

## Proficient Technique for Monitor An Elephant Intrusion In Forest Border Areas Using Embedded Systems

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### ABSTRACT

In recent years, as the issue of human elephant interaction and conflict has become more important, researchers and wild life managers have begun to investigate the subject. since crop damage by elephant is more localized but more severe per raid than that of smaller pest species ,the reasonably standardized system is required .In this paper we proposed an automated system which will detect the intrusion of elephants in the forest border areas by measuring the vibration and motion of elephants and it take immediate action by producing the large burst sound to avoid the elephant intrusion into living areas .It also indicates the level of water filled in the bunker for elephants during summer season.

Keywords: Human-Elephant Conflict, Sensors, Audio Module, GPS, GSM.

### 1. INTRODUCTION

Many species face increasing competition with people for space and resources. As human population gradually increased in recent decades, human-animal conflict problems are getting serious. These problems occur due to the encroachment of human beings on animal habitats for agriculture or poaching activities. Thus Human Elephant Conflict (HEC) is triggered by habitat loss and fragmentation and the lack of suitable wildlife habitat .In addition to that, animals which lost their habitat would run into agriculture areas or villages for food resources .Crop raiding problems happen due to that fact. The report says that about 400 people annually die in India because of human-wildlife conflicts. Hence our system was designed to reduce crop damage, human death and elephants being killed by human. The following figure shows the year wise death of elephant due to human elephant conflict.

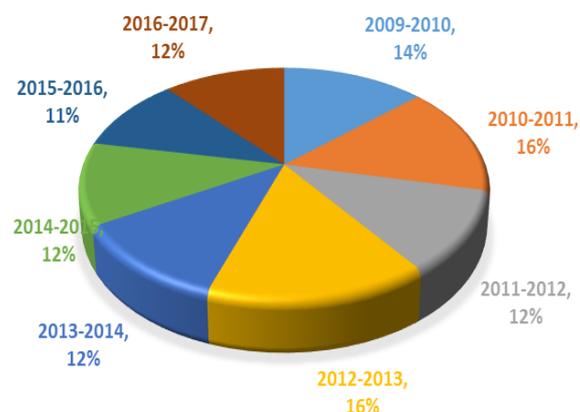


Figure 1: Yearwise Death of Elephants

Our proposed system aims to find the intrusion of elephants by detecting the vibration and motion of it. As soon as the presence of elephant was detected, it creates the burst sound which will defer the elephants back into forests.

The elephant influx into the living areas for searching of water during summer season was avoided by indicating the level of water in the bunker which was filled for elephants.



Figure 2: Number of People killed by wild elephants

## 2. LITERARY SURVEY

Based on the facts and conclusion of previous research works, many systems are available to monitor the elephant intrusion into living areas. They used various techniques to detect the arrival of elephants such as recording the vocalizations to determine the size and composition of the herd, image detection method in which the image of elephants are compared with the database image using image vision algorithm, automatic acoustic and visual detection method of finding intrude of elephants, intelligent image processing algorithm in Raspberry PI for the detection of motion of elephants. In such way our proposed system was designed to find the intrusion of elephants by detecting the motion and vibration of it and takes an immediate action by produce the burst sound.

## 3. STUDY AREA

Study was conducted at the Karamadai block of Coimbatore in Tamil Nadu. This area was selected for study as it showed higher human death due to human elephant conflict. Data were collected from the Coimbatore Forest Department website and interviews with village people affected by elephants. Coimbatore district is richly endowed with hills, forests, rivers, and wildlife. Geographical area of the district is 74,433.72 sq. km with a forest area of 693.48 sq. km (9.33%). The research shows that the period between September 2016 and August 2017 saw 1,806 such incidents of elephants straying into human habitations in search of food and fodder.

Seventeen human deaths were reported due to direct elephant encounters in the forest border areas. There were 39 cases of human injured in elephant attack. Elephants visit to Coimbatore never stopped with farms alone. They crossed major roads on 92 occasions of which 52 were along Mettupalayam and Sathyamangalam road. And also 22 elephant deaths were reported in the period of which ten were outside the forest.

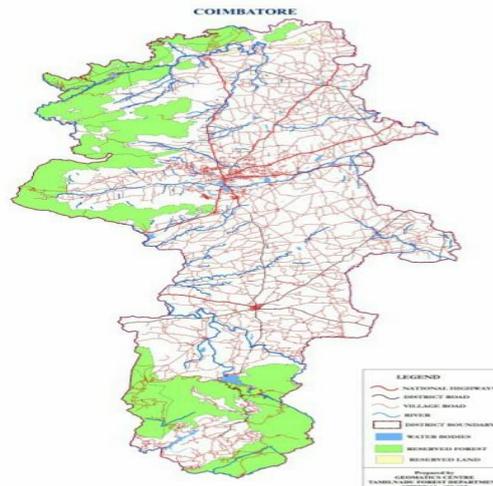


Figure 3: Shows the Reserved Forest Area in Coimbatore of Tamil Nadu, India

#### 4. PROPOSED SYSTEM

Human Elephant Conflict is a major problem and it results in the death of human as well as elephants. Some traditional methods proposed by human to avoid such incidents are electric fences, watch towers, trenches, etc., these methods are not accurate and need the human intervention. There were several automated system to detect the intrusion of elephants. Our proposed system outperforms existing approaches and accurately detects the intrusion of elephants into human habitats by measuring the vibration and motion of the elephants. PIC microcontroller is used to controlling and displaying the resultant sensor values using LCD Display. When the controller detects the presence of elephants it takes an immediate action by producing a burst sound. GPS is used to find out the location of the animal and the arrival of elephant was indicating to the ranger via GSM. In addition to that the water level sensor is used to find the level of the water in the bunker.

