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Wildlife Intrusion and Early Fire Detection System Using IoT

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ABSTRACT: Intrusion of wildlife is proved to be destructive for both human beings and animals. The incompatibility between the human wildlife is the major cause that leads to crop damage,injuries caused to both human and animals .In this system we have put forth wildlife intrusion monitoring using IoT.The wildlife are captured by using a camera.A GSM notification along with the alarm is processed to the forest officials indicating that an animal has been detected in the forest borders and is fast approaching the human habitats. The existing system also focuses on atmospheric monitoring and therefore it overcomes the drawbacks of existing system.Thus,we have refined a prototype model that allows persistent detection and monitoring.

KEYWORDS: IoT (Internet of things), camera, wildlife monitoring,atmospheric monitoring GSM, alarm.

I. INTRODUCTION

The rapid increase in human population has led to the conversion of forest land into human settlements.Due to this,the wild animals face lack of food and water.However, wildlife is greatly distressed due to deforestation which forces them to move into human habitats.It creates tremendous loss to properties and lives. In Times of India it has been reported that over 1300 people died due to tiger elephant attacks in India over the past three years.Thus, humans face serious danger and the time to regain from the huge loss is imperceptible.Human animal interaction can prove to cause crisis for both species and therefore there is a need for an intelligence supervision and perceptive system.Human animal conflict is increased to a higher extent.A number of factors include elephant habitat structure,weather,animal life etc. Forest fire is an important hazard that occurs periodically due to the natural changes, human activities and other factors. In the contemporary years there is a persistent increase in the forest fires that causes damage to crops, wildlife as well as to humans. Therefore, a network based wireless sensor is used for forest fire to achieve high verdict accuracy for the early detection.

The approach targets on detecting animals and sending cautionary messages using GSM and alarm. The humidity of the forest is measured and maintained.The main aim of our work is to alert the people in and around the forest borders and to forbid their lives.In an uncontrolled field environments like desert,forest or trees it is desirable to develop computer perception tools instead of performing physical field investigation. These, automated tools helps in many adequate and predictable studies.

II. RELATED WORK

T.Burghardt and Calicproposed a system on analyzing animal behavior using face detection and tracking in which the algorithm is based on human face detection method which uses the AdaBoost classifiers. A novel system for automatic detection and classification of animal was done by Matusa et al which uses visual words for detecting the animal SIFT

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and SURF were used as key point detectors.A vision based human animal collision detection system by IshaDua,PushkarShukla,Anush Mittal focuses onidentifying elephants in an image which makes use of haar features to detect the image of the elephant.This system achieved an overall accuracy of 83%.Matthias Zeppelzaeur and Angela S Stoegaer proposed a system on establishing the fundamentals on early warning and monitoring system which uses automated elephant detection that is robust to noise. Tracking is shown by visual detection technique which is feasible and resilient. Characterizing animal behavior through audio and video processing by Dan Valente, HaibinHang, Peter Andrews put forward the concept video processing through locomotors activity and exploratory behavior.

III. PROPOSED WORK

In this system,we are recognizing the problems of detecting animals in forest border areas using IoT.The main objective of the syst4em is to alert and protect the people across the forest borders.Once the animal is detected across a particular range, it is sensed and a notification is sent and an alarm is produced which indicates that the animal is approaching the human life. A GSM notification is enabled if the animals are captured. The animals are monitored using camera and is detected by using PIR sensor which signifies the motion of an animal. The distance of the animal is done by using the Ultrasonic sensor. The notification can be in the form of SMS,twitter,telegram,etc.Verification is done as soon as alarm is produced. Verification may be in the form of, if the animal is detected, the notification and alarm is sent if not the same process is continued until the animal is found. The location of the animal can also be observed and is stored in Ubidots. Forest fire is an important threat and it can be reduced to a maximum extent in our system. The humidity sensor is used to sense the climate and stores the value. The environmental monitoring is also done on a regular basis.The temperature of the forest can be monitored and the disaster management is informed if any consequencetakesplace.The location of the forest is detected and the humidity is monitored using DHT sensor.

IV. COMPONENTS REQUIRED

1.NODEMCU: It is an open source IoT platform. It includes firmware which runs on the **ESP8266 Wi-Fi SOC.** Operating system used are XTOS. Storage capacity is **4Mbytes,** power is from USB.All the sensors used in our system is connected with nodemcu.

2.PIR sensor: It is an electronic sensor that measures the infrared light radiating from the object in its field of view. They are most often used in PIR based motion detectors.PIR Sensor is used in camera for detection of animals.

3.Ultrasonic sensor: It is a device that can measure the distance by sending out sound waves. It measures the distance of the animal from the system. The ultrasonic sensor used in our system is **HC-SR04.**

4.DHT sensor: It is a device that can measure the temperature and the humidity of the location where it is placed.DHT Sensor used are DHT 11 and DHT 22.In our system we are using DHT 11 to monitor the environmental temperature and moisture

5. Arduino: It is open source hardware and software .It is a microcontroller kit used for interactive objects that can sense and control objects that can control object in the physical world. In our system we are using arduino c software.

6. Ubidots: It a platform for developers that enables them to easily capture sensor data and turn it into useful information. The ubidots platform is used to send data to the cloud from any internet enabled device. Our system uses ubidots to store the data detected by the sensors.

