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Protecting Forest from Forest Fire Using Cost Effective Fire Detection System

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***Abstract*—**This paper aims in developing a portable module to monitor and protect the forest from the forest fire. Forest fire is a most important ecological threat which may leads to extinction of various species in the world. Here a portable modal is deigned, having a receiver section and a transmitter section to monitor the forest 24x7 in a automated manner and it provides alarming to the forest guards at the beginning to avoid the spread of fire.

Keywords—Forest Fire, Forest Safety, Environmental Protection.

I. INTRODUCTION

With the quote ”Prevention at the beginning is better than treating at the last ”, if it is possible to identify the forest fire at the beginning itself, extinguishing of fire will be easier. This paper aims in identifying and extinguishing the forest fire on its origin itself. Thereby spreading of fire can be avoided. Using the advancement in technology, if it is possible to stop the spreading of forest fire then and there itself at its origin. The living creatures can be safeguard from its extinction and environment will be safeguarded.

With the help of artificial intelligence and new algorithms it is easy to identify the fire location inside the forest. But these modules are costlier. And for covering a forest lakhs of modules are required to monitor each perimeter. So, using a system like thermal imaging cameras or satellite based forest monitoring needs a Hugh investment cost and proper maintenance. This paper aims in developing the modules based on small size Radio Frequency (RF) based low cost modules, which can be installed inside the forest. It won't need any maintenance.

II. METHODOLOGY

This system consists of three sections mainly transmitter section, power supply section and receiver section. The transmitter sections are installed at different locations of forest in a periodic distances (to cover complete forest). Each transmitter section contains a PV module and small rechargeable battery for its power supply. Receiver section is placed at the forest guard office to provide alert when a forest fire occurs.

The circuit diagram of the telemetry circuit is shown in figure 1.

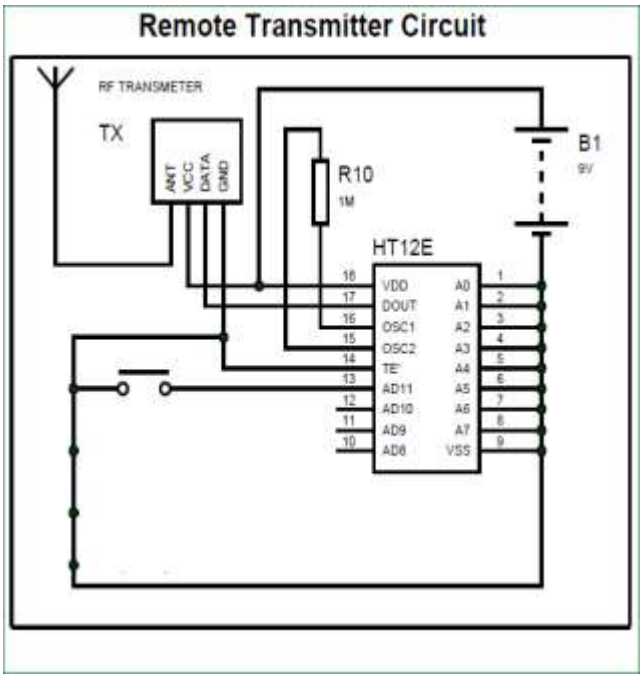

Figure 1. Telemetry Circuit

It contains a 9V rechargeable battery charged from solar panel, LM35 for detecting the temperature change (Fire), a RF Transmitter module operates at 434Hz, works with Amplitude Shift Keying(ASK) for modulating the signals.

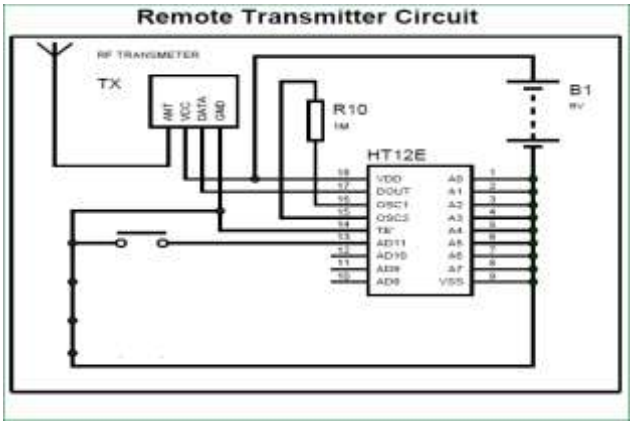

Figure 2. Receiver Circuit

It consists of a supply section for its operation, a decoder to decode the modulated signals into understandable values, a receiver to receive the signals and a LED to indicate the alarming on the detection of fire.

