

Sensor based Fire Detection in Forest using Atmega328p, Zigbee and GSM

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Abstract:

Accidentally or un-accidentally if there is a fire in forest, it will cost a huge lost to ecological system. Animals will get affected by this fire. Recently world have experienced the fire burning in Australia’s forest and Brazilian Amazon blaze. This kind of forest burning will increase the level of CO₂ in the atmosphere. In this paper it has been tried to detect the fire in forest using Atmega328p, Zigbee and GSM. Early detection of fire will help in giving alert to authorized people so that the chain of this fire will get break. The system presented here makes use of various sensors attached and wireless data transmission, to fulfil the fire detection task. These collected data are transmitted to the coordinator and the coordinator transmits the data to the mobile phone through the GSM, where they are analyzed.

Keywords — Forest, Fire, Atmega328p, Detection

I. INTRODUCTION

The fire detection in large forest areas is done through satellite images and forest guard posts. But these methods are not suitable for local and short region of forest. In this paper we can observe the parameters through LCD which is designed by using Aurdiuno language. So, we thought that why not use the WSN application in project idea. As today’s world moving towards the Automation and people also want all the things automated. So, our intention is also same to provide safety and security to the forest by using “Wireless Sensor Network and control by using Arduino UNO” which is our aimed task. So, for the purpose WSN we use a Wireless Device. So, in our task to provide safety and alert message to forest department and person in tree saturated areas. The sensors used in this task are- fire sensor to detect the fire, wind directions sensor to trace the direction of wind, wind speed sensor to detect the appropriate wind speed and temperature sensor to detect the increased

temperature beyond a necessary threshold level. After detection of any sensor value, our system will send SMS to authorized person to inform the problem occurred and based on message user will take the appropriate action.

II. LITERATURE REVIEW

Ahmad AA Alkhatib concluded that fire detection and decision making system does not require any complicated gas boards and specialized devices or connect the network to data bases and applying complicated models to detect fires.

D. Vignesh Kirubaharan *et.al* used in their system to predict early detection of fire with the help of the data obtained from the sensors that are deployed in the forest.

Harjinder Singh *et al* concluded that we can replace the BT-Bee module by Zigbee module in order to increase the transmission range. There are three WSNs topological structures supported by Zigbee.

III. SYSTEM BLOCK DIAGRAM DETAILS

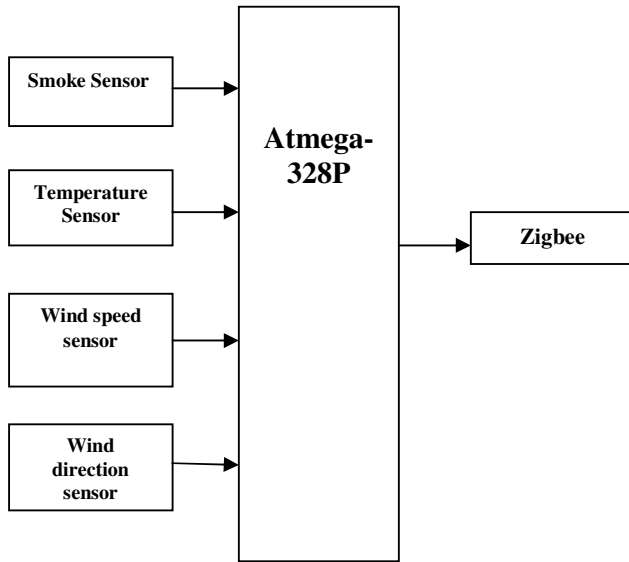


Fig.1 Node implementation

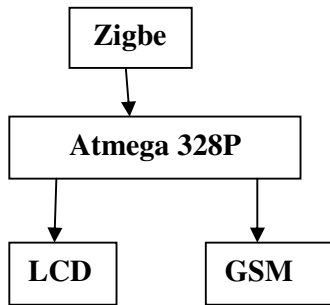


Fig.2 Coordinator System

The main part of the system consists of a Microcontroller (Arduino ATmega328) with a Zigbee module for controlling. These Zigbee modules are connected to each other which transfer data with each other. Zigbee coordinator module is connected to other router modules to automatically

transfers data with each other. All Zigbee devices are connected to separate Atmega328p controller. To make this design more efficient an automatic system has been designed as well. For this automated fire detection system, there is a temperature sensor which senses its immediate environment (i.e., a room) and indicates current temperature. There is smoke sensor MQ6 which senses the smoke, carbon dioxide, and all flammable gases. There is Wind direction sensor which indicates the direction of wind flow.

