IOT APPLICATION ON WILDLIFE SURVEILLANCE

A project report submitted for Lean Startup Management (TE2)

Bachelor of Technology in Computer Science Engineering

by Group 15

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ABSTRACT

In spite of extending urban zones and expanded attention to urbanization impacts on untamed life, inclines in urban natural life studies have not been assessed efficiently. We played out an intensive appraisal of such research, assessing urban untamed life productions from 16 driving diaries in creature conduct, preservation, nature, general science, scene environment, and untamed life science from 1971 to 2010. Utilizing a the precise audit process, we evaluated slants in urban untamed life explore after some time and in various logical fields, and furthermore surveyed creator affiliations, geographic and ordered centre, inquire about points, and study site types. Along with this, unusual events such as floods, tornados, or other natural disasters as well as power outages, fires spread of disease or other events also cause a high number of mortalities. This paper aims at providing a solution for wildlife surveillance and for this purpose we will design a wildlife observation robot. It will also provide flood prediction features to help minimize the damage during the natural disaster. The robot will be able to effectively balance surveillance objectives, autonomously performing the job of human patrols and responders.

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

Abbreviation No.	Abbreviation	Full Form
1.	Iot	Internet of things
2.	WSN	Wireless sensor networks
3.	R pi	Raspberry Pi
4.	PC	Personal Computer
5.	Wifi	Wirless fidelity
6.	IR	Infrared

1. Introduction and Literature Review

1.1 Concept

Floods is a water-related natural disasters which affect a wide range of environmental factors and activities related to agriculture, vegetation, human and wild life and local economies. It is the single most important weather-related natural disaster often aggravated by human action, since it affects very large areas for months and years and thus has a serious impact on regional food production, life expectancy for entire populations and economic performance of large regions or several countries. During 1967-1991, floods have affected 50 per cent of the billion people who suffered from all natural disasters and killed 35 per cent of the 3.5 million people who lost their lives. In the recent years large-scale intensive floods have been observed in all continents leading to huge economic losses, destruction of ecological resources, food shortages and starvation of millions people. Floods are among the most devastating natural hazards in the world, claiming more lives and causing more property damage than any other natural phenomena. Several users such as top level policy makers at the national and international organisations, researchers, middle level

policy makers at the state, province and local levels consultants, relief agencies and local producers including farmers, suppliers, traders and water managers are interested in reliable and accurate drought and flood information for effective management. The procedure of logical untamed life perception incorporates the revealing of what (determination of the species), where (land area), when (date and time), who (insights regarding spectator), and why (the purpose behind perception, or clarifications for the event). Natural life perception can be performed if the creatures are alive, with the most outstanding model being eye to eye perception and live cameras, or are dead, with the essential model being the telling of where roadkill has happened. These frameworks the essential data expected to gather information for a natural life perception; which can likewise add to logical examinations of appropriation, living space relations, patterns, and development of untamed life species. Through untamed life perception, there are numerous significant subtleties that can be found about nature. For example, if a fisher in Taiwan finds that a specific type of fish he/she habitually gets is getting to be rarer and rarer, there may be a considerable issue in the water that fisher is angling in. It may be the case that there is another predator in the water that has changed the creature's evolved way of life, a wellspring of contamination, or maybe even a bigger issue. Despite the explanation, this procedure of watching creatures can help recognize potential issues before they become serious issues on the planet. Moreover, through creature perception, the individuals who take an interest are additionally effectively taking part in the preservation of creature life. As a rule, the two subjects go connected at the hip with each other in light of the fact that through the perception of creatures, people are likewise finding what issues creatures around the globe are presently confronting and if there are any approaches to set up a battle against them. With more perception, fewer types of creatures will end up wiped out.

