Midterm Progress Report

"Design and Implementation of a Multiple Sensor Automated Warning System for Roadkill Prevention"

Sanctioned Under

Ref: 18144-1

For Conservation Research & Action Under

The Rufford Small Grants Foundation

Submitted by

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Title of the Project: "Design and Implementation of a Multiple Sensor Automated Warning System for Roadkill Prevention"

Project location: Sathyamangalam Tiger Reserve, Tamilnadu, India

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Project Duration: Approximately 1.5 years from the starting from December 2015

Project Cost: Rs. 3,12,000.00/- (INR)

Project Sanctioned Amount: Rs. 3,12,000.00/- (INR) in November 2015

Amount Spent (till 10th May 2016): Rs. 1,10,000.00/- (INR)

Specific Objectives (as per the project application):

Sl. No.	Specific Objectives	Status on 10th May 2016
1	a. Survey about the cause and pattern of Road-kill incidents on NH 209 at Sathyamangalam Tiger Reserve Area b. Survey to identify few potential hot-spot for system deployment.	Ongoing
2	Technical survey on system requirements and components specifications for proposed 'Automated Roadkill Prevention System' (ARPS) hardware design	Completed
3	Design and development ARPS hardware prototype	Ongoing
4	Field implementation of ARPS system for a shorter stretch and monitor its impact	Yet to be started
5	Extension of proposed ARPS system for longer stretch on NH 209 at Sathyamangalam Tiger Reserve	Yet to be started

Details on Work Status

1. a. Survey about the cause and pattern of Road-kill incidents on NH 209 at Sathyamangalam Tiger Reserve Area:

Last few months we are involved in surveying the cause and pattern of Road-kill events on NH 209 at Sathyamangalam Tiger Reserve (STR). We have restricted our survey and research activities on NH 209 within a range from 5 km before Bannari Tample to 5km after it. We have found few interesting possible facts behind Road-kill incidents happening at our study area.

Fact 1: As per our observation, most of the Roadkill is happening at evening and morning time when many animals are crossing road to get access to vegetable fields on the other side of the road or nearby areas. More preciously speaking, mostly at the late evening time when rod traffic is comparatively heavy between (5.30 to 8.30 pm). Here are some useful pictures taken during our field survey activities.

Fig. 1: Heavy and speedy traffic at NH 209 near to Bannari Temple at 5.30 pm.

Fig. 2 & 3: A herd of spotted deer is at the edge of the NH 209 at 5.45 pm. They are waiting to get it little dark so that they can cross the road to enter the vegetable field just opposite to the road.

Fig. 4: A monkey is on the tree hanging over the road for eating tamarind

Fig. 5: A peacock is searching left over from human eating just side of the road. Such dangerous but common practice is frequently observable for other animals too like Wild pigs, forest hen etc.

Fact 2: There are few stretches of road just before and after Bannari Temple which are basically death traps for wild animals. That is because those sections are long and straight so car generally picks acceleration at those locations which literally causes more frequent road kills.

Fig.6: Long stretch of straight road (NH-209) after Bannari Temple which suffers from frequent Road-kill incidents. These makes is one of the ideal hot-spots, for proposed ARPS deployment.

NOTE: We have captured few photographs of Road-Kill incidents but without local forest official's permission we can't share those pictures and till now, they are their reluctant to give it.

1. b. Survey to identify few potential hot-spot for system deployment:

Through frequent survey and with discussion with the forests officials, 4-5 potential road-kill hot-spots have been listed for system deployment. As per the plan, the first prototype system will be covering a stretch of 100 meters at a selected potential hot-spot.

2. Technical survey on system requirements and components specifications for proposed ARPS hardware design:

We have gone through numerous relevant articles and also discussed with few experts regarding system requirements and other issues. After analyzing those we have finalized the component list and also identified their specifications. Instead for IR fencing as in submitted proposal we are going to design LASER fencing because of its long range and high reliability. For short range bidirectional communication among different units of the proposed system we are going to use ZigBee module and we are also going to use Arduino GSM/GPS module to avoid using costly RF communication units. Instead of acoustic sensor as per the earlier proposal we are going to use wired PIR sensor to sense animals at a distant from the road. Along with that, considering the high cost we are not going to use and geophone sensors.

