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Leaving Habitat of Wild Animals in Gir National Park : a Critical Scenario and a Possible Solution

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Abstract: ***Wild animals are the ecosystem's main link. Wildlife is important to humans because it maintains a balance between the active environment and biotic factors. It plays an important role in making the various natural processes of nature stable. The tradition of protecting wildlife species and their ecosystems is wildlife conservation. In India the Asiatic lion is the wild animals species which has lowest population in the world. The government established Gir National Park to protect the Asiatic lion and start various programs through in which the population of Asiatic lion should increase. Even other such programs this wild animals faces lots of problem in the national park. This paper addresses the wild animals in India relevant issues and concerns. After the problems we have found, we have suggested a potential solution to these problems. The system uses the Wireless Sensor Network (WSN) platform. This shows how WSN can be seamlessly integrated into the wildlife habitats / national park located in India to enhance the wildlife design.***

Keywords: WSN, Sensors, Wild Animals, National park.

I. INTRODUCTION

A Wireless Sensor Network (WSN) is comprise of sensing, computing and communication units [14]. It gives an ability of observing and reacting in the specific environment. The environment may be physical world, a biological system or an information technology framework. The WSN is used for monitoring /surveillance, data collection and administrative action against any event in the deployed environment. WSNs are now being introduced for different purposes for a few days. Military sensing, forest tracking, physical security, air traffic control, video surveillance, climate surveillance, environmental monitoring, national border surveillance and structure monitoring are some of WSN's few applications [14].

As per the wildlife protection act 1972, manage by the Indian Ministry of Environment and Forest, a national park is "an area, is notified by the government to be constituted as a National Park, by reason of ecological or zoological association or importance, needed to for the purpose of protecting and propagating wildlife therein or its environment" [1]. National Park is an area exclusively reserved for wildlife and biodiversity enhancement and where activities such as development, forestry, poaching, hunting and grazing are not permitted for cultivation. As of July 2018, Total 104 national parks encompassing an area of 40,501square kilometres of India's total surface area [2]. Fig.1 shows the state wise number of national parks in India.

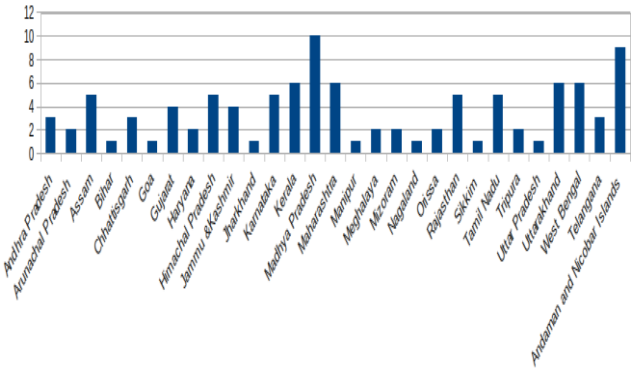

Fig. 1 No. Of National Parks in India

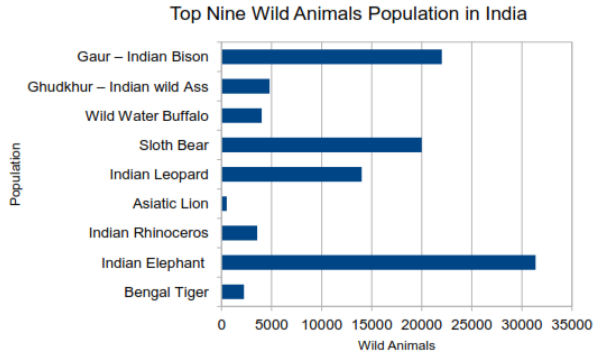

Fig. 2 Population of tops nine wild animals in India

The top ten wild animals in India are the Bengal Tiger, Indian Elephant, Indian Rhinoceros, Asian Lion, Indian Leopard, Sloth Bear, Wild Water Buffalo, Ghudkhur – Indian Wild Ass, Gaur – Indian Bison, Nilgai – Blue Bull. [3] [4][5]. Fig.2 show the population of top nine wild animals in India. We can observe here that Asiatic Lion's population is the lowest in the top ten wild animals category in India [W5]. Figure 2 shows that the population of Asiatic Lion is lowest among the wild animals category in India.