IoT – Wildlife Monitoring, Virtual Fencing with Deforestation Notifications

Supreeth SK1, Suraj DN1, Vishnu AR1, Vishruth V Sastry1, Srinidhi kulkarni2

India has been identified as an ecological blackspot where half of the wildlife is vulnerable to extinction. This is caused due to the destruction of forest areas for farming, logging and construction of new cities and towns. This is forcing the animals to move out of their habitat and into human establishments, which is causing problems to both animals and humans. Recent advancements in sensor technology has the potential to revolutionize our understanding of the natural and man-made environment by providing fine grained spatio-temporal data (moving

object databases and real time locating system). Physical barriers cause physical damage to animals which can sometimes lead to death of the very animals we are trying to protect. This can be prevented by using virtual fencing which is a lifesaving improvement from the existing system. This project implements a sensor network, designed to track the location of the animals in sanctuaries and national park without hurting the animals. Forest fire and deforestation (or any illegal activities in the forest) can also be monitored through this system and it helps us preventing the destruction of wildlife. The proposed system will provide safety and security to wildlife and help to increase their numbers which are on extinction. Animal tracking system is useful for tracking and monitoring of animals. So, they can be protected from illegal hunting, killing or capturing of wild animals. Embedded system based this project provides accurate health information and location of the animal. System provide automated solution for data prediction. This system helps to divert the animals while entering the village. Because of this the human work can be minimized and the death of wild life also can be minimized. This system can also have its usage in border security system, home automation system, school zones, and in railway tracks and it has low cost and good performance.

An IOT system for environmental monitoring and protecting with heterogeneous communication networks

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This paper presents the design, deployment and empirical study of an internet of things (IOT) system, which is used to monitor and protect the living environment of the wildlife. In order to make the system meet the needs of practical applications and adapt to the local various landform characteristic, the communication module of the system is composed to three different communication networks, which supports the protocol of IEEE 802.15.4/ ZigBee networks, IEEE 802.11b WLANs and 3G respectively. The communication cost according to various transmission devices is not equilibrium, it is necessary to design appropriate and effective transmission strategies for the heterogeneous communication network. Especially, the subnetwork constructed by the low power nodes is only powered by discharged batteries. The performance of energy-saving scheme for this type of network is very important, because it will impact on the lifetime of the whole system. Thus we introduce a power management scheme which can reduce the energy

expenditure of the system effectively. The working overhead can be reduced to 53.18% under the 95.23% transmission reliability through the analysis of the experimental result.

The application of the *Internet of Things* to animal ecology

Wen Cui, Xiaoqing Gong, Chen Liu, Dan Xu, Xiaojiang Chen, Dingyi

Fang, Shaojie Tang, Fan Wu and Guihai Chen

For ecologists, understanding the reaction of animals to environmental changes is critical. Using networked sensor technology to measure wildlife and environmental parameters can provide accurate, real-time and comprehensive data for monitoring, research and conservation of wildlife. This paper reviews: (i) conventional detection technology; (ii) concepts and applications of the *Internet of Things* (IoT) in animal ecology; and (iii) the advantages and disadvantages of IoT. The current theoretical limits of IoT in animal ecology are also discussed. Although IoT offers a new direction in animal ecological research, it still needs to be further explored and developed as a theoretical system and applied to the appropriate scientific frameworks for understanding animal ecology.

Research on the Architecture of Wildlife Observation and Communication System

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With the development of Internet of Things (IOT) industry, research on wildlife monitoring meets with innovative progress. In this manuscript, we analyse the development of communication technologies, and discuss the architecture of wildlife observation and communication system from three aspects: component, communication platform, and research application. We introduce our preliminary research on a real-world bird tracking system, and discuss the system's working process and mechanisms such as power saving, data storage, and communication area indication. We introduce initial system applications on tracking and behavior recognition, and give some considerations on the architecture implementation.