3. Design and development ARPS hardware prototype:

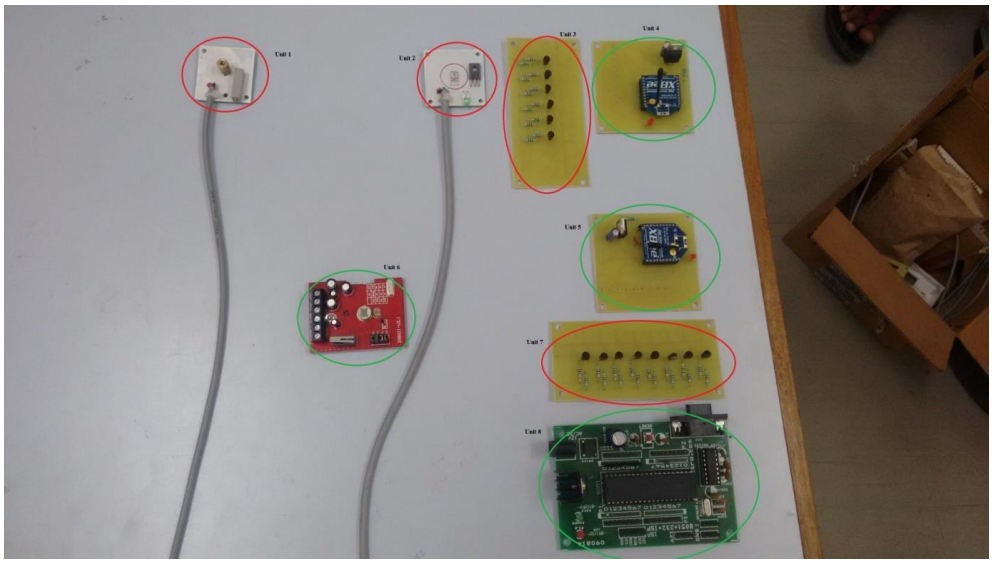

Fig.7. Hardware components: Unit 1 & 2 LASER transmitter and receiver units and Unit 3 & 7 are power interfacing units which **are exclusively designed by us (red circles).** Other units are; Unit 4 and 5 are ZigBee transceiver units, Unit 6 is PIR sensor unit and Unit 8 is the PIC microcontroller unit.

Hardware components are getting used for ongoing system development are placed over a table in our Lab as shown in Fig. 7. A single unit of ARPS which will be composed with three laser-sensor pairs (as one shown in the picture), two PIR sensors (one shown in picture), one power interfacing unit, one ZigBee transceiver module and these whole set will be precisely copied on the other side of the road. These whole set of components placed both sides of rood will be called an ARPS sub-unit. Those units from both sides will be wirelessly connected with one PIC microcontroller unit through one ZigBee transceiver and one power interfacing unit these three will from an ARPS core unit. As per the plan two sub-units can be operated with one ARPS core unit and such configuration will approximately will cover a starch of 100 meters.

Fig. 8: Outdoor experimentation of designed LASER transmitter and receiver unit at BIT.

Fig. 9 & 10: LASER transmitter (top) receiver (bottom) units testing at day light. At complete darkness the unit is working for a range around 50 meters but with surrounding light the range is getting reduced and at twilight the system is working up to 30 meters.

Presently we are working various issues of effective algorithm development. Once it is finalized, we will start assembling the hardware components.

NOTE: It is difficult to catch picture of wild animal without high quality still camera from a distance but presently we don't have it. Please provide us permission to purchase a digital SLR camera (cost approximately thirty to forty thousands INR) from the project fund which we really need.

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