II. WILDLIFE OF INDIA

India comes from a variety of animals. Besides a definite bowing down of livestock, such as cows, buffaloes, goats, chickens and camels, India has a large anomaly of country-affiliated wildlife. According to the forest department of Indian tigers, Asian lions, Indian and White Giraffe and Indochinese leopards, deferred leopards, all torn leopards,

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distinct Deer species, including Chital, Hangul, Indian Elephant, Great Indian Rhinoceros, and many others. The rich biodiversity of the world is protected throughout the country in over 120 national parks, 18 bio-reserves and over 500 wildlife sanctuaries [W11]. India has some of the most biodiversity regions of the world and contains four of the world's 36 biodiversity hotspots[– the Western Ghats, the Eastern Himalayas, Indo-Burma and Sunda Land.[3].Wildlife sanctuaries in India termed as an Eco-system is stunning place to discover fruitful wildlife and by seat of one pants habitats. India has completely 441 wildlife sanctuaries.[W11]

The Government of India has taken many steps in order to protect Indian Wild Animals. First the India Wildlife Act passed by the government in 1972 for the protection of animals. In Act government banned hunting and poaching of animals and provided legal protection to their habitats. To protect forest and wild animals the central and state governments have established many wildlife sanctuaries and national parks. Government initiated various projects regarding to the conservation of wild animals such as tiger and one horned rhino. The government, through the introduction of a joint management programme has involved local communities in the management of forests.[4]

A. Gir National Park

The Gir National Park in Gujarat is the only place in the world where we can see the Asian Lions playing in the real forest. It is the only region in Asia that has Asian lions and is considered one of Asia's most valuable protected areas due to its biodiversity. The Gir National Park is also known as Sasan Gir in Gujarat State's Junagarh district. This occupies a total area of 1412 km2 of which 258 km is the National Park's core area The Government notified the large geographical extent of Sasan Gir as wildlife sanctuary on 18th September, 1965 in order to conserve the Asiatic Lion.[6].

The population of Asiatic Lions are approximately 20 lions in 1913. It risen to a comfortable 523 according to 2015 census. There are 106 male, 201 female and 213 sub-adult lions in the wilderness of Gir National Park [W5] [W6]. As per the 14th Asiatic Lion Census conducted in 2015 the park is also home of Leopards, Sambars, Chowsingha, Jackal, Striped Hyena and India Fox [W6]. Tabel 1. shows the census of the Asiatic Lions in Gir National Parks [7]. It shows that population of Asiatic lions is increase by only 346 during last 47 years. Average 7% population of Asiatic lions is increase every year. Slower growth rate of population lead to serious issue to protect such kind of wild animals. In this paper we proposed wireless sensor network base architecture for the wild animal protection in the national parks. Here we proposed said architecture in context Asiatic Lions living in Gir National Park.

Year	Total No of Asiatic Lions	Year	Total No of Asiatic Lions
1968	177	1995	265
1974	180	2000	327
1979	261	2005	359
1984	252	2010	411
1990	249	2015	523

Table . 1- Population of tops nine wild animals in India

III. WIRELESS SENSOR NETWORKS

Wireless Sensor Networks (WSNs) are used in a wide range of applications, including rural and forest ecosystems. A Wireless Sensor Network can be distinguished as a sensor network that can communicate via wireless links with collected information from a screen region. WSN is a wireless network consisting of base stations and wireless sensor numbers. These networks are used to track physical or environmental conditions such as noise, pressure, temperature and jointly transfer data to a main location through the network. Sensors can play vital role in WSN like variety of purposes, functions and capabilities. Sensors are internetworked via a series of multi hop short-distance low-power wire-less links. Sensors usually use the Internet or some other network to deliver information over long distances to a point(or points) of final aggregation and analysis of data. A basic Sensor node comprise the five main components.

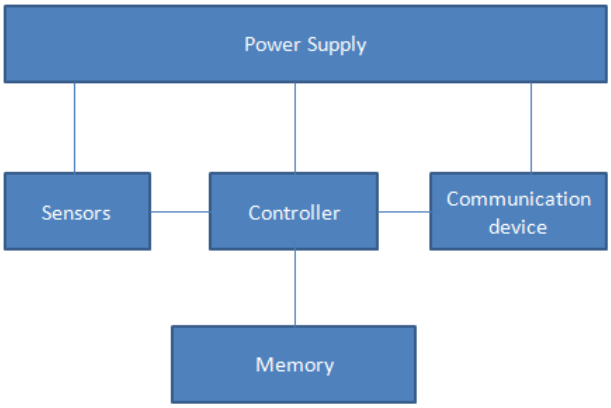

Fig. 3. Basic node structures

Fig. 3. Show that sensor will sense the event which capture the event data and passes to the First a controller to process data and it is capable of executing arbitrary code. Memory is used to store intermediate data and programs. To store a program and data different kind of memory are used. Usually sensors are the provide the interface to the physical word. It is a device which responsible for observe or control the physical parameter of area. Communication devices are used to transfer a information over a wireless network. Power supply is generally used to supply a power to batteries.

