



An Experimental Study for an IOT Based Automated System for Early Detection and Warning on Probability of Musth in Elephants

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ABSTRACT: ‘Musth’ is a periodic condition in male elephants, characterized by highly aggressive behavior due to a large rise in reproductive hormones. During the ‘Musth’ even the most placid elephants become highly violent toward humans and other elephants. Reports of humans killed and other destructions made by elephants in ‘Musth’ is too common news in the state of Kerala. The symptoms of Musth in elephants are raised hormonal levels and temperature variations. In this paper, we propose IOT based mechanism that includes modules for detecting that the Elephant is turning to Musth and generating warning messages accordingly. The system uses a sensor to detect the factors under investigation and conversion module to convert the data to required mode and then the analysis and message generation module. The proposed work can ensure a Musth fear-free society.

KEYWORDS: Musth Detection, Real-time Wireless Sensor Network System, Central Data Center

I. INTRODUCTION

Elephants are the largest land mammals on earth which can be found in Asian and African continents. They have a vital role spread in variety of ways including the religious customs, ecosystem and economic importance.

The awe-inspiring size of elephants has led to them being revered in religions. In the Hindu religion, the God of wisdom and remover of obstacles, Ganesh, has the head of an Elephant. The head symbolizes the wisdom of an elephant and the ears are to hear everything but retain only the good that is said. In Buddhism it is believed that the lord Buddha has many times been reincarnated as white elephants [1].

The elephant plays numerous vital roles in its ecosystem, which cannot be replicated by any other species of animals. Elephants in dry regions are able to smell water close to the surface of the ground and use their tusks to dig small waterholes. Other animals sometimes have to rely on these water holes [1]. Elephants are referred as the ecosystem’s engineers, gardeners and architects. Elephants’ role as seed dispersers, water providers and habitat modifiers are well known.

Humans have been taming elephants for thousands of years and putting them to work in many ways. Until as recently as 1960, elephants were being used in war either in battle or as the ultimate beasts of burden. The power of the animals is harnessed for heavy jobs such as log hauling and forest clearance. More agile and less likely to break down than machines, in some areas elephants are more economically viable for heavy tasks.

Zoos can often draw more visitors and revenue if they have elephants, a species that many may not see outside of a wildlife park. In their native countries, revenue can be made by organizing safaris to see them in the wild. The huge animals are a wonder to look at, and this can be profitable to a country's tourism.



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'Musth' or 'musth' [8][10][11][12] is a periodic condition in male elephants, characterized by highly aggressive behavior accompanied by a large rise in reproductive hormones. During the 'Musth' even the most placid elephants become highly violent toward humans and other elephants. Reports of humans being killed by elephants in 'Musth' is too common news in the state of Kerala. Elephants in Musth sometimes go to very violent destructive frenzy and may kill even its caring owners. At the same time tamed elephants in Kerala are currently a need in processions and other rituals in temples. The part played by the elephants in timber industry is noteworthy. Moreover, Human lives are precious, services rendered by the elephants are also needed, and hence we propose this life saving, socially useful system. Part 2 of the paper explains the background of the study. Part 3 explains the proposed system. Part 4 details the methodology including the system architecture.

II. RELATED WORK

Musth can be seen as a very stressful time for a bull elephant. Bulls in Musth decrease their food intake, greatly increase their territories (so they roam over a much larger range), fight more with other elephants (and with other species), and at the height of Musth they lose large amounts of water to urine dribbling (they become 'incontinent' and dribble urine almost constantly; this is probably to leave specific chemicals behind to communicate their state to other elephants) [2][3][4][5]. The adrenal glands are involved in the stress response in most species studied to date, and it is reasonable to think that they would be active during the stressful time of Musth [6][7][8][9]. Information Technology Related work in this veterinary field has not been reported.

III. PROPOSED SYSTEM

The proposed system is to develop an Android application to store the details of the registered elephant and owners. The information of every elephant will be stored in the database so that the app shows the details of the elephant in a locality including its previous Musth tenure. This helps people to be vigilant as it is studied that mostly Musth occurs once in an year.

In the present system we propose a method to record the temperature at regular intervals using the sensor. The values will be passed to Raspberry Pi where it is recorded and the variation levels are identified. If the variations of the temperature is found shows a symptom of Musth, the system sends an alert to the responsible people including the owners, mahouts and if required to the concerned department.

The major components of the proposed system are:

a. Wearable Wireless Sensor System WSS & IOT Device-Raspberry Pi

The wireless sensor system is attached to the body of the elephant- preferably near the neck. The temperature values are fed into the file in the Raspberry pi. The temperature variations in the intervals are noted. An algorithm works in the background of the device to identify the irregular or continuous variations of the temperature. When the variation raises more than a threshold, an alert notification will be sent to the officers and elephant owner which informs the owners to be vigilant and to take actions for not bringing the animal for any public events.

b. Mobile App and Communication System

A mobile app is developed for elephant users for registering their own elephant details and ownership details. A module is created for identifying the elephants in a chosen locality. The details of the interested elephant can be displayed using this app.

c. Central Data Center (CDC).

