

# PREVENTION AND MONITORING OF WILDLIFE BY USING WIRELESS NETWORKS

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## ABSTRACT

*The aim of this project is to design a next generation wildlife animal protection and monitoring the animals while crossing the railroads and modernizing existing features and thus try to overcome the drawbacks. There is a long list of features implemented in this paper. This paper helps to prevent the elephant death from train accidents. Each and every train has a receiver which can debug the implanted tag and thereby stop the train when the elephants near a train section. Also this paper initiates a effort to tag all wildlife so that when wild animals like cheetah or leopard enters into a residential area is intimated to the forest rangers by transceiver units placed at potential places where wild animals can enter the human zone.*

**Keyword :** - Zigbee, Alert buzzer, LCD, Track the animals.

## 1. INTRODUCTION

Train Elephant Conflict (TEC) is one of the major issues across the world which affects both human and elephant. A recent research indicates many elephants and other animals die due to train accidents mostly at night time. Despite railway authorities instructing the drivers to reduce the train speed in forest areas, there has not been much reduction in elephant death from trains. The surveillance and tracking of elephants are difficult due to their size.

The proposed system automatically detects the elephants with a small tag implanted on their ears or in their bodies. Each and every train has a receiver which can debug the implanted tag and thereby stop the train when the elephants near a train section. Human wildlife Conflict is one of the major threat to Indian wildlife, human activities such as deforestation, Habitat loss, Lack of prey and illegal roads cut through forest are threaten the safety and survival of wildlife in India. Lack of prey pushing leopards, jackal, wolf and other nocturnal wild animals towards the cities.

Speeding vehicles in Indian states are killing many animals annually mostly Chital Deer, mouse deer, Fox, birds, snakes and nocturnal animals such as Indian civets, black-Naped hare and mouse deer and some time the big cats including tiger and leopard. Image Source: Monga bay, conservation India and Khandals. Many wild animals have been killed due to road accidents and speeding vehicles passes through the wildlife protected area. Big animals like sloth bears, striped hyena, blue bull and small creatures such as snakes, monitor lizards and Jackal are getting endangered due to road kill.

Man-eaters have been a history for India, especially in Kumaon, Garhwal, and the Sundarbans, mangrove swamps of Bengal. Tiger and Leopards of India that preys upon humans are known as man eaters wild animals of India. At a time when widening of national highways through forested areas and wildlife corridors has attracted court cases and intense debates, the ministry of road transport and highways informed the Parliament on Monday that stray animals crossing national highways caused 7,734 accidents between 2012-2014. Member of Parliament from Trinamool Congress Mohammad Nadimul Haque asked the question and the ministry through a written reply informed that 2013 saw 3103, the highest accident cases due to stray animals in the given duration.

The ministry though did not specify the number of national highways that are fenced inadequately or even the human and animal casualties recorded because of these accidents. As per the road ministry's information, Uttar Pradesh recorded the maximum accident cases at 1,865 followed by Andhra Pradesh and Jammu and Kashmir.

Across the country, many existing national highways cut through forested areas and along protected areas such as tiger reserves and national parks. Wild animals such as elephants, Deers, nilgai, leopards and even tigers often cross these highways in forested areas, resulting in road accidents. Expert studies and papers published in scientific journals have shown that these animals usually cross over in search of food, to go into other habitats and for water. Studies on NH-69 and NH-7 connecting Maharashtra and Madhya Pradesh have shown that spotted deers have often got killed due to collision with vehicles. The high-speed of vehicular traffic and lack of underpasses and overpasses on highway stretches has made forested areas prone to accidents.

Through 2015, the National Highways Authority of India was drawn into a major court battle on the widening of NH-7 as wildlife activists protested against the project. The project involves widening of the highway through the Kanha-Pench tiger corridor and after directions from the National Green Tribunal and Nagpur high court, the NHAI has agreed to build underpasses and overpasses to protect wildlife along the highway.

### 1.1 Platform

In this system embedded C is used to write the coding in order to make the controller to perform series of operations. Embedded C, is a set of language extension for the C - programming language. Two salient features of Embedded Programming is code speed and code size. Compared to other high level languages, embedded C offers more flexibility because C is relatively small, structured language. Embedded compilers give access to all resources which is not provided in compilers for desktop computer applications Embedded system often have the real time constrains. The GCC compiler is the most popular C compiler for embedded systems. The goal of embedded c programming is to get maximum features in minimum space and minimum time. Embedded has many advantages such as it is small and reasonably simpler to learn.

