Forest Fire Detection and Notification System

[1]Prof. A. R. Gaidhani, [2]Pratik.V.Kulkarni, [3]Anuja.J.Sinde, [4]Rupali Wadlekar

[1]Professor, [2,3,4]BE Computer
Computer Engineering Department
Sandip Institute of Engineering and Management, Nashik

***Abstract*: Wildfire is a kind of fire that occurs in the forests or reserved national parks. It starts as small fire but eventually turns into a huge fire due to some favorable con-ditions such as presence of dry trees and grasses as well as strong winds in the forests. The outcome may be due to failure of responsible authorities of getting early information about fire as soon as it starts so that they could be able to control before it turns into a huge fire. Human activities like clearing field for cultivation, charcoal burning or smoking can cause wildfire to occur. Broken glasses can be another source of wildfire because sometimes they can act as collective lens focusing sun light on a smallspot for a length of time, a condition that could trigger fire.Economic activities such as tourism can be affected in a negative way by wildfires due to damages it causes to the vegetation of ecosystems. Wildfires are a constant threat to ecological systems of forests and human safety especially in regions which present hot climate. Just like other countries, Tanzania is affected by wildfires each year causing deaths of people and wild animals as well as damage to valuable infrastructures leading to loss of some valuable plants and animal species. According to the reported analysis of 2012 for Tanzania using MODIS (Moderate Resolution Imaging Spectroradiometer), in average Tanzania loses over 11 million hectares offorests and woodlands each year (ranging between 8.5 and 12.9 million hectares) This is equivalent to about 9% - 14% of Tanzania's total land area. In another**

***Keywords*: Forestfire, Monitoring, Detection, Wireless Sensor Network, Forests, GSM, Arduino**

I. INTRODUCTION

FOREST is play an important role in the global,ecological, environmental and recreational system. It greatly impacts the amount of greenhouse gases, atmospheric carbon absorption, and reduce soil erosion. the Earth's ecological balance. However, forest fire, affected by some human uncontrolled behaviour in social activities and abnormal natural factors, occurs occasionally. Forest fire was considered as one of the severest disasters.

In forest fire detection, it is essential to know how fire affects the soil mantle, stems and treetops, as well as how to detect underground fires. The sensor network must cover large areas, distributing high amount of sensing nodes, inexpensive sensors are needed to achieve cost reduction. Video cameras sensitive in visible spectrum based on smoke recognition during the day and fire flame recognition during the night, Infrared thermal imaging cameras based on detection of heat flux from the fire, IR spectrometer which identifies the spectral characteristics of smoke gases, and "Light detection and ranging" system which measures laser light backscattered by smoke particles. Infrared and laser-based systems have higher accuracy than the other systems. General1y if the infrared level exceeds a predetermined threshold, an alarm 1s sent; but this methodology has some drawbacks that affect detection capability and reliability. Detection capabilities 1s negatively influenced by the fact that often fires are not directly visible from the sensor because during the first phases they grow up in the underbrush and are occluded from the vegetation. On the other hand the smoke (water vapour plus carbon monoxide), copiously produced during the wood drying process, is perfectly transparent in the infrared region (3-7 pm) so it cannot be detected by means of IR sensors. To become directly IR-visible, generally a fire must be at the tree top, so that when it can be detected is already widely extended from the fire starting instant. Handling uncertainty due to data aggregation and missing information requires space-time synthesis in rigorous formalism. Information granulation is at the heart of rough set theory. Rough set theory offers an attribute reduction algorithm and the dependency metric for feature selection. Meteorological data and images are parameters that change over space and time with relatively high frequency. The change of meteorological data could be recognized in hour scale, and the change of image data, taking into account only information connected to forest fires, in minute scale. Also for the forest fire prediction system, meteorological data history (archive values) is quite important. In order to monitor meteorological parameters and collect images in real time, the sensory network has to be established. The most critical issue in a forest fire detection system is immediate response in order to minimize the scale of the disaster. This requires constant surveillance of the forest area. Current medium and large-scale fire surveillance systems do not accomplish timely detection due to low resolution and long period of scan. Therefore, there is a need for a scalable solution that can provide real-time fire detection with high accuracy. We believe that wireless sensor networks can potentially provide such solution..

II. APPLICATIONS

1 In forest fire detection system we uses the WSN in which sensors are totally connected with wire less technologhy The WSN will monitor a determinedarea and collect data from the environment such as temperature and smoke.The collected data, upon arriving on the sink node, will then be sent to a gateway that by runninga script will receive and process the data, store it in a local file, send it to a web server, calculateand send to the sink node a danger index that allows for introducing a variable rate on a sensor node with high risk levels for a fire occurrence. The web server's purpose is to handle all client requests and all database operations. The web application will be responsible for presenting allthe collected data upon request by a web client or browser.