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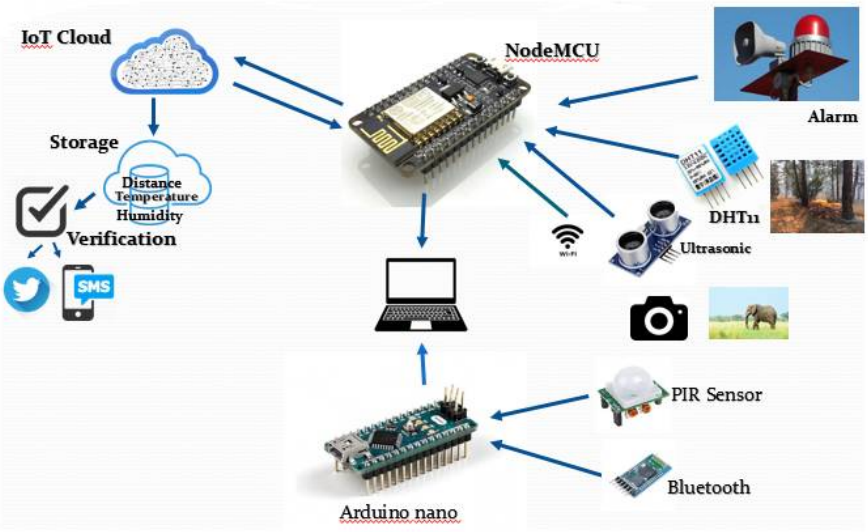
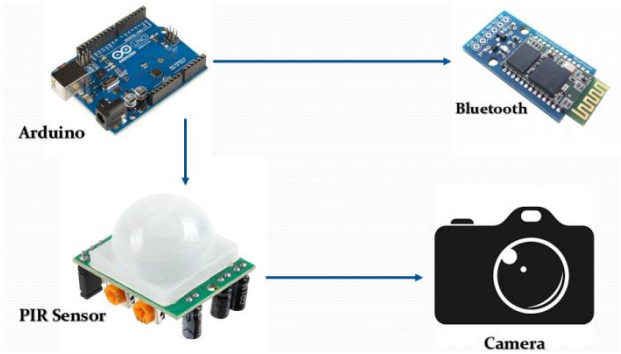
V. ARCHITECTURE DIAGRAM



Camera Module:



Camera module is used to find the animal that has been detected using ultrasonic sensor ,once the animal is found the PIR sensor enable camera and the animal is captured in the camera and it is stored.

Animal detection:

Ultrasonic sensor is used to measure the distance of a wildlife animal by using sound waves. The ultrasonic sensor sends out a high frequency sound pulse and then times how long it takes for the echo of the sound to reflect back is measured. The sensor has 2 opening on its front, one for transmitting ultrasonic waves, the other receives them. By recording the time taken between the sound wave being transmitted and the sound wave bouncing back, it is possible to calculate the distance between the ultrasonic sensor and the object. The ultrasonic sensor uses a single ultrasonic element for both emission and reception. It ranges from 10m to 20 m. Considering the travel time and the speed of the sound you can calculate the distance. Once the animal is detected, ultrasonic sensor will send information and it captured image and it is stored in ubidots, simultaneously a notification is sent to the user along with an alarm .The alarm will be enabled once the animal is detected by the ultrasonic senor is notified. The user will also verify manually if complex results are notified.

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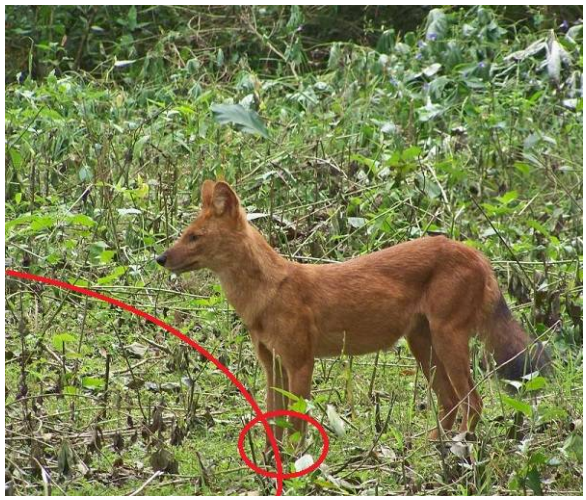
Animal entering the border



Message sent went the animal is detected

Humidity detection:

The sensor used for humidity detection is DHT 11.The DHT 11 sensor consist of a humidity sensing component, a NTC temperature sensor and an IC on the back side of the sensor. The DHT 11 sensor has two electrodes with moisture holding substrate between them, so as the humidity changes the conductivity of the substrate changes or the resistance between these electrodes changes. This change in resistance is measured and processed by the IC which makes it ready to be read by a microcontroller. The temperature range of the DHT 11 sensor is 0-50˚C ,Humidity range is 20-80% and the operating voltage is 3-5V .In our system the DHT 11 sensor monitors the moisture and the temperature of the forest 24X7 and the ranges are stored in ubidots. Once if any changes in the moisture or temperature are detected immediate notification is sent to the user.

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Temparature data posted in cloud

Humidity data posted in cloud

VI. CONCLUSION

The findings of our work contribute to conservation of elephant issues and solutions to human elephant conflict. We recommend the usage of real time system to identify individual animals or group of animals approaching the human habitats.This study provides insights to safeguard the animals from human activities and reduces the work pressure for the forest officials. Our model overcomes the drawbacks of the existing system. Location detection and humidity detection along with animal detection is done. Our system can be deployed at forest borders, tea estates, food plantation, water holes, migration routes etc. for elephant monitoring and detection. Human-animal collision can be reduced to a greater extent. This system also focuses on conservation of rare species. Humidity can also to monitored and notified. Traditional observation can be less effective. Therefore, automated systems are being used.The real time automated approach minimizes manual work and is more efficient and reliable when compared to all existing systems. Thus, not only monitoring and detecting, prediction of future is also possible in Internet of Things (IoT).

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