IV. PROBLEM FACED BY WILD ANIMALS IN NATIONAL PARK

In widening our borders, we threaten the habitats of wildlife. As woods are cleared and fields are subdivided, biodiversity is affected. We have changed our environment over time to favor both people and our culture. It may not be appropriate for them to survive. Then we drive our wildlife into roads, power lines and wind turbines or wells. Wildlife, however, faces a number of threats including climate change, pollution, disease, conflicts with human wildlife and accidental deaths.[12]

The most common problems involve wild animals:

Pollution: Every point the by-products of our by the day lives—sewage, coming to a close, abuse, floral and yard chemicals, scientific and power plant emissions, and more—make their way for the am relay and water directed toward the ingrained environment and annex pollutants.

Habitat Loss: Loss of habitat — due to habitat destruction, fragmentation, or degradation — is the primary threat to wildlife survival. Today, we are increasingly under pressure to restore conservation land for high-priced food and biofuel crops.

Disease: Disease is a natural part of the world. Many animals contain disease-causing viruses, bacteria, fungi, and parasites. Many wild animals are sick and cause death due to some serious disease.

Injury: Due to the internal fight for starving a food wild animals are getting injured.

Road Accident: Only a few days of animals living near us and fighting for survival in road accidents due to mass destruction of wildlife. Accident on the road side is increasing rapidly, but less effort has been made in this area.

Crossing the boundary: Sometimes wildlife away from territory also need some water sources so for that wildlife may cross the certain boundaries and cause the death.

Falling in the well: Wildlife rivals are forced to move into human settlements over the diminishing prey base, territories and water sources, putting them at risk of dropping into exposed wells.

Human-Wildlife Conflict: Details of human-wildlife conflicts including loss of human lives and damage to crops by wildlife.

Forest Fires affect Wildlife: Forest fires have both difficult to believe and awesome effects by the whole of respect to wild-animal suffering. Burning alive is among the worst possible deaths. Bad chattels personal include havoc many animals (sometimes in troublesome ways) and as likely as not spurring increased shovel growth.

In the monsoon season, the animal often falls ill. Because there are no veterinary clinics in and around the forest or national parks. Mostly some wild animals are injured by road accident sometimes animals cross the boundary lines of forest or park and they met with road vehicles.

The recent deaths of three people from a lion near Gir Sanctuary in Gujarat's western state resulted in 18 lions being "arrested". Yet the "guilty" lion won't be killed in this case, but sentenced to life in a zoo instead.[12]

A. Problems faced by Asiatic lion in Gir

The Asian lion currently exists as a single population and is therefore vulnerable to extinction due to unforeseen events such as an epidemic or large forest fire. Incidents of poaching have been recorded in recent years. There are rumors that organized gangs have turned focus from tigers to lions. A number of drowning cases have also occurred after lions fell into wells.[7]

The lions face the daily threats of poaching and degradation of their habitat. The Gir Protected Area (PA) is crossed by three major roads and a highway. There are also three large temples within the PA attracting a large number of pilgrims, particularly during certain periods of the year. The number of lions has grown and more than 200 lions remain outside the PA. Although the conflict is not high now, these may increase in the future with changing lifestyles and values. There are also reports of lions dying from falling into the unguarded wells around the Gir PA. In one location, the Asian lion faces a risk of genetic inbreeding from a single population.

Nearly 25 lions were found dead in October 2018 in the vicinity of Gir Forest. Four of them died as a result of canine distemper virus, the same disease that had previously killed many Serengeti lions.[6][17]

222 lions have died over the past two years due to natural causes in the Gujarat forest area of Gir. Between them 23 lions died because of unnatural causes such as being struck by trains or falling into wells, and between June 2017 and May 2019, 199 deaths occurred due to natural causes such as disease and illnesses.[10]

The Gir forest was heavily degraded and used by livestock before the resettlement of Maldharis, which competed with and restricted the size of native ungulates. Various studies show enormous habitat regeneration and rises in wild ungulate populations over the past four decades following the resettlement of Maldhari.[14]

V. RELATED WORKS

This section elaborates the review and discussion made by various authors on wild animal protection using wireless sensor network. The discussion are presented below.[1][4][9][10][11]

Dr. Prabhat Ranjan et. al.,[8] ” wildCENSE – GPS based animal tracking system using wireless sensor network” has been developed to track wildlife. A specially designed collar with an attached sensor node would be mounted on wild animals in their process. This data is used by wildlife authorities to monitor certain wildlife habitats and their behavioural patterns.

Tim Wark, et al.,[2] ” The Design and Evaluation of a Mobile Sensor/Actuator Network for Autonomous Animal Control” defined the wild animal state estimation algorithm. Also designed and implemented on the basis of a state-machine model for each animal. Autonomous behavior is carried out on the basis of an animal's approximate state relative to other species.

To achieve high delivery rates in mobile environments, a simple effective wireless communication model has been proposed and implemented.