2. With the help of this sysytem we will find out the exact location of fire in the jungle, Since each mote was also equipped with a GPS module, the positionof every sensor node and possible detected events is known to the system manager or overseer.The collected data may be accessed in a more visual and user friendly way, which consideratelyincreases the understanding of the covered area status.

3. It will aslo notify the different Government offices like Fire brigade, Police station , Hospital , Forest office

4. It well gives some default message with the google map link

5. We will uses the 2 sensors light sensor and smoke sensor deu to which the rate of spread of fire is detected

III LITERATURE SURVEY:

Forest is considered as one of the most important and indispensable resource, furthermore, as the protector of the Earth's ecological balance. However, forest fire, affected by some human uncontrolled behaviour in social activities and abnormal natural factors, occurs occasionally. Forest fire was considered as one of the severest disasters. In forest fire detection, it is essential to know how fire affects the soil mantle, stems and treetops, as well as how to detect underground fires. The sensor network must cover large areas, distributing high amount of sensing nodes, inexpensive sensors are needed to achieve cost reduction. Video cameras sensitive in visible spectrum based on smoke recognition during the day and fire flame recognition during the night, Infrared thermal imaging cameras based on detection of heat flux from the fire, IR spectrometer which identifies the spectral characteristics of smoke gases, and "Light detection and ranging" system which measures laser light backscattered by smoke particles. Infrared and laser-based systems have higher accuracy than the other systems.General1y if the infrared level exceeds a predetermined threshold, an alarm 1s sent; but this methodology has some drawbacks that affect detection capability and reliability. Detection capabilities 1s negatively influenced by the fact that often fires are not directly visible from the sensor because during the first phases they grow up in the underbrush and are occluded from the vegetation. On the other hand the smoke (water vapour plus carbon monoxide), copiously produced during the wood drying process, is perfectly transparent in the infrared region (3-7 pm) so it cannot be detected by means of IR sensors. To become directly IR-visible, generally a fire must be at the tree top, so that when it can be detected is already widely extended from the fire starting instant.

IV Conclusion

In this paper, we propose android app**,** In order to be able to effectively control wildfire, there should be mechanisms to detect it immediately as soon as it occurs and inform responsible people/authority so that they can take appropriate measures as quickly as possible. Any failure or delay to inform responsible people about wildfire on time will result in the fire becoming very huge to the extent that controlling becomes almost impossible leading to irreversible damages, distraction of infrastructures and other valuable properties, deaths of people as well as wild animals.There are a number of systems around the world for monitoring and detection of wildfire but most of them can't be deployed and used in developing countries like Tanzania due to several issues such as absence of reliable internet coverage within forests, high power consumption as well as lack of technological infrastructures to support smooth operation of the systems.The contributions of the work proposed in this paper to already existing systems for monitoring and detection of wildfire based on wireless sensor network can be seen in three aspects; the sensing and gateway nodes can be deployed in areas where there is no reliable internet coverage, a scenario common in forests and national parks in developing countries like Tanzania. This is achievable through the use of short message services available in mobile cellular network. The second contribution is the involvement of communities living around forests or national parks in conserving the environment by giving them a means of reporting wildfire or illegal activities taking place in forests.

.

REFERENCES

[1] Silicon Labs. The Evolution of Wireless Sensor Networks. White Papers, pages 1–5, 2013.
URL: http://www.silabs.com/SupportDocuments/TechnicalDocs/evolution-of-wireless-sensor-networks.pdf.
Cited on pages vii, 3, 4, and 5

[2] Kazem Sohraby, Daniel Minoli, and Taieb Znati. Wireless Sensor Networks. 2007.
URL: http://www.amazon.com/Wireless-Sensor-Networks-Technology-Applications/dp/0471743003$\

[3] Ieee Standard and Ieee Computer Society. Local and metropolitan area networks — Part15. 4: Low-Rate Wireles Personal Area Networks (LR-WPANs) IEEE Computer Society,volume 2011. 2011

[4] Elaheh Rahmani. Presented by : Elaheh Rahmani May 2005 Outline :. (May), 2005.

[5] Fabian Nack. An overview on wireless sensor networks. Institute of Computer Science (ICS)

[6] Wenxiang Li, YunheWu, Chunsheng Zhu, and Yajie Ma. Performance Comparison of Source Routing Tactics for WSN of Grid Topology. 12:3–8, 2014. doi:10.1109/DASC.2014.

[7] Crossbow Technology Inc. TelosB Mote Platform. pages 1–2, 2004. doi:6020-0094-01Rev.B.

[8] Memsic. MICAz datasheet: 6020-0065-05 rev. San Jose, CA, California, Revision 6:1–2, 2003

[9] Libelium Comunicaciones Distribuidas S.L. Waspmote Datasheet, 2016.

[10] Tiago Couto Braga. Monitorização ambiental em espaços florestais com rede de sensoressem fios. 2010.
URL: http://digituma.uma.pt/handle/10400.13/229.