IV. SYSTEM IMPLIMENTATION

In our system we used Arduino Atmega328P, power supply circuit, smoke sensor MQ6, temperature sensor LM35, wind direction and speed sensor, digital compass. The AC supply given to the step down transformer to convert into Dc voltage which is required to start relays and Arduino. In power supply circuit 12-0-12 transformer output applied to the rectifier and then to filter. We used voltage regulator IC7812. The output of the regulator 12V is given to the Arduino and relays.

If smoke and temperature detected at node 1 then it sends acknowledgement ACK A1 bit to coordinator. If smoke reaches up to the threshold level node 1 sends ACK A1 bit to Coordinator. Then Coordinator runs the program and compares the value and displays the values on LCD display and sends fire warning message to the Mobile which is at forest office. If smoke does not detected then it will wait for detection of temp and smoke. The wind direction and speed also displays on LCD display. Wind direction is important for understand the direction of wind because of it affects on fire spread. Wind direction is displays in four directions East, West, north, south. The speed sensor displays the speed of wind in forest. It is displayed on LCD. If smoke and temperature detected at node 2 then it sends acknowledgement ACK A2 bit to coordinator. If smoke reaches up to the threshold level node 2 sends ACK A2 bit to Coordinator. Then Coordinator runs the program and compares the

value and displays the values on LCD display and sends fire warning message to the Mobile which is at forest office. If smoke does not detect then it will wait for detection of temp and smoke.



Fig. 3 Model of a system

V. RESULTS

The detected temperature, gas values, wind direction and its speed are displayed on LCD. This is done for 2 nodes. The suffix 1 and 2 indicates node1 and node2 respectively. It is as shown in below figure.



Fig.4 Messages on LCD

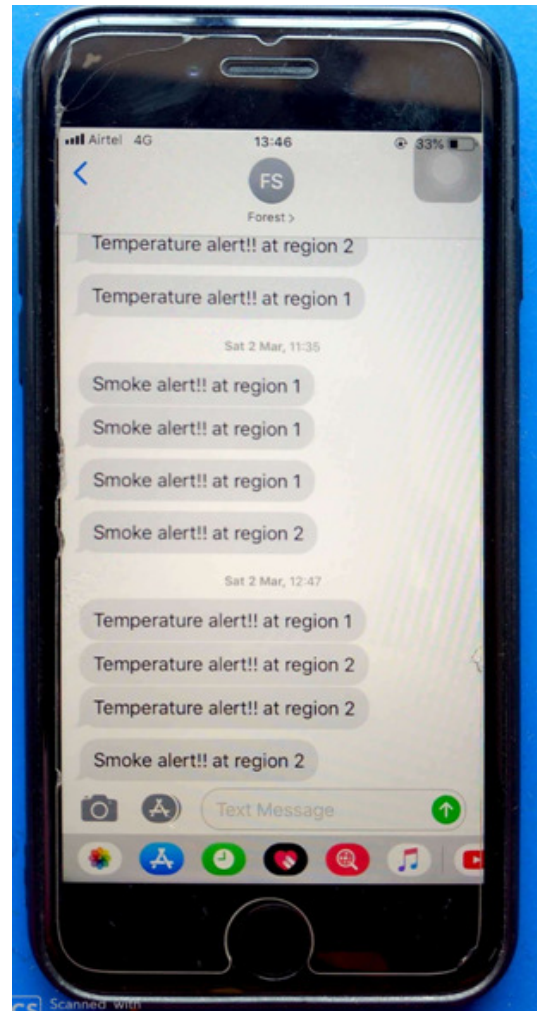


Fig.5 SMS received on mobile

If either temperature or smoke value exceeds the given threshold value then alert message is given through GSM. The received SMS is as shown in above figure no.5

VI. CONCLUSION AND FUTURE SCOPE

The main focus is on fire monitoring rather than controlling. The sensors node will automatically sense the fire causing parameters and sensor output given to the Arduino, collected data serially send to coordinator and displayed on LCD. Coordinator will check the threshold levels and alert message will send to authorized person. Due to some network issues, final results may be slightly short of our initial expectations.

A sub server unit can be used in between the transmitter unit and main receiver unit to make the whole process take comparatively less time to alert the forest officer to take preventive action. Higher versions of Zigbee can be used in order to make the system run for longer periods with increased efficiency.

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