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Forest Monitoring Unit and Traveller Safety Gadget Using Wireless Sensor Network

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***Abstract*: Human life is always under threat for one's who live or travel near forest areas. It is important to safe guard the life of human by taking necessary actions. It is also equally important to save life of animals from fire accidents occurring in forest regions naturally or by human errors and also hunting is a major threat to animals also illegal deforestation is matter of concern, so in order to overcome the above situations a solution must be developed by technology. This project involves the use of image processing concept to detect the presence of humans at boundaries of restricted area. Cutting of trees can be detected by installing sensors on trees and also a region will be covered by fire and smoke sensors to detect the fire accidents occurring at the particular region of forest. Travelers safety device is developed and given to people on check post who are entering the forest areas where mobile phone signals do not cover the area and communication is not possible but via wireless safety device an emergency alert can be triggered during rescue situation to the control room, the safety device can also be used during trekking to locate in which part of forest the traveller is travelling using wireless technology.**

***Keywords*: Wireless Sensor Network.**

1. Introduction

Forest region where humans reside are still lagging with the safety and are living their life under the threat of wild animals. Also highway route connecting between many places go through the reserved forest area where safety is nil and also mobile phone communication is not possible due to low signal coverage and in most places wild animals enter on the highways and create life threatening situation to the travellers.

Most of the time travellers are lost in dense forest during trekking and fail to locate themselves on map hence a safety device is developed to help the travellers in all the aspects in forest area. It is also a responsibility of human to conserve the forest and protect the animals from illegal activities like deforestation and hunting animals, also protect the nature from fire accidents occurring naturally or by human errors, to overcome such situation fire and smoke sensor are installed and safety device is used to notify any illegal activities noticed by traveller during journey. All the above activities are under coverage of control room unit so that they will provide necessary security and facility on time.

This project involves the use of image processing concept to detect the presence of humans at boundaries of restricted area. Cutting of trees can be detected by installing sensors on trees and also a region will be covered by fire and smoke sensors to detect the fire accidents occurring at the particular region of forest. Travelers safety device is developed and given to people on check post who are entering the forest areas where mobile phone signals do not cover the area and communication is not possible but via wireless safety device an emergency alert can be triggered during rescue situation to the control room, the safety device can also be used during trekking to locate in which part of forest the traveller is traveling using wireless technology. The proposed concept is mainly directed towards monitoring the forest safety parameters and traveller's safety during journey under forest area.

Monitoring the boundaries of restricted zone is important to prevent illegal deforestation and hunting, hence the system is installed with camera for input to perform the image processing to detect human face at boundaries.

Fire accidents at dense forest region occur due to natural effect/human error, and preventing it at initial stage is very important to avoid it from spreading it to other regions which cause disaster, hence the system is installed with fire/smoke sensors are different regions/zones of forest.

Commercial trees in forest are always under risk of getting illegal deforestation, hence the system is installed with sensor which monitors the tree fall axis.

Forest areas where roads are not protected with electric fencing due to animals crossing to other end of forest via roadways is normal, but it is a threat to traveller's life anytime. Hence the concept involves the traveller's safety device to help the travellers at panic situation.

2. Methodology

It is a responsibility of human to conserve the forest and protect the animals from illegal activities Like deforestation and hunting animals, also protect the nature from fire accidents occurring naturally or by human errors to overcome such situation fire and smoke sensor are installed and safety device

is used to notify any illegal activities noticed by traveller during journey.

The project consists of 3 major modules and they are as follows,

1) Forest Monitoring Unit (Zone Device)
2) Travelers Safety Gadget.
3) Control Room Unit.

a) Boundary monitoring system: Boundaries of a restricted area is monitored for trespass of humans via image processing concept. Detection of human is implemented via image processing by analysing the captured images from the camera which is installed on the boundaries, any trespass found during monitoring process an alert is triggered to the control room to take necessary action.

b) Fire detection unit: Forest is virtually divided into various zones and installation of fire and smoke sensors are done. Continuous monitor of smoke and fire parameters is conducted and if any of the parameter is triggered then an alert is sent to the control room unit to send an fire and emergency services to that particular zone for rescue.

c) Tree cutting detection unit: Deforestation being a major issue, so to monitor tree fall an accelerometer and tilt sensor is installed on trees so that tree cutting can be monitored and an alert can be triggered to the control room unit. In many parts of forest mobile phone communication is not possible due to low signal coverage.

