

ADVANCES IN WILDLIFE ROAD-CROSSING EARLY ALERT SYSTEM (DEVELOPING VEHICLE SPEED WARNING SYSTEM AND WILDLIFE DETECTION SYSTEMS TO AVOID WILDLIFE VEHICLE COLLISIONS)

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Abstract - In the forest area thousands of animals are being killed each year by vehicular collision. The main aim of our project is to prevent wildlife collision and monitor speed, thus protecting our wildlife. Using a night vision camera, animals are detected and indication is sent to the drivers on the forest roads. The speed and animal detection are programmed by MATLAB. Using GSM module, alerts are given to drivers when animals are detected and when the drivers cross the speed limit the forest officials are informed about it. Thus wildlife collision percentage is reduced.

Problem Statement: Proposal for the developing a vehicle speed warning system and wildlife detection systems to avoid wildlife vehicle collisions.

Key Points - Night Vision Camera, Raspberry-pi, Image Processing, GSM, Alert System.

I. INTRODUCTION

Wildlife plays an important role in balancing the environment and provides stability to different natural process. Wild animals must be conserved and protected. But wildlife collision is a major problem on forest roads as shown . Animals like moose, deer, pigs, goats, etc., normally are being killed by vehicular collision on the forest roads. 89% of all wildlife collisions occur on roads.



Fig 1 a. Wildlife in forest roads

According to data from national crash databases, 89 percent of all Wildlife Vehicle Collisions (WVC) (2001–2005) were on two-lane roads[1]. National crash databases estimate the total number of reported collisions at 300,000 per year as shown in fig1b. However, most researchers believe that WVCs are substantially under-reported for a number of reasons. Furthermore, many animals that are injured wander away from the road before they die and are never found.

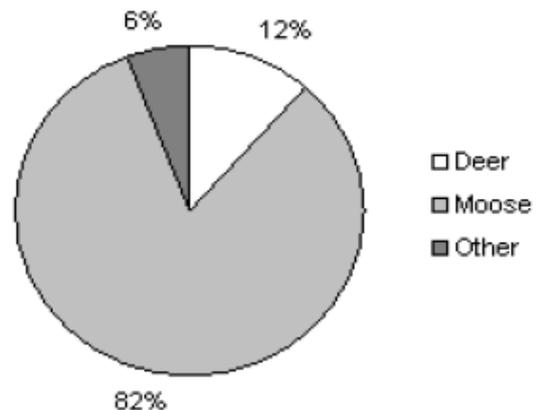


Fig 1b. Wildlife involved in Collisions

The main cause for this problem is people's carelessness. Over 10,000 wildlife vehicle collisions occur every year and many animals are being killed because of wildlife collision. Now, in recent days, due to lack of proper technology, various accidents takes place at different forest covers. We, humans are also responsible for it. Some measures have to be taken to prevent such accidents. The proposed project is to concentrate on protection of wildlife from collisions while crossing the roads.

II. EXISTING SYSTEM

Tripwire systems were installed on Ontario's Highway 17 in 2009 and on Highway 6 in 2012, in areas where wildlife is often encountered on roadways. If the system is triggered, yellow lights flash to alert motorists that wildlife is within approximately one mile of the sensor. Powered by

solar panels and backup batteries, the two tripwire installations costs high. Despite the reduction in collisions, some challenges with the technology are that the tripwires can be easily triggered by false alarms, rain, or vegetation.

Also, because system lights flash for just three minutes upon detection of an animal, any animal that stays still for more than three minutes can go undetected and the lights will not flash. In some systems, thermal cameras[3] are used for animal detection, these cameras however detects heat from both living and non living things. Using thermal cameras for animal detection costs much. Also the road signs on the forest area are not so effective. Hence, our proposed system will be able to overcome these problems in order to safeguard our living creatures.

III. PROPOSED SYSTEM

Our Proposed system consists of different parameters to prevent wildlife from collisions. They are:

- ❖ Using Speed Detection and Warning System, the speed of the vehicle would be monitored.
- ❖ Using Image Processing Techniques, the animals on the road can be detected.
- ❖ Using Raspberry Pi microcontroller, the people can be alerted by various road advisory signs along with digital display alert indication.

A. Block Diagram

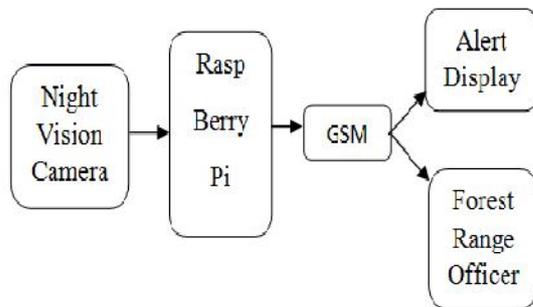


Fig 2. Proposed System

IV. PROTOTYPE DESCRIPTION

The prototype of the system includes a night vision camera, raspberry pi interfacing with CSI (Camera Serial Interface). Then the output of raspberry pi is sent to the indication board to alert the driver. This is done using GSM (Global System for Mobile Communication) module. Vehicle speed detection is used to estimate the speed of the moving vehicle using image processing techniques. With camera calibrations, video is captured and analyzed for speed in real time. This detected speed is fed to the raspberry pi module to check whether the vehicle crosses the speed limit. If so, the speed is notified to

the forest officer for further action to be taken. This is done using a GSM module. GSM module is introduced to rectify the main limitation of the dial up modem based on its acceptance of a SIM card[2]. Raspberry Pi is a high end embedded device, so an interface with a GSM modem will results in the invention of an intelligent system.

