Forest Fire Detection Using Wireless Sensor Network

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Abstract **- As we all know, the forests have been studied intensely in global forest fire prevention departments as one of the most significant and essential resources for preventing and identifying forested fires In addition, a wireless sensor network technology was introduced for the detection and monitoring of forest fires by satellite, aerial surveillance and manual monitoring, omni-bearing and stereoscopic air, ground forest-fire detection patterns, based upon the deficiency of conventional wood fire detections and the precision of the monitoring.[1] This research includes a cluster-based wireless sensor network architecture for real-time forest fire detection. Some major issues have been strongly debated, such as technology for the ad hoc network, hardware design, the model for forest fire predictions, and UHF WLAN propagation features, etc.**

Index Terms **- Forest fire detection, wireless sensor network, GSM, Bluetooth, wireless communication.**

1.INTRODUCTION

The forest is also regarded to be one of the largest and most significant resources and a defender of the natural balance of the Earth. Forest fire, however, happens sometimes, due to uncontrolled human conduct in social activities and anomalous environmental elements. Forest fire was regarded as one of the most serious catastrophes which devastated the security of forest resources and damaged the ecosystem. Recently a trend of strong rise has been seen in the forest fire due to the interaction of elements such as climate changes, human activities etc. Accordingly, important points for forest fire prevention and detection in international forest fire prevention departments have been explored. At present, conventional forest fire prevention tactics include field surveillance, aircraft surveillance, long-range video detection, satellite monitoring, tower surveillance, etc. In the light of the deficiencies in traditional forest fire detection, an omni bearing and stereoscopic air and ground forest fire pattern must be implemented using a novel approach for effective supplementation. A mass of built-in micro sensor Nodes has been installed in the monitoring region in the Wireless Sensor Network and all sorts of environmental specifications have been collected via the cooperative Nodes, this information has been transmitted to the operator via embedded systems. For forestry for fire detection, dynamic changing fire data such as temperature, moisture and air pressure were collected from the forest nodes in real time. The wireless network of sensors and satellite monitoring, aerial patronizing and manual surveillance set a stereoscopic and omnivorous air and ground forest fire detection pattern enabling the necessary departments to take immediate steps to combat fire or to provide the foundation for their decisions. Wireless sensor networks, like in particular areas such as inattentive environmental monitoring, disaster controls, etc., offer unmatched advantages of traditional technology, echeneid surveillance, and early-warning forest fire technologies that have attracted a large number of attentions in the international market.

2. LITERATURE SURVEY

1] Kumar, S. A. Ansari, M.F. Siddiqui, M.F, "IOT Enable Forest fire detection and online monitoring system"

Most common systems used in field work are video surveillance systems. Video cameras are sensitive to smoke only in daytime. Fire sensitive cameras at night, using IR thermal imaging cameras for heat flux detecting and using backscattering of laser light, detect the smoke particles. This fire alert system has a few limitations because of environmental conditions like dust particles, mist, shadows and so on. Another method is automated picture capturing of fires in forest. Capturing can be done by the cameras which are placed on top of towers. A motor was introduced to give a coverage view on the forest and for its

movement. Captured pictures are processed using program or MATLAB simulation and matching with references taken at beginning stage.

2] Guilherme borba Newmann, “Smart Forest: fire detection service”
Introduced the Wireless Sensor Network (WSN) Simulator and its use for planning the timberland fire early identification framework. The WSN Simulator is created dependent on the proposed Sensor model and WSN model. The WSN Simulator addresses significant plan issues like the inclusion of the region under reconnaissance in connection to starting sensor send, the number of sensors required for focused organization, and inclusion change as a component of time. The test system is versatile and can be effectively stretched out to incorporate extra demonstrating arrangements.