A. Forest monitoring unit

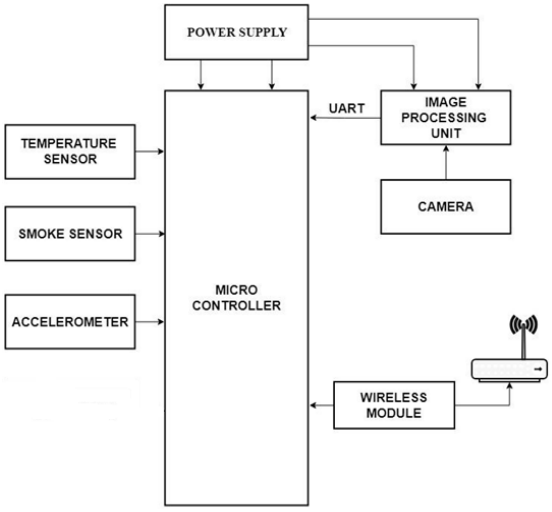

Fig. 1. Forest monitoring unit

B. Travelers safety device

In many parts of forest mobile phone communication is not possible due to low signal coverage, travellers might have high risk of life threat when no communication is possible when they needs help. So to overcome this problem a travellers safety device is developed and is handed to the traveller at the entrance check post of the forest so that under any life threat situation encountered, one can press the button and alert the control room for help. The device can also be used to notify the control room by pressing button if any illegal activity like tree cutting or hunting etc., being noticed by the traveller on his journey. Also the device has a trekking mode to help the traveller locate himself on which part of forest he is travelling in.

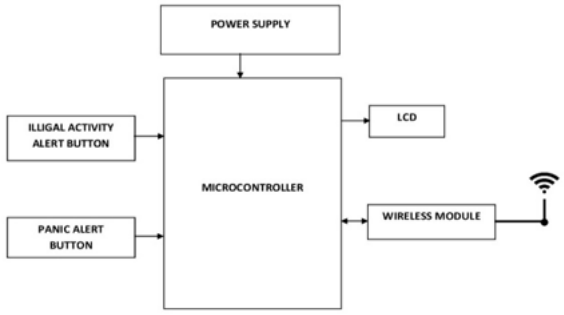

Fig. 2. Traveller safety gadget

C. Control Room Unit

Control room unit receives all the alert information from zone devices and traveller's safety gadget via wireless and display on LCD.

Alert information regarding fire accidents, human detection at boundaries, tree fall received from zone devices inside forest are displayed and also alert information regarding panic and illegal activity received from traveller's gadget are displayed.

All the alerts will be further pushed to cloud using IOT implementation so that monitoring can also be done from head office using Android App.

20×4 LCD display is used in control room unit all the information will be displayed in this LCD, where LCD display connected I2C LCD driver .it works on I2C so called as LCD driver. Control room and traveller safety gadget act as a trans receiver but other zones are act as a only transmitter.

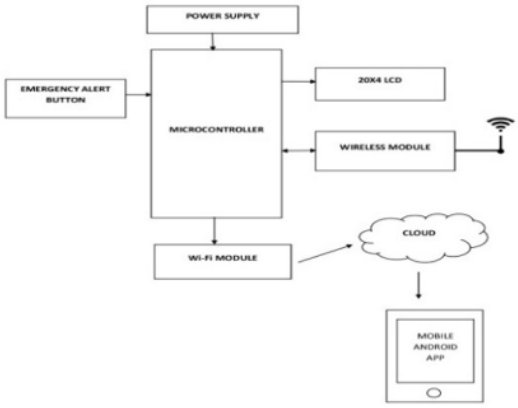

Fig. 3. Control room unit

3. Implementation

The proposed project involves division of forest into 4 different zones and installed with sensor unit, camera and wireless node to monitor the tree fall and fire/smoke accidents and boundary monitor. travellers safety gadget is used for trekking and safety of travellers.

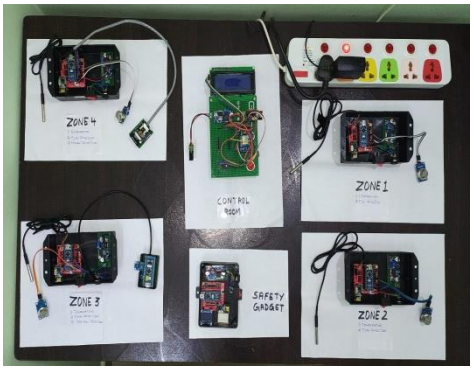

Fig. 4. Overview of model

Zone-1:

Fig. 5. Fire detection unit

Zone1 is responsible for extinguish of fire that has occurred due to human error or naturally. This zone contains DS18B20 temperature sensor, MQ135 smoke sensor and NRF24LO1 wireless module.

Zone-2:

Fig. 6. Fire detection unit

Zone 2 is responsible for extinguish of fire that has occurred due to human error or naturally.

This zone contains DS18B20 temperature sensorMQ135 smoke sensor and NRF24LO1 wireless module.

Zone-3:

In this region commercial trees in the forest area always under risk of getting illegal deforestation.

Hence the system is installed with accelerometer which monitors the tree fall axis.