When an alert message is generated and delivered to the mobile, the corresponding details of the elephant and its values are noted in CDC. This information will be displayed on request from separate systems. The details stored will be helpful for the users to identify whether the elephant has had Musth in the searched period or whether is a probability of Musth as the studies show that the Musth occurs one in a year.

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IV. METHODOLOGY

A study on the factors of variation and its variation levels of elephant during the musth season was done with the information obtained from vets, elephant owners and mahouts. Mainly two features are currently considered for the study: temperature and hormonal level.

We propose a mechanism that includes three modules, for detecting that the Elephant is turning to Musth.

1. Sensors in our proposed system should be able to read changes in two attributes, given below, of the animal. Based on continuous evaluation of these attributes we can decide whether an elephant is in Musth. A good amount of research need to be done here to find out the actual pattern of changes in these attributes.

- Increase/fluctuation of testosterone level in elephants nearing Musth.
- Increase/Fluctuation of body temperature in elephants nearing Musth.

2. Microcontrollers and memory devices shall intake the analog input from the above mentioned devices and do processing of information. Compare and contrast operations done by a small micro device can periodically decide the probability of the Musth.

3. A small GSM device can send the details to a centralized control center or to a group of users like mahouts, owners or a government nodal agency.

The choice of whether the device needs to be worn by the elephants during its entire life or just during the high probability months of Musth can be left to the Owner of the elephant. Once put into production, the cost of entire product must be in affordable range.

SYSTEM ARCHITECTURE

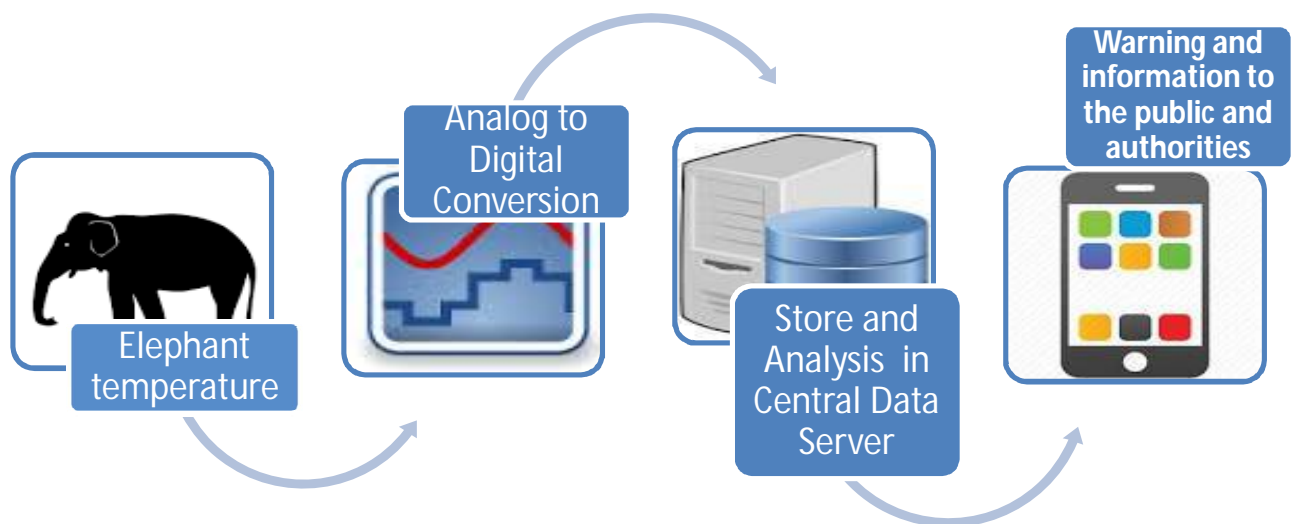


Fig.1. System Architecture for Detection of Probability of Musth in Elephants and Generation of Warning

V. CONCLUSION AND FUTURE WORK

This paper presents a real-time wireless sensor network system for monitoring and detecting the probability of Musth in elephants. The system can be designed to monitor multiple elephants at the same time, to deliver rapid and effective caution messages or alarms if any unusual pattern is diagnosed in the factor of concern of the animal. The proposed system design consists of wearable wireless sensor knob, mobile unit, central data centre, data analysis and the warning system. The system is also able to collect the data according to perceived risk in animal. Especially this system will be useful before and during the days where elephant is brought in front of the public especially for religious festivals and for carrying logs. The system will contribute in the reduction of death due to Musth elephants.



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Comparatively, this system can be produced in low cost, since it only needs to develop a wearable wireless sensor system, the software, and the development of data storage capability. The system utilizes the available wireless network for the data transmission, which contributes to the cost reduction. The current system can be modified by incorporating the algorithms for testing factors other than temperature and hormones will be modified later, by incorporating other sensors.

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