3] Bulusu, J. Heidemann, and D. Estrin, "Wireless sensor for wildfire monitoring Proceedings of SPIE Symposium on Smart Structures & Materials".
Performance evaluation of routing protocols for wireless sensor networks in forest fire detection. The forest fire detection as a monitoring network is one of these applications. Sensors collect dynamic changes such as temperature, humidity, smoke, atmospheric pressure and forward those to a single node or a base station. This information’s are sent to a long-distance data server which is located in a fire center. Due to the importance of these networks and their ability of real-time monitoring, they should be a reliable network communications. Our proposed forest fire detection system consists of a vast amount of inexpensive and small sensor nodes. Compared with the satellite imagery based approach, our design can detect forest fire more promptly and forecast the forest fire danger rate accurately.

4]K. Khamforoosh, H.Khamforoush, “A new routing Algorithm for Energy Reduction in Wireless Sensor Networks”.
A proposal for fire rescue applications is described in First; the authors show the requirements that have to be considered for this kind of network, including accountability of firefighters, real-time monitoring, intelligent scheduling and resource allocation, and web-enabled service and integration. According to these requirements the authors propose Fire Net. It is a wireless sensor network architecture where sensors are distributed in the vehicles, forming a self-organized heterogeneous network with the fire fighters. Finally, according to the requirements abovementioned and the characteristics of wireless sensor networks, the authors present several research challenges from the point of view of new protocols, hardware and software for WSNs. Fire Net architecture is considered to be very useful in fire rescue processes.

5] Garcia, E.M.; Serna, M.A.; “A WSN-based wildfire fighting support system”.
The Canadian study proposed the calculation of the index fire according to FWI (Fire Weather Index). This eliminates the need to communicate all the sensor data to Sink, and only a few aggregated index are reported for reduce energy consumption. FWI system comprises six standardized index. The three first shows daily variations of water content of three types of fuel forest with different speeds drying. The other three relate to fire behavior and are representative of the propagation speed, the quantity of burned fuel and intensity of the fire. The method is based solely on the determination noon daily weather: temperature, relative humidity, speed wind and rain during the last 24 hours (if there was). The month must also be specified. This method is primarily to solve a set of equations (Van Wagner and Pickett, 1985), which can be calculated with fast computer.

3. DESIGN & DEVELOPMENT

As shown in figure, Block diagram of forest fire detection using wireless sensor.

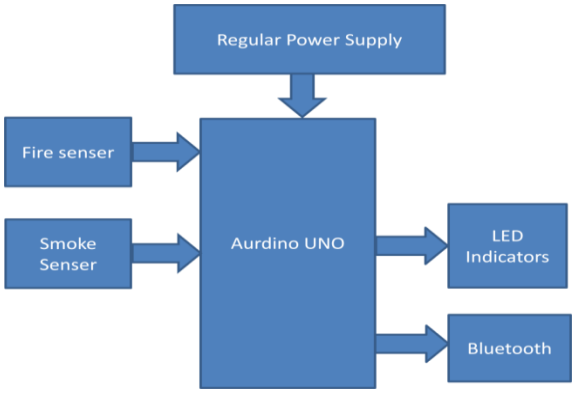

Figure 1 Block diagram of Transmitter system

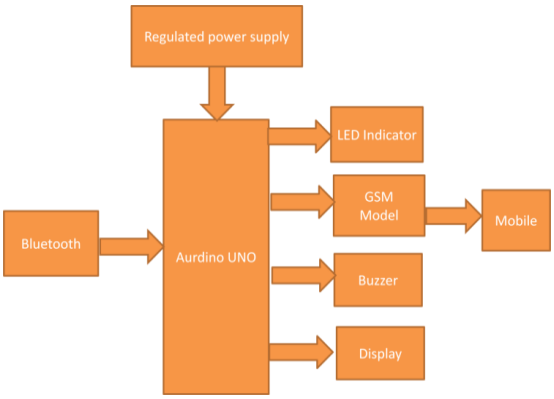

Figure 2 Block diagram of Receiver system.