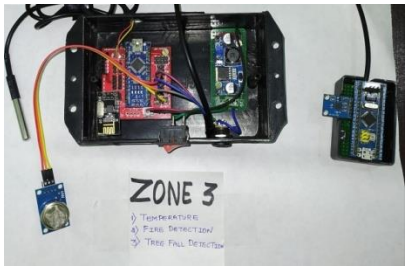

Fig. 7. Tree cutting detection

Zone-4:

Fig. 8. Boundary monitoring unit

Monitoring the boundaries of restricted zone is important to prevent illegal, deforestation and hunting.

So the system is installed with the to perform image processing technique to detect the human face at boundaries.

Travellers safety gadget

Fig. 9. Traveler safety gadget

The traveler's safety gadget contains OLED display to display the zone it is present.

This contains NRF24L01wireless module, microcontroller and buttons. It contains panic button emergency alert button, illegal activity button and alert button.

Control room unit:

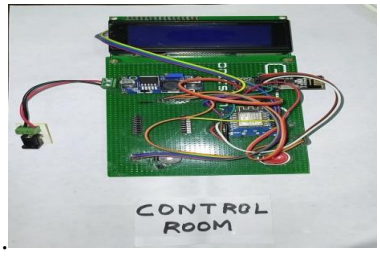

Fig. 10. Control unit

All the monitoring parameters from forest zone devices are received by control room unit. The control room unit is implemented with IoT technology using Wi-Fi module.

All the parameters are sent to cloud and using forest monitoring android app all the parameters can be monitor from anywhere.

4. Results

Fig. 11. Fire detected message

Fire detected in zone-2 by smoke sensor and alert is displayed in control room.

Fig. 12. Tree cutting message

Tree cutting in zone-3 is detected by accelerometer and alert is displayed in control room unit.

Fig. 13. Human found message

Human detected by ESP32CAM in zone-4 is displayed as alert in control room unit.

Fig. 13. Human found message

So the system is installed with camera to perform the image processing technique to detect human face at bound.

Travellers safety gadget is on and all the zones are off is displayed in forest monitoring app.

Fig. 14. Forest monitoring app

In notification all the alert from zone and travellers gadget is displayed in forest monitoring app.

5. Conclusion

The proposed project involves virtual division of forest into 4 different zones and each zone is installed with sensor unit and wireless node to monitor the tree fall and fire/smoke accidents at the particular zone. As soon the zone detects any abnormalities in monitoring parameters, the zone sends an alert to control room unit via wireless technology. Control room unit is equipped with wireless device and microcontroller including LCD to display alert messages. Forest boundaries are installed with camera which is used as input for image processing and it detects human face using image processing algorithms and when human face is detected then an alert is provided to control room unit. The system also includes traveler's safety device/gadget which is handed over to person who is entering the forest region at the entry check post, the safety gadget has panic button which is pressed to alert for help from control room during panic situation, the gadget also has illegal activity alert button which is pressed by person when he notices any illegal activity during his journey in forest region. The gadget has wireless device which is connected to control room unit and zone devices, traveler can also locate himself with the help of gadget when lost in forest which will show him the zone which he is present in.

References

[1] Lamir Shkurti, Xhevahir Bajrami, Ercan Canhasi, Besim Limani, Samedin Krrabaj, Astrit Hulaj, "Development of ambient environmental monitoring system through wireless sensor network (WSN) using NodeMCU and WSN monitoring," IEEE 2017 6th Mediterranean Conference on Embedded Computing (MECO).

[2] Rizky Pratama Hudhajanto, Nurul Fahmi, Eko Prayitno, Rosmida, "Real-Time Monitoring for Environmental Through Wireless Sensor Network Technology", Applied Engineering (ICAE) 2018 International Conference on, pp. 1-5, 2018.

[3] D. Punniamoorthy, Vikram S. Kamadal, B. Srujana Yadav, V. Sriram Reddy, "Wireless Sensor Networks for Effective Environmental Tracking System Using IoT and Sensors", I-SMAC (IoT in Social Mobile Analytics and Cloud) (I-SMAC) 2018 2nd International Conference on, pp. 66-69, 2018.

[4] C. T. Cheng, C. K. Tse, and F. Lau, "A delay-aware data collection network structure for wireless sensor networks," Sensors Journal, IEEE, vol. 11, pp. 699- 710, 2011.

[5] F. Wang and J. Liu, "Networked wireless sensor data collection: issues, challenges, and approaches," Communications Surveys & Tutorials, IEEE, vol. 13, pp. 673-687, 2011.

[6] S. Ji, R. Beyah, and Y. Li, "Continuous data collection capacity of wireless sensor networks under physical interference model," in Mobile Adhoc and Sensor Systems (MASS), 2011 IEEE 8th International Conference on, 2011, pp. 222-231.