1.2 Problem Definition

Our project will talk about finding the solution for the problem of hunting, poaching and proper surveillance of wildlife animals. The problem of guarding and observing the wildlife has been solved using the IOT technology. Moreover, this project can also help in flood prediction using machine learning algorithms to alert the public about various calamities. Natural disasters can cause many health and life problems for animals, so we also talk about how to minimize the damage. The overall balance of wildlife and its environment is necessary for human survival, and hence this is an important problem we have focused on in our project.

1.3 Objectives of work

These days poaching and hunting of animals have cause a danger to the natural wildlife and has led to the extinction of a lot of the species. A large number of the jeopardized species have danger of getting to be extinct. Along with this, unusual events such as floods, tornados, or other natural disasters as well as power outages, fires spread of disease or other events also cause a high number of mortalities.

- Our paper will talk about providing a solution for wildlife surveillance and flood prediction using sensors, Raspberry pi, cloud services and database and various networks.
- For this purpose, we will design a wildlife observation robot that will use the IOT technology to work as a proper guard and observatory device for the wildlife.
- It will also provide flood prediction features using techniques such as artificial neural networks to devise prediction algorithms to generate

patterns that can be analyzed to forecast about the upcoming flood and calamities.

- To help minimize the damage during the natural disaster such as the terrible effects like injury, starvation, thirst, displacement, illness and stress.
- To build a robot will be able to effectively balance surveillance objectives, autonomously performing the job of human patrols and responders.

To provide a viable method to overall help the protection of wildlife and detection and prediction of floods and other natural calamities.

2. Methodology and Experimental Work

2.1 Methodology

Wildlife observers need to get a close footage of wild animals by getting into their habitats. Well it is not always safe to get close to all wild animals. So for this purpose we put forward this wildlife observation robot which also keeps close watch over various natural factors to predict a flood, so we can embrace ourselves for caution, to minimize the damage caused by the flood. This robot can be operated wirelessly by users using just their android phones. The robot also has a camera that sends footage stream wirelessly to the user PC. This system consists of Raspberry Pi used for processing user sent commands. The commands given by user are sent through Wi-Fi as well as the data from Raspberry Pi is received over a web server.

Raspberry PI

Raspberry PI Infrared IR Night Vision Surveillance Camera

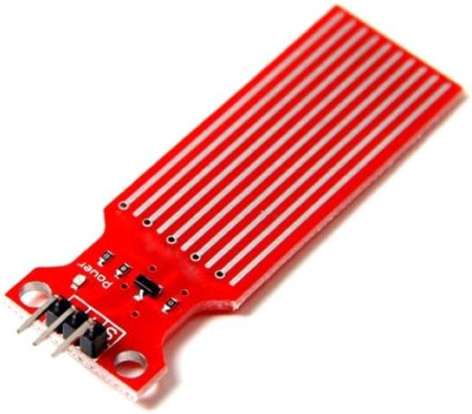
2.2 MODELLING/FEA ANALYSIS/LITERATURE REVIEW

To detect a flood the system observes various natural factors, which includes humidity, temperature, and water level and flow level. To collect data of mentioned natural factors the system consist of different sensors which collects data for individual parameters. For detecting changes in humidity and temperature the system has a DHT11 Digital Temperature Humidity Sensor. It is a advanced sensor module with consists of resistive humidity and temperature detection components. The water level is always under observation by a float sensor, which works by opening and closing circuits (dry contacts) as water levels rise and fall. It normally rest in the closed position, meaning the circuit is incomplete and no electricity is passing through the wires yet. Once the water level drops below a predetermined point, the circuit completes itself and sends electricity through the completed circuit to trigger an alarm. The flow sensor on the system keeps eye on the flow of water. The water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The system also consists of a HC-SR04 Ultrasonic Range Finder Distance Sensor. The Ultrasonic sensor works on the principle of SONAR and is designed to measure the distance using ultrasonic wave to determine the distance of an object from the sensor. All the sensors are connected to Raspberry Pi, which processes and sends data to a MySQL database.