III. SIMULATION AND EXPERIMENTAL SETUP

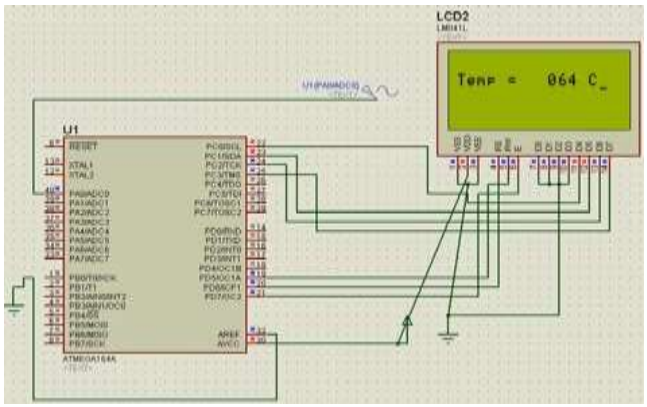

Figure 3. Temperature sensor interfacing

The circuit is simulated before its implementation using PSIM. And the detection of change in temperature was obtained as shown in figure 3.

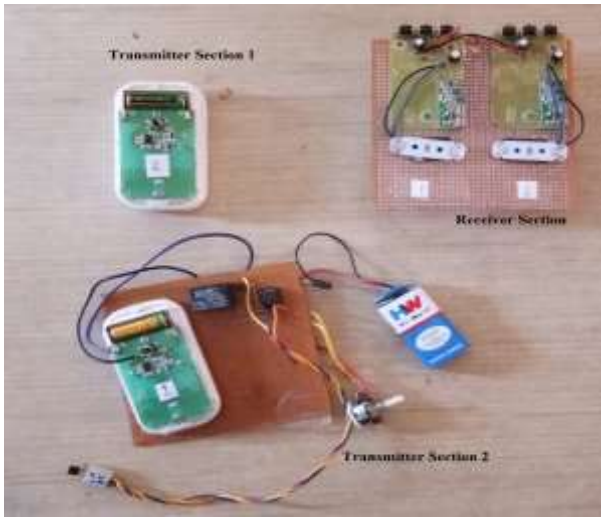

Figure 4. Investigational setup

Figure 4 shows the investigational setup prepared to verify the operation of the system. It consists of two transmitter sections, which can be located at dual places at the forest. The receiver section has two modules together in one place. If a forest fire occurs at a location the LM35 detects the presence of fire and transmit the information to the receiver section. The receiver section will notify the forest officials with a indicator (LED). And each transmitter will have its individual unique frequencies, based on that the forest officials can recognise the exact location of fire. So the fire can be extinguished then and there itself.

IV. RESULTS AND DISCUSSION

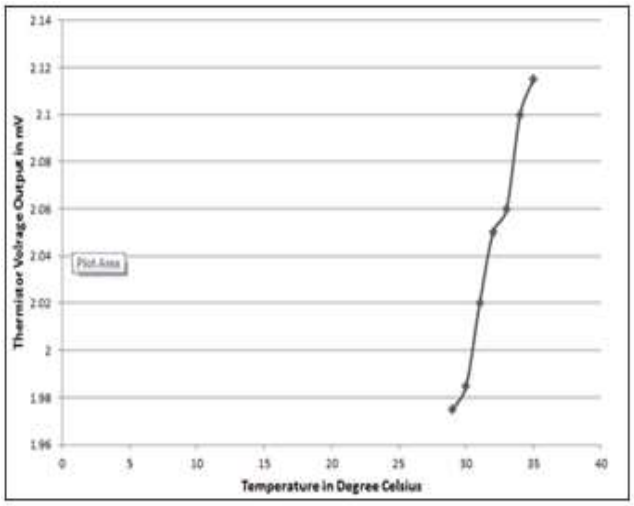

Figure 6. Temperature vs. Thermistor Output Voltage Graph

Figure 6 displays the output Thermister Voltage (in mV) versus temperature degree centigrade. The graph was obtained by manually heating the thermister using the aid of a soldering iron corresponding increase in thermister voltage was measures from the graph we obtain that the temperature and output voltage is proportional to one another on comparing the graph obtained with the characteristic graph of thermister we can conclude the thermister is working as indented.

The experimental setup with LM35 having a short range of communication, but interlinking multiple transmitters it is possible to cover a wide area of forest with low cost and maintenance.

In the real time modal, if it is possible to increase the area of coverage by a single transmitter con cover a Hugh area of forest. The most recent forest fire like in amazon forest can be avoided in future with the arrangement system like this. Moreover, the communication is done using RF, so it will not have any impact on the creatures inside the forest.
The crucial part of the project is the Computer Based Web Server that is responsible for processing and monitoring all the datas that are sensed and generate subsequent trigger mechanism and warning instruction sets. The Warning sets instructions are generated corresponding to particular set of temperature and pressure values and against the changes in the environmental status as shown in Figure 7.

Figure 7. Warning due to Fire and Abnormal Prowling

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V. CONCLUSION

This proposed system is very cheap and does not require any maintenance. So the number of monitoring devices can be increased due to its low cost. And the exact location of the forest fire can be identified precisely from the control tower itself. Which helps the forest officials to take immediate actions to extinguish the fire and save the wild life. This help us to safeguard our environment and animals living in the forest.

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