Zhengming Tang, et al.,[7] " PetTracker – Pet Tracking System Using Motes" has Allowed pet owners to log in and monitor their pets in an indoor environment like a house or apartment. Their current system uses motes that are attached to them with environment sensor boards. One of these motes is attached to the animal and used to monitor its position, behaviour and surroundings area.

Antonio-Javier G S, et al.,[5]" Wireless Sensor Network Deployment for Monitoring Wildlife Passages" has Proposed and studied a generic target (animal) tracking system based on WSN in the surrounding area of wildlife passages designed to identify safe transportation infrastructure for animals. However, by using video sensors linked to strategically placed nodes, it enables target identification.

Tsung Ta Wu et. al,[3]" Wireless Sensor Network for Cattle Monitoring System" has Propose the use of WSN to track cattle. They identify in this paper a cost-effective WSN system to track dairy cow's health. Farmers can recognise the onset of disease and also obtain some disease data using sensors to recognize cow behaviour.

VI. WSN BASED PRAPOSED SOLUTION FOR THE WILD ANIMAL PROTECTION

We will proposed a wireless sensor network based architecture that focuses on wild animal protection from facing problem in their lives in forest or national park. Proposed architecture will protect the wild animal from different aspects by fire in forest, illness, unbalancing of health, injury, falling in well or pond, boundary crossing. It also monitors the locations and movement of wild animals in National park.

To implement the WSN based architecture, we proposed to divide entire National park in to small area. Below figure represent the communication architecture for the area.

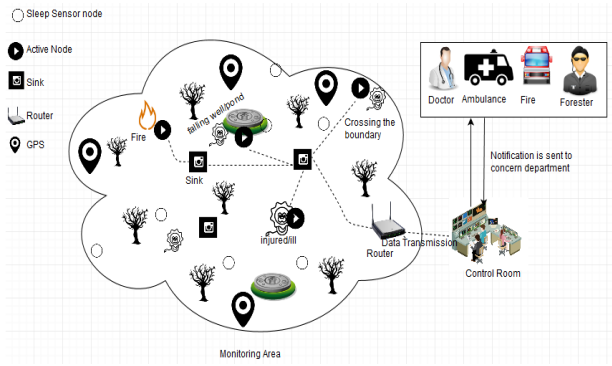

Fig. 4. Generalized Communication Architecture

Fig. 4. depict the generalized communication architecture architecture. The communication flow shown in this architecture is based on four criteria mainly wild animal Injury/Illness detection, Fire detection, Falling in well or pond and boundary crossing. Everything is based on detection and monitoring so they must equipped with the smart system, so which is capable of transmitting the required information to identify the problems. Sink node used to collect the information from sensors and send that information through router to control room. Control room is place where the required action can be initiated after receiving and analyzing the information obtained from the sink nodes.

The overall architecture is divided into main four category: Wild animal protection from fire, Wild animal protection from crossing the boundary line, wild animal protect form illness and wild animal protect form falling in well or pond.

A. Wild animal protection from fire: In this category mainly detect the fire in the forest. The detection is done by the sensors and through the sink node information will be transmitted to the control room using router. In this situation may be there are some wild animals near to the fire so proposed architecture will be detect that all wild animals near to fire and send their information to control room also. From the control room notification is also sent to the concern stack holders.

B. Wild animal protection from crossing the boundary line: In this category proposed architecture will work like protecting the wild animal from crossing or near by the boundary as detecting them.

This work like there are sensors near to the boundary area they detect the animals. We need to set some time interval or distance. If they are beyond the time interval or distance then their information is transmitted to the control room.

C. Wild animal protection from injury or illness: in this category need to identify the sick wild animal. Mainly using the body temperature or injury detection we can identify the sick animal. So need to identify the normal temperature of wild animal so for that we have to collect the body temperature of wild animal in early morning than after need to monitor target wild animal.. To identify the injured animal we have to check the lameness or inability to stand or walk of wild animal. Using the wearable sensor we can able to detect the body temperature and identification injured wild animal is possible. Wearable sensors will pass the information to the sink node, then router and control room receive the information.

D. Wild animal protection from falling in well or pond: In this category of my proposed architecture probably sensor detect the wild animal near to well or pond after the predefined time. Time is predefined, based on that time if wild animal meet or cross the time then sensors send the information through sink and router to control room. Control room send the notification to the concern department for action.

VII. CONCLUSION

The proposed interaction systems would attempt to expand the conventional human-based wildlife monitoring system. Wireless Sensor Network based remotely monitoring and reporting system for in the national park. By using this architecture based system we would get the real time information of wild animal who may need immediate attention to care.

It will allows National parks authority to monitoring wild animals from remote place and also possible to reporting to concern stack holder in case of abnormality.

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