

Ecological Stability with Advancing Technology

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Abstract—World around is advancing and developing in each and every segment known to human kind in every second. Every innovations made by humans must not have a negative influence on living creatures. In some areas, animal density will be high, especially in forest areas. There are chances of animals getting in the way and accident cases are high too. There are also incidents like animals harming human beings, so in all these cases it is clear that if there is an early warning system to give timely warning to drivers about the presence of animals all these issues can be solved to a considerable extent. This paper aims to study about such human-animal conflict areas in Palakkad division and plans to adopt an image processing technology. Develop a device programmed by storing structural features of animals. It gives information as the animal approaches the vicinity of the device. The device will be placed in a post like structure at a particular height or can adopt existing street light post for the same to make it cost effective.

I. INTRODUCTION

India is a developing country which witnesses a drastic change in the field of construction, especially in transportation sector. Expansion of transportation system poses a threat to existence of wildlife. All these developmental activities destroys their natural habitats, pollution of fresh environment, causing hindrance in migrations, increasing number of animal death rates (both road & rail accidents). All developmental activities must go hand in hand with wildlife conservation. In India , Reports shows that 3442 animals got injured in road accidents between 2020-2021. While the figure was 4262 in 2019-20. Wildlife accidents affects the ecological balance. That itself is the reason for going with advancing technologies to maintain ecological stability. Wildlife protection using sensors is a technical idea put forward for wildlife conservation as well as to ensure safety of human beings, This device mainly aims to give timely warnings to drivers and enabling them to act accordingly. System has relevance in both road

and rail mode of transportation. As the death rates are more in road ways , this study mainly focuses on the possibility of implanting the system in road ways.

II. RELATED STUDIES

A. Application of device in road transport

From the datas collected in Kava region of Palakkad division, came to know that accident caused by animals happen quite often throughout the area. There are a variety of species in this region such as Monkey (macaques, languor), Mongoose, Deer (sambar deer, spotted deer), Wild boar, Reptiles, Rodents, Wild pigs, Peafowl, Civet, Tiger, Elephants. Among this major animals causing accidents are Elephant, Wild boar, Wild pig, Civet, Deer. Implantation of system in this area inco-operates structural features of these accident causing animals. Fixing the system in side of road requires details about sight distance. Sight distance is the maximum roadway length ahead visible to the drivers. It is a major factor considered in ensuring safe driving conditions. Device will be placed in the existing posts on road. Average distance between post is 30 m and electric post height is less than 5m, and that of street light post standard height is between 9 and 14 feet.



Fig 1. Road view of Kava

Table I. Animal accident details in Palakkad division

| YEAR | ANIMAL INJURY | ANIMAL DEATH |
|-----------|---------------|--------------|
| 2016-2017 | 0 | 0 |
| 2017-2018 | 5 | 2 |
| 2018-2019 | 4 | 3 |
| 2019-2020 | 0 | 1 |
| 2020-2021 | 0 | 0 |

B. Application of device in Rail transport

From the details collected from Southern Railway Palakkad , Kanjikode – Walayar 12.34 km stretch is the accident prone area. Railway Department is in continuous research to find a solution to this issue. Accident prevention in case of railway is not that easy as in the case of roads. Because minimum length of a train in India is 1.7 k m and its average breaking distance is 1.5 km, it varies with the running speed at which the locopilot applies the break. Various measures have already taken into practice, but none of these could prevent wildlife accidents completely. Major animals subjected to rail accidents in this region are elephants. There are mainly two tracks in this stretch A and B track, it has been noted that most of the elephants were hit by trains on B line, which runs close to the forest fringes. Installation of device in this major crossing areas will be an effective solution for this problem. As it is a fully automated system it can effectively pass information to the locopilots so that they can act accordingly. 360 degree vision camera consisting device will be placed at regular intervals in vulnerable sections and by using optical fibres signals will be passed to the device fixed at at points before entering into these sections by considering the minimum breaking distance and the regular intervals for fixing the device is decided according to the available sight distance. It is not possible to pull the breaks of these heavily loaded trains all of a sudden or to reduce their speed, Railway has restricted the speed to 65 km in day and 45 km in night for all the trains passing through this stretch.

Various measures taken by Railway and Forest are :-

- Clearance of vegetation on the sides of the railway track.
- Speed restriction at vulnerable sections.
- Signage boards to pre-warn the locopilots.
- Sensitizing programs and awareness workshops for locopilots/guards/station masters on elephant conservation.

- Wires with low voltage current at boundary to deter elephants.
- Lights to ward away elephants from railway cutting.
- Elephant ramps.
- Widening of cutting and cess making.
- Installation of audio alarm with honey bee sound.
- To keep the railway track free from food waste.
- Engagement of elephant trackers.