Temperature and Humidity Sensor

Water Flow Sensor

Ultrasonic Sensor



Water Level Sensor

2.3 EXPERIMENTAL PROCEDURE /MATHAMATECIAL CALCULATION

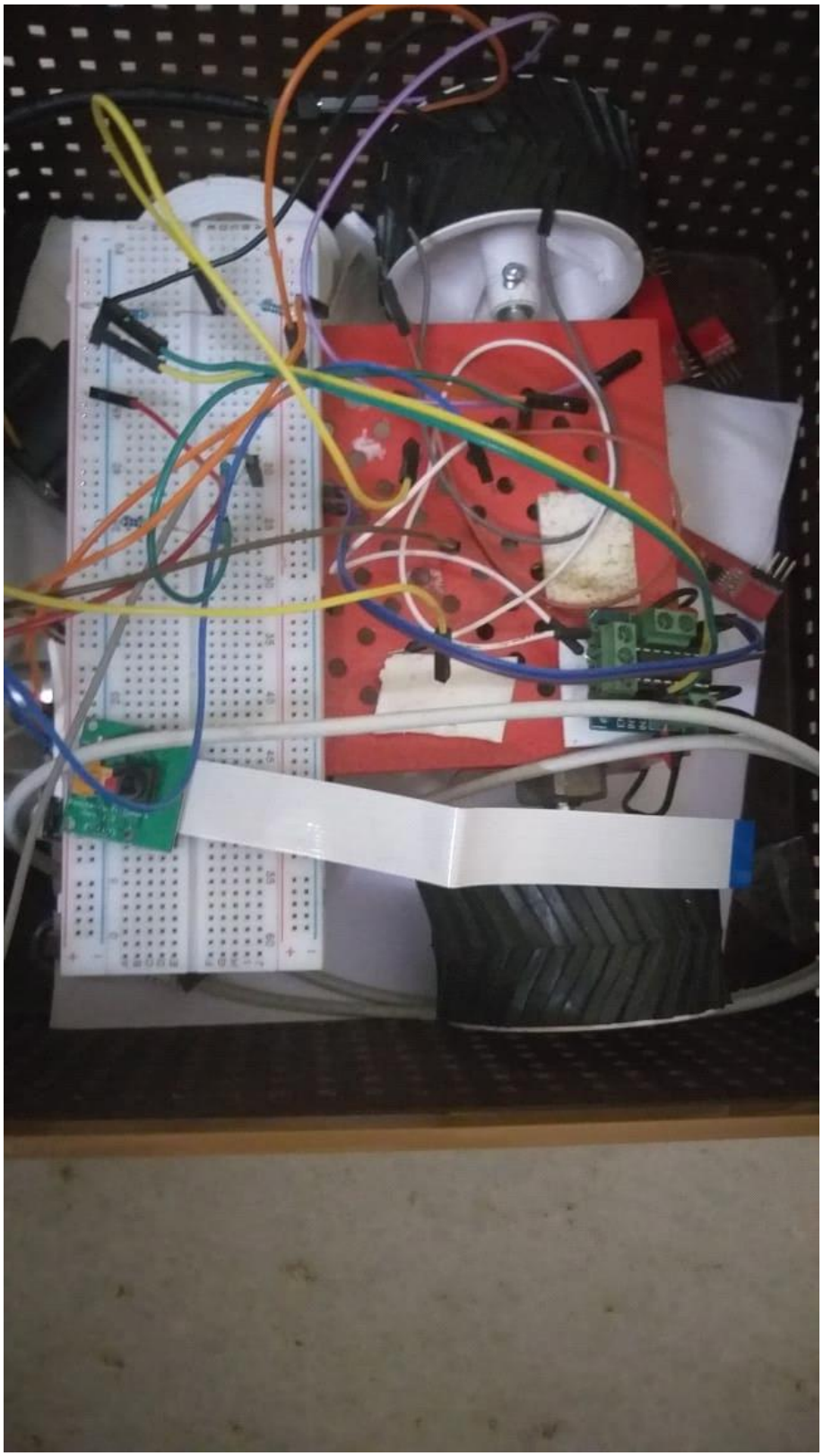
When we think of poaching, trapped, slaughtered and mutilated apes, big cats, pachyderms and other tropical animals fallen prey to the multi-billion dollar global black-market wildlife trade usually comes to mind. This robot can help in detecting any danger to animals due to natural causes and also to catch poachers and curb hunting in restricted regions and time periods. Poaching usually occurs without witnesses, involves evidence that can easily be destroyed and affects victims that can't speak, making wildlife law enforcement particularly challenging. But these robot creatures help understaffed, underfunded and poorly equipped enforcement agencies safely witness poaching first hand and apprehend hundreds of unauthorized hunters, acquire tens of thousands of dollars in enforcement fines, deter potential violators and save real animals' lives. Multiple features make the robotic animals an effective, popular tool for wildlife law enforcement. The mechanical creatures are lightweight and easy to handle during operations.