4. WORKING

The smoke sensor and the fire sensor feel the smoke. These sensors are the Arduino UNO digital sensor. The Arduino UNO is also linked to the regulated power supplies. The kind of switch mode power is the controlled power supply (SMPS). This power generator transforms the power output. The Arduino UNO is connected to the output side by LED indication and Bluetooth transmitter. Data is obtained from the fire and smoke sensor by Arduino UNO. This information is supplied to the Bluetooth and LED indicators. The LED indicator is blinked and red light will be seen upon receipt of the data from Arduino UNO. At the same time, the transmitter Bluetooth transmits all data to the receiver Bluetooth. Bluetooth receiver is supplied data from Arduino UNO's Bluetooth transmitter. In the Bluetooth receiver the input is linked to Arduino UNO. Controlled power supply converts the Bluetooth output power.LED indicators, GSM, Buzzer, display on the output side coupled with the Arduino UNO. Arduino Uno has received data for LED indication, GSM, Buzzer, Display from Bluetooth. LED's flicker and red light is shown once the data is received from Arduino UNO. Display produces a visible image simultaneously. Buzzer converts the audio signal to the sound signal and the Arduino UNO data is sent to the GSM model. This information is sent to a mobile phone.

5. APPLICATIONS

1. Fire detection in forest
2. Military Application
3. Health Application
4. Commercial Application
5. Environmental Application
6. Habited monitoring

6. FUTURE SCOPE

1. The future advances of the project considers the production of more powerful and less costly devices, so that the technology can be implemented for majority of application providing efficient solutions.
2. We will deployments in remote areas and even more purpose oriented for early detection of forest fire 3. In future, we can install a wind sensor to the system which helps to determine the direction of the fire and the rate at which it will spread. Another solution would be to add a wind energy generator.
3. This would complement the photovoltaic panel in energy production and provide extra information about the monitored site conditions, such as wind speed and direction.

7. RESULT & ANALYSIS

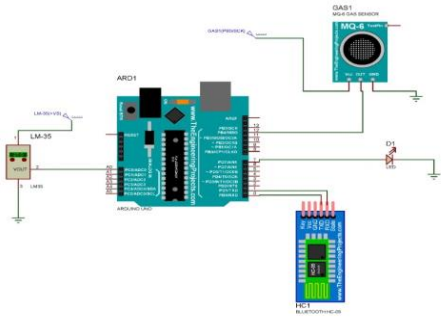

Fig.[3] Circuit Diagram of Transmitter

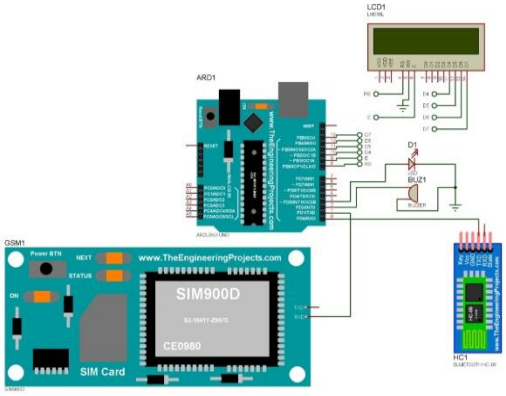

Fig.[4] Circuit Diagram of receiver

Fig.[5] LCD display : Smoke ALERT

Fig.[6] LCD display : Fire ALERT

Fig.[5] Base station message

8. CONCLUSION

In this research, we introduced forest fire detection in Arduino projects which employ wireless sensor networks to monitor and communicate relevant data. in their designs. A sensor node is responsible for feeling the surroundings, conveying and exchanging sensory data with other nodes in the neighbourhood. In the industrial application of digital transmission to monitor temperature and humidity in the woods, we have pointed to unique advantages of data security, flexibility in network building as well as low cost and energy demands for a forest fire monitoring system that is based upon Arduino wireless sensor technology that we desire. The industrial application of wireless sensor network systems. Industry. The emphasis of the review leans towards explanation of physics and description of experimental work, interactions between space charge gradient and electric field produced which in turn can generate instability throughout the bulk of the continuum. It also discussed the interaction between finely divided charged particulate matters and naturally occurring ions present in the atmosphere, leads to neutralization of the charged droplets and hence deteriorates the performance of the spraying system.

9. ACKNOWLEDGEMENT

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