Fig 2. Elephant crossing railway track



Fig 3. Solar lights to distract elephants

III. METHODOLOGY

Morphological image processing using Open CV library in python. Morphology is a broad set of image processing operations that process image based on shapes. It applies a structuring element to an input image creating an output image of the same size. Open CV is an open source computer vision library with more than 2500 optimized algorithms, used to detect and recognize faces, identify objects, tracking moving objects, extract 3D models of objects, find similar images from an image database. Colab or Colaboratory allows us to write and execute python in our browser. With colab we can import an image dataset, train an image classifier on it, and evaluate the model in a just few lines of code.

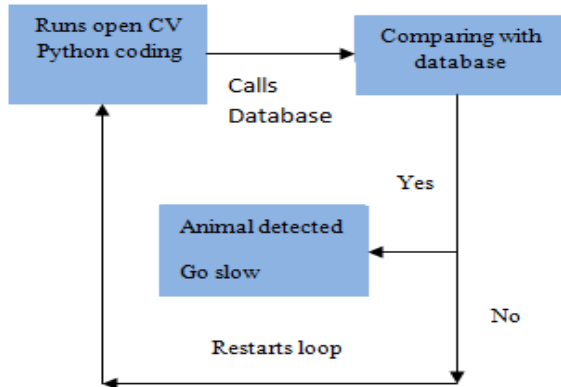


Fig 4. Working of program

A. Webcam live detection

Running YOLOv4 on webcam video is a little more complex than images. Need to start a video stream using webcam as input. Then run each frame through YOLOv4 model and create an overlay image that contains bounding box of detection(s). Then overlay the bounding box image back onto the next frame of the video stream.

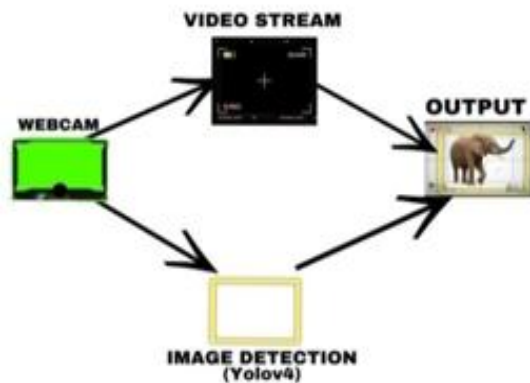


Fig 5. Flow chart of live detection

IV. RESULTS AND DISCUSSIONS

World is witnessing a drastic change with developing technologies. Artificial intelligence is marking its influence in all the fields. As our system is a device which sensors the presence of animals when it comes to the vicinity of the camera module it is highly effective because it causes no harm to both animals and human beings. Here the animal is detected according to the structural features stored in coding. By making use of optical fibres we can use this device in vulnerable sections of railway. It will not be economical to provide this throughout the railway

lines, so it is feasible to provide this where there are major crossings. One of the reason for this scenario is technological development itself, because diesel engines used to have more sound than electric tarins. Reports shows that the animals being hit by train was less in the earlier period because they were afraid of this high noise. Even though the reduction of sound benefited in several ways it caused a demerit like this. Crop raiding is also one reason for human-animal conflict in both roads and rails. This method is highly recommended because it is eco-friendly, highly efficient than any other practices followed now and eventually it will help to maintain the ecological stability. As it is placed in existing posts there is no need of installing extra post for implanting this device. In that way it can be considered as a cost effective method.

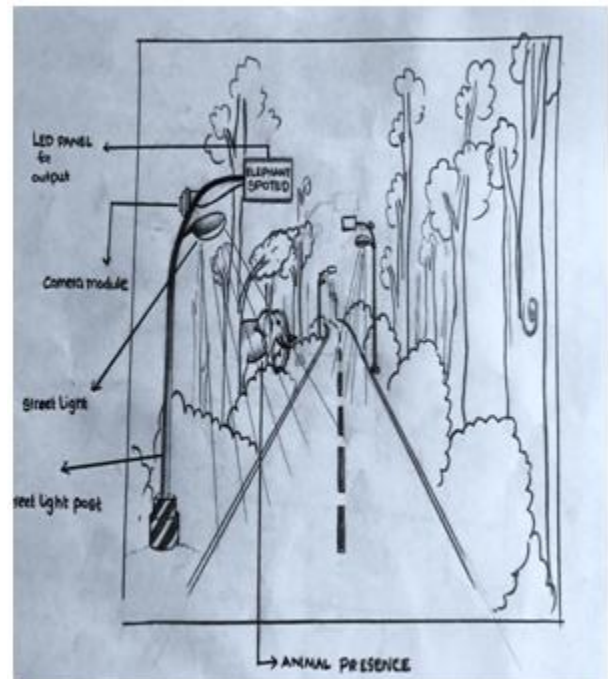


Fig 6. Pictorial representation of the system

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