Flow sensor is a pulse type of sensor which contains wheel inside the sensor, rotates on the flow of water, so that by counting the number of revolution of flow wheel we can measure the flow speed of the water. When we interface the flow sensor with Raspberry Pi the reading is obtained in the form of a pulse as

an interrupt. So that count of the pulse gets increased based on the pulse, so if the count is large, it is identified that flow speed is faster. If it is less count, it is assumed that revolution is slow because the water flow is slow on passing across the flow sensor.

Water level sensor has strips of metal plated probes that when in the presence of liquids change the resistance that will activate the internal switch. When the liquids drain away from the probe the resistance will drop and the switch contacts will open again. Liquids of very poor viscosity may not drain away from the probes and will cause the switch contacts to remain closed.

3. Results and Discussion



The picam displays live video in a website along with flow sensor and float level switch readings.

4. Conclusion

4.1 Conclusion

Our review of 16 leading journals from the animal behavior, conservation, ecology, general s cience, landscape ecology, and wildlife biology fields confirms that the rates at which journal s are publishing urban wildlife studies are increasing.The expansion of urban wildlife literatur e is varied, with animal behavior, ecology, and general science journals disciplines lagging be hind those in landscape ecology, wildlife biology,and conservation.Nonacademic researchers were infrequent first authors of urban wildlife work, and thus represent an underexploited yet valuable resource in this field.A disproportionate amount of urban wildlife research is publish ed from North America, Europe, and Australia, even though South America, Africa, and Asia are rapidly urbanizing and support much of the earth's biodiversity; this represents an importa nt gap in our knowledge that should be addressed. Most urban research is conducted on birds and mammals, with herpetiles, fish, and arthropods relatively unrepresented.Overall, knowledge regarding urban wildlife and their adaptations to, and persistence within, human-dominated landscapes will continue to advance. Urban wildlife research is still a young field with unfulfilled potential and numerous opportunities for a wide range of scientists from a diversity of disciplines.

4.2 Future Scope Of Work

In this report we have mentioned about how we can use IOT as a resource to provide surveillance and protection for wildlife animals. This project have been done on a small scale and can be built on a very large scale to suit the forest environment using wireless sensor networks. Government can use this project as a means to predict floods and deploy the sensors across forests and make stations where humans can work to protect animals and study their behavior in order to make improvements in their habitat for a better lifestyle. Poaching is a punishable offense and by using this project, we can easily identity the people

who attempt in hunting and other illegal activities. This project aims at using technology to built and sustain a better tomorrow.

References

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- Nelson Institute for Environmental Studies, 30A Science Hall, 550 North Park Street, Madison, WI 53706–1491, U.S.A., email atreves@wisc.edu
- Wildlife Conservation Society, Greater Madidi-Tambopata Landscape Conservation Program, No. 133, Calle 11, Obrajes, La Paz, Bolivia
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