The prototype description can be explained in the following modules. They are:

- ❖ Speed Detection Module
- ❖ Wildlife Detection Module
- ❖ Alert System Module

A. Speed Detection Module

The need of speed detection is to check the vehicular speeds. If the vehicle exceeds the speed limit of the area, necessary action is taken. To capture the images of vehicles, animals and to detect vehicular speed, a well suited camera is used[4].

The cameras are installed in the forest area at regular intervals depending on the range of the camera. The captured image is processed by interfacing with MATLAB Software. When the detected image is a vehicle, the MATLAB Software checks the speed. If the speed exceeds the limit, then the information about the vehicle is sent to the corresponding forest authorities. detected image is a vehicle, the MATLAB Software checks the speed. If the speed exceeds the limit, then the information about the vehicle is sent to the corresponding forest authorities.

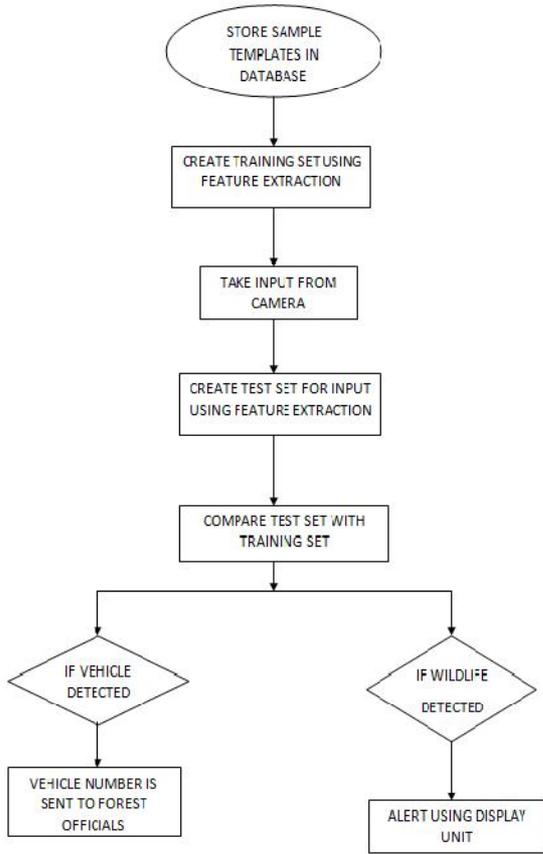


Fig 3. Speed Detection

B. Wildlife Detection Module

Night vision cameras are installed along the roadsides[5]. The cameras are connected to raspberry pi microcontroller using CSI (camera serial interface). The recording of the camera is fed to the input of the raspberry pi. The video recording is processed in raspberry pi. The image processing technique is uploaded to raspberry pi which is used to recognize the animals and vehicles. The image processing technique is used to detect the wildlife and also the speed of the vehicle. The image processing is done using MATLAB software.

1. Flow-Chart for Wildlife & Vehicle Number Detection Using Image Processing



Supervised pattern recognition method is used to detect the presence of wildlife and also recognize the vehicle number. The speed of the vehicle is also detected using image processing.



Fig 4. Wildlife Detection

C. Alert System Module

In forest areas, probability of wildlife accidents has increased due to increased number of automobiles.

Hence, it is the need of the hour to overcome this issue. The major reason behind it is that the driver is unaware of the approaching animal and finds it difficult to reduce the vehicle speed instantly. To overcome this problem, an alert system is used in our project. GSM plays a vital role in transferring information to the alert display. It also sends it to the forest office. The combination of Time and Frequency division multiple access (TDMA and FDMA) enables GSM for effective data transmission. Improved spectrum efficiency makes the communication faster which alerts the drivers in an early stage. In the first case, the image is processed using raspberry pi and the raspberry pi is also programmed to detect whether the processed image is an animal. If so, the information is passed to the alert system with the help of GSM. In the other case, if the processed image is identified as a vehicle, the speed of the vehicle is determined using appropriate program in MATLAB Software.



Fig 5. Digital Alert Display

CONCLUSION

Hence the project helps to detect the presence of animals on the road and an early alert is given to the driver. The vehicle number and the speed is also detected and sent to the forest officials. Thus, the wildlife-vehicle collision is minimized and the details of over speeding vehicle are sent to forest officials.

REFERENCE

- [1] <https://www.fhwa.dot.gov/publications/research/safety/08034/exec.cfm>
- [2] https://www.ijrcce.com/upload/2017/march/205_saritha%20B_new.pdf
- [3] <http://ieeexplore.ieee.org/document/7500671/>
- [4] <https://gregtinkers.wordpress.com/2016/03/25/car-speed-detector>

