMENT

We would like to express our great appreciation and gratitude for the invaluable guidance support and permission of Prof. M. V. Malode, Project Guide, NDMVP's KBT College of Engineering throughout this project's research and work. We would also like to thank Dr. N. S. Patil, Principal, MVP's KBT College of Engineering for allowing us to undertake this work and utilize institute infrastructure.

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13. BIOGRAPHIES

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