### 1.2 Keil Compiler

Compilers are programs used to convert a High Level Language to object code. Desktop compilers produce an output object code for the underlying microprocessor, but not for other microprocessors. I.E the programs written in one of the HLL like 'C' will compile the code to run on the system for a particular processor like x86 (underlying microprocessor in the computer). For example compilers for Dos platform is different from the Compilers for Unix platform.

So if one wants to define a compiler then compiler is a program that translates source code into object code. The compiler derives its name from the way it works, looking at the entire piece of source code and collecting and reorganizing the instruction. See there is a bit little difference between compiler and an interpreter. Interpreter just interprets whole program at a time while compiler analyzes and execute each line of source code in succession, without looking at the entire program.

The advantage of interpreters is that they can execute a program immediately. Secondly programs produced by compilers run much faster than the same programs executed by an interpreter. However compilers require some time before an executable program emerges.

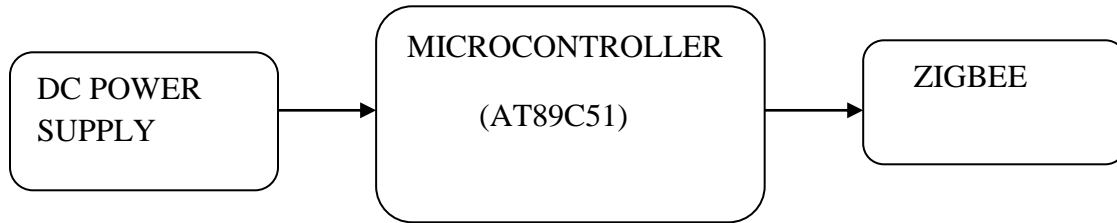
## 2. PROPOSED SYSTEM

To prevent the problem of collisions with the approaching trains is addressed in this proposal. The system is based on a wireless sensor tags implemented on wild life animals to secure their safety and the human safety is employed .Suitable Wireless receivers are placed along the suitable positions to detect the activity of wildlife animals and to inform their activities to the concerned person for securing the wild life and human life is deployed in this system.

The accidents caused to wild animals and particularly Elephants are considered. This mainly occurs in railway tracks, when the elephants tries to cross the track. For that purpose elephants in the forest are equipped with special wireless receivers which intimate the presence of the animal in close nearby. When such an event occurs the loco pilot is alerted and the train speed is reduced drastically to stop any accidents.

**2.1 Animal Unit**

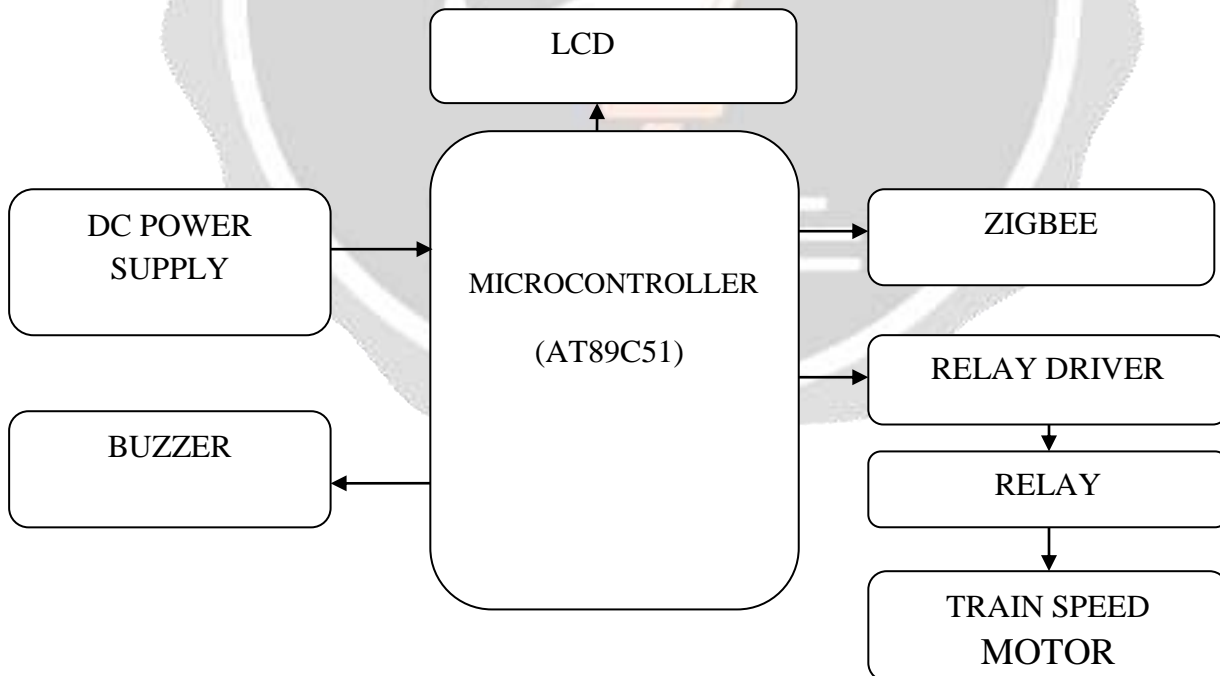
Animal unit access the animal location through a zigbee transceiver protocol with a valid data. And the animal unit accept the data. Fig-1 shows the typical block diagram of the animal unit, which consist of Zigbee transceiver to send data to the animal unit.