#### 5. BLOCK DIAGRAM

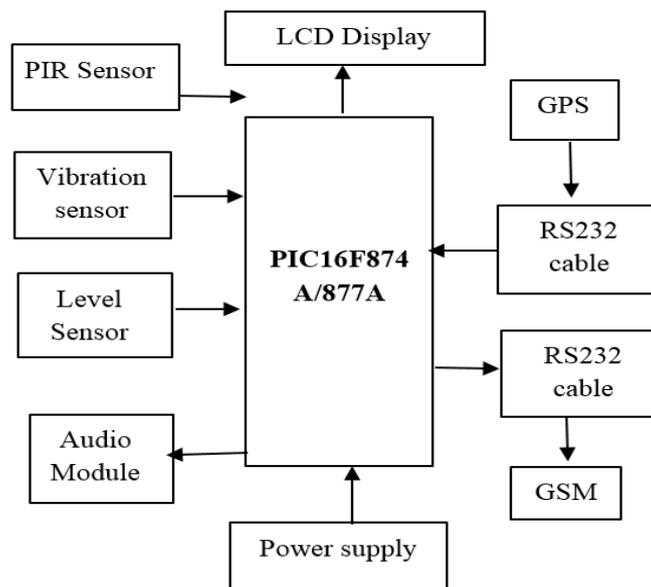


Figure 4: Block diagram of proposed system

### **✚ VIBRATION SENSOR**

Vibration sensors are sensors for measuring, displaying and analyzing linear Velocity, displacement and proximity, or acceleration. Vibration velocity sensors operate in accordance with the electrodynamic principle and are used for measuring the bearing absolute vibration. The range of the vibration of elephants are programmed in that sensor. Whenever the vibration is detected, it indicates to the PIC controller.

### **✚ PIR [MOTION] SENSOR**

A Passive Infrared Sensor [PIR sensor] is an electronic sensor that measures the infrared light radiating from objects in its field of view. The PIR sensor is tuned to detect the target's wavelength which only emanates when a target arrives in their proximity.

### **✚ WATER LEVEL SENSOR**

Level sensors detect the level of liquids and other fluids and fluidized solids, including slurries, granular materials and powders that exhibits an upper free surface. It works on the principle of buoyancy, which states that "A float immersed in a liquid is buoyed towards the upward direction by an applied equal force to the weight of the displaced liquid". This sensor is used to indicate the level of water in the bunker which was filled for elephants during summer. Whenever the water level decreases it indicates to the forest officials using controller via GSM.

### **✚ RS 232 COMMUNICATION**

The RS232 is a communication cable, generally used to transfer and receive the serial data between two devices. This cable supports both synchronous and asynchronous data transmissions. RS 232 cable is used in many devices in the industries and it is used to find the difference between two signal levels like logic 0 and logic 1.

## **6. RESULTS AND DISCUSSION**

The figure shows the proposed module which is used to track, detect and prevent the elephant intrusion into living areas.

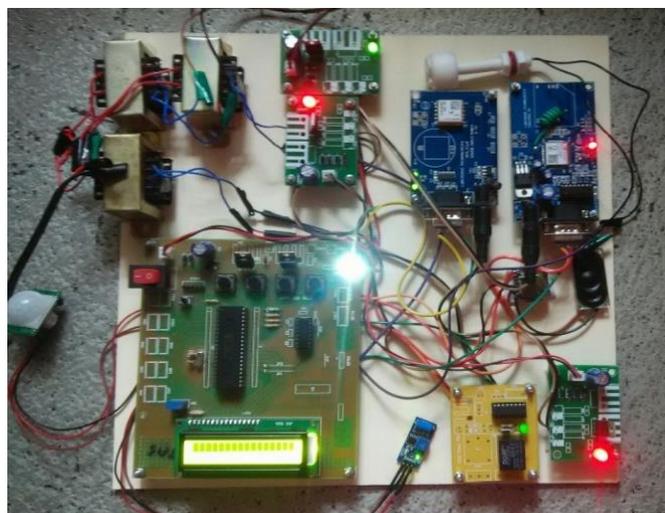


Figure 5: Snapshot of proposed module

PIC microcontroller was used to monitor and control the whole system. The vibration and motion sensors are used to detect the intrude of elephants. The vibration sensor is programmed with the minimum vibration level of the elephant, so that it accurately detects the arrival of elephants. Motion sensors monitor 120° angle and indicate to the controller whenever motion is detected. Audio module is used to produce burst sound if the presence of elephant was detected. Water level sensor is used to monitor the bunker and indicates to the ranger via GSM, whenever the bunker is dry. The GPS module is used to find the location of the elephant.

## 7. CONCLUSION AND ENHANCEMENT

Thus our proposed system to detect the intrusion of elephants into human habitats focuses to reduce the human elephant conflict. It reduces the manual work which is not possible all time and it takes an immediate attempt by producing the burst sound and indicates to the ranger via GSM. The GPS is used to find the intrusion area. Also by detecting the water level in the bunker and sending SMS to the ranger, the elephant intrusion gets reduced if the intrusion is due to the lack of water for the elephants.

## 8. ACKNOWLEDGEMENT

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