IOT BASED ANIMAL TRACKING AND MONITORING SYSTEM IN ZOO

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Received: 03/01/2017, Revised: 03/02/2017 and Accepted: 04/03/2017

Abstract

The goal of this project is to track the location of Animal in the zoo or national parks. This system would include a temperature sensor and PIR sensor. The temperature sensor senses the temperature of each animal and PIR sensor senses the human presence inside the animal boundaries or restricted areas. Generally every animal having particular range of body temperature. If the animal having any wounds or fever, the body temperature will be automatically increased. To monitor this, we are using temperature sensor. It continuously monitors the animal’s temperature. If any variation in the temperature, It will be displayed on the LCD. The PIR sensor is used to monitor the human presence in restricted areas or nearby the animal boundaries. When the human presence is detected, the voice processor will give alert to the people through the pre-recorded voice. The GPS receiver send the location, animal temperature to the controller and it is interfaced with the IOT, It will give the complete information to the website on PC or laptop.

Keywords: PIC microcontroller, GPS, IoT.

1. Introduction

Every living creature on this earth has equal importance in the ecosystem. But nowadays life of wild animals is in danger. If any accident happens to them in the zoo, physical injury or any disease may cause even death of animals in the zoo. In such situations we cannot find out exact location of animal in such a large area. To avoid such problems in the finding exact geographical location of animal in the jungle, national park or in wildlife reserves, animal tracking system is used. Talking about existing technologies in some countries, many animals have belt in their neck. This belt has a wireless transmitter. A wildlife officer have receiver in his/her hand and will search location. However main drawback of this technique is that range of wireless transmitter is less. And in such situations these wireless transmitters are not much useful and they are time consuming. With the help of GPS technology and GSM technology, we can track an animal in the zoo or national parks of thousands of kilometers in length. This system also includes a technology such as Internet of things (IOT). Thus the animal tracking system is
used to track the animals in zoo and national parks.

2. Literature Survey

2.1 Tracking Animal Location and Activity with an Automated Radio Telemetry System in a Tropical Rainforest

This paper describes a sensor network designed to automatically, continuously and simultaneously track the locations and activities of radio-tagged wild animals living in a tropical rain forest. The developed system is not an in-laboratory research prototype, but a real-world working system that has been gathering science-quality data for over 6 years. This system is able to monitor the behavior of these wild animals at a much higher resolution than would be possible using traditional observational methods or other tracking technologies, including GPS tracking.

2.2 Wireless sensor devices for animal tracking and control

This paper describes some new wireless sensor hardware developed for pastoral and environmental applications. From our early experiments with Mote hardware we were inspired to develop our devices with improved radio range, solar power capability, mechanical and electrical robustness, and with unique combinations of sensors. Here we describe the design and evolution of a small family of devices: radio/processor board, a soil moisture sensor interface, and a single board multi-sensor unit for animal tracking experiments.

2.3 Animal monitoring telltale and information system

An animal monitoring telltale device including a receiver attached to the animal and a transmitting device inserted in the animal subcutaneously or in a cavity at a location indicative of the animal. The implanted transmitter will send a signal to the proximately located receiver indicative of a monitored condition in the animal. In addition, the signal is encoded with an identification signal providing ownership information and theft protection. The receiver is preferably secured to an ear tag which tag includes a light or other visual signal indicative of a predetermined value of the measured condition.

2.4 Animal tracking system

An animal tracking system is provided for remotely monitoring animal positioning. The system includes an implant device, a global positioning system, a network, one or more remote servers, and at least one wireless computing device. The implant device acts as a GPS receiver, calculating the animal's position and then transmitting the results to the remote server where they are stored in a database. Owners can remotely access the database via a software application installed on a wireless computing device. Users can select an acceptable roaming range for the animal, an acceptable range between the animal and other animals being tracked, a lack of movement.

2.5 Animal monitoring system

An animal monitoring system comprises a plurality of sensors positioned in a containment area and emitting infrared light across the containment area. Pluralsities of infrared light-detecting sensors receive said infrared light from said transmitters and provides a signal indicating such reception to a controller. The controller monitors the presence of interruptions in said light beams and infers that, in the presence of said interruptions, the
animal is standing. If no interruption is present for a predetermined amount of time, an alarm may be generated to alert an individual monitoring the animal.