**Fig -1:** Animal Unit

**2.2 Train Unit**

In the train unit access the location between the train and the animal by using the received signal strength indication. If the transmitter that is animal unit is nearby the receiver unit than the RSSI value get increased and at the particular value the buzzer will be alarmed and the loco pilot get slow down the train manually. If the local pilot cannot able to reduce the speed of the train. Then by using relay and relay driver the speed of the motor get reduced before the location of the animal. And here LCD is used to display the name of the animal by using the assigned alphabet. Therefore fig 2 shows that the train unit and here relay and relay driver is used to control the speed of the train. In this train unit we are using DC power supply to run the device and speed of the motor is control by the relay and relay driver.



**Fig -2:** Train Unit

### 2.3. Ranger Unit

Ranger unit in this unit we are using the zigbee and buzzer to alert the ranger officer. The location that can be tracked by the ranger and is used to help the animal when it is in any danger zone. Suitable Wireless receivers are placed along the suitable positions to detect the activity of wildlife animals and to inform their activities to the concerned person for securing the wild life and human life is deployed in this project. Fig 3 shows ranger unit.

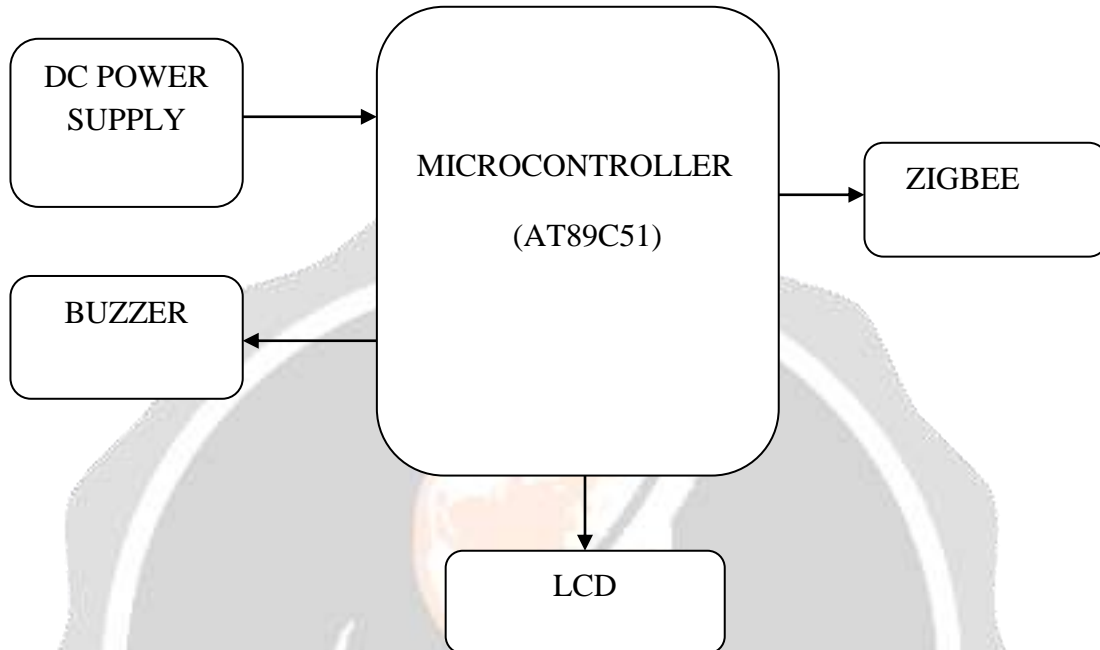


Fig -3: Ranger Unit

### 3. ZIGBEE

ZigBee is a specification protocol to suite high level communication with ultra Low power Digital radio signals IEEE 802 standard. The technology involved in Zigbee is simpler and intended for lesser cost compared to WPANs, such as Bluetooth. ZigBee is featured with higher Battery life or lower Power consumption and secure Communication. ZigBee has a higher baud rate and is best for continuous or splitted data Transmission (in our case a Trooper Monitoring system) from a Dynamic Sensor or Input device.

Wireless technology was developed in many applications that becoming a part of human activities such as agriculture, military, medical care, smart home system etc. Distinctly, wireless sensor networks (WSN) play a crucial role in such a monitoring system application, for the reason that WSN can offer some advantages over other types of wireless systems especially its scalability, power management and flexibility of architecture. As a matter of fact, there are two popular standards in the wireless personal area network (WPAN), namely, Bluetooth and ZigBee. Since This work was focused on the capability of wireless sensor networks as an efficient tool to monitor health . This situation makes it difficult to develop and challenge because many applications in WSNs developed for fixing the position of member in wireless personal area network (WPAN). We adopted the ZigBee for using as a real-time health monitoring system on a TROOPER.

#### 3.1. Features of Zigbee

We selected ZigBee because of its low power consumption, low cost and moderate range 1Km to 40 Km. This range is suitable for our application where we want to wirelessly transmit data from Trooper to the Database Server, Another most important reason for using ZigBee module is that these modules come with serial interface therefore it will be easier for us to use these modules. These low-Rate WPAN standards have exceedingly secured wireless transmission over a very distant range.

#### 4. RESULT AND DISCUSSION

This system implements to ensure that the number of elephants that gets killed every year is vastly reduced. It also helps in monitoring the areas of occurrence of Train Elephant Conflicts. The surveillance and tracking of elephants are also made easier over the entire forest region. Implementation of this method over other animals also helps in saving many endangered species present across the country. Replacement of wireless distributed system over IOT ensures that in addition to monitoring services provided, both speed control of train as well as alert system to animals can be provided with. The presence of zigbee ensures low power consumptions and higher transmission ranges. The entire system is powered by Li-ion batteries that provide power to the units extending up to five years.

The most advantageous point is the application of zigbee for alert transmission. Since ZigBee has moderate coverage area extending from 1km to 40km, it is more helpful in monitoring high and denser forest ranges. Also mesh networking ensures that more number of interfering ZigBee devices for animals are provided without any interference among them.

Above all, ZigBee can be interfaced with a microcontroller. This makes sure that not only the signals are received but also with respect to each signal type, the commands are automatically generated at the microcontroller and from these command, the relay is driven to control the speed of train as well as provides an alert to the Wild animals crossing the quarantined region. Since ZigBee can allow multiple connections, more number of ranger units can be provided across the entire region. So whenever an emergency situation arises, the rangers who monitor the wildlife can easily respond to the cases and can prevent further damages to both wildlife and property. It also helps the rangers and wildlife centre to keep count of wildlife population through the region. A relay driver based motor control helps in reducing the speed of train when it crosses the TEC areas. This provides assistance to the train driver regarding the speed control when it moves through the TEC area. The presence of buzzer helps the driver in alerting about wildlife movement through the tracks.



**Fig 4 - RSSI Value**

In figure 4 it shows the RSSI value between the two Zigbee devices, Consider one device as railway track and another device as an animal. If Animal device is comes closer to Railway track then the RSSI value gets reduced. If the value is small, the animal unit is seems to be nearer to the railway track, so the train motor speed gets reduced and in ranger unit the buzzer will be alarmed to alert the forest ranger officer.

#### 5. CONCLUSIONS

This system presents a WSN, implemented in a distributed system with a sensory fusion integration in order to study and classify animal accidents in real time, which is a novelty for animal tracking networks. We have presented a network topology that allows this kind of processing of the information obtained from the sensory fusion, and the communication between every element on it. A power consumption study is presented to compare embedded and external classifications. Best battery life is obtained when data is sent after a classification step using a neural network embedded in the collar. Testing results for signal coverage are presented. This system has implemented animal tracking and its avoidance from humans along with accident prevention.

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