2.6 Animal Situation Tracking Service Using RFID, GPS, and Sensors

In this paper, we propose an intelligent animal situation tracking service for zoological gardens, based on GPS, RFID, and sensors. Firstly, we present a service scenario of animal situation tracking and introduce the tracking system configuration. The proposed system can provide real-time animal situation information such as the current location, bodily temperature, and pictures. Plus, it can track the animals based on the information even when they escape their cages. Next, we design and implement a prototype of the proposed animal situation tracking system.

2.7 Mobile animal tracking systems using light sensor for efficient power and cost saving motion detection

This paper proposes an open architecture for animal tracking systems using an easy-to-access Arduino board equipped with various sensors built into a compact prototype, easily attached to an animal collar. With GPS and public Google Map API functionalities, global location and sensor information are sent over SMS-GSM networks to an Android OS phone embedded with a simplified RF technology used to track animals when closing by with an adaptive alert sound and bar sign for mobile monitoring and searching. In addition, to efficiently save the battery power and cost of the tracking system, a practical usage of a simple analog light sensor with motion logic is investigated, and then implemented resulting in feasibility and efficiency of battery power and data transmission.


Remote monitoring of animal behaviour in the environment can assist in managing both the animal and its environmental impact. GPS collars which record animal locations with high temporal frequency allow researchers to monitor both animal behaviour and interactions with the environment. These ground-based sensors can be combined with remotely-sensed satellite images to understand animal-landscape interactions. The key to combining these technologies is communication methods such as wireless sensor networks (WSNs). We explore this concept using a case-study from an extensive cattle enterprise in northern Australia and demonstrate the potential for combining GPS collars and satellite images in a WSN to monitor behavioural preferences and social behaviour of cattle.

3. Block Diagram
3.1 Methodology

In this project, it mainly consists of sensing part and monitoring part. In the sensing part, we are using two sensors, namely temperature sensor and PIR sensor. The temperature sensor is fixed at the surface of the animal. It frequently monitors the temperature of each animal. If there is any variation in the temperature level, it will be displayed on the LCD display. Another one, PIR sensor is used to detect the human movement inside the animal boundaries or restricted areas. It detect the human movement by infrared radiation which is exposed by human, if there is any movement is detected by the PIR sensor, the voice processor is activated and the speaker will be on. It gives the alert to the people through the prerecorded voice. The GPS device is connected to the micro controller which is used to monitor the location of animals. And it will send the location of the animal which affected due to increased temperature. After getting all the information about the animal location and the temperature and any object movement like human it will be displayed on the PC using the IoT kit.

3.2 Circuit diagram
4. Hardware description

A. Temperature sensor:

We have used temperature sensor to detect the body temperature of animal. Temperature sensor is an analog sensor. Which means it gives variable voltage as per the variation in the body temperature. Voltage range is 4v to 30v. Here we have provided 5v. Range of temperature is between −55°C to +150°C. It is easily suitable for remote application.

B. PIR sensor:

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors allows to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. **Sensitivity range:** up to 20 feet (6 meters) 110 degrees x 70 degrees detection range
C. GPS Modem:
We have used GPS modem to retrieve and longitude and latitude of the location. This GPS modem communicates using serial communication with the microcontroller. GPS modem sends a bunch of data to the microcontroller. This bunch of Data contains many parameters which include longitude and latitude.

D. Microcontroller:
PIC 16F877 is one of the most advanced microcontroller from Microchip. This controller is widely used for experimental and modern applications because of its low price, wide range of applications, high quality, and ease of availability. It is ideal for applications such as machine control applications, measurement devices, study purpose, and so on. This is the important block of this project. It performs various functions like, reading coordinates from GPS modem. It finds out the longitude and latitude from this data.

E. LCD display:
It is used to show various messages on LCD. Although LCD does not have much use in actual application but still it is really very useful for testing purpose and while developing this project. Because we can show various messages like: Sending SMS or we can display longitude and latitude of current location on LCD display.

4. Conclusions
Thus the animal tracking system is used to track the animals in zoo and national parks. It continuously monitors the animal’s temperature and human presence. If any accident happens to them in the zoo, physical injury or any disease, we cannot find out exact location of animal in such a large area. To avoid such problems, our system can be used. This does not require human attention as this is completely self-independent and automated system.
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