

Anti-poaching System using Wireless Sensors Network

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Abstract

Pertaining technology advancement, several innovations have been implemented in the wireless sensors networks field. This research seeks to facilitate innovation of a wireless network monitoring system that will be more efficient in gathering data from nodes of the wireless sensor network as it will be able to monitor from long range hence improving coverage. WSN will be employed to enhance LoRa data transmission from body-attached sensor nodes to a base station for analysis. The anti-poaching system will also have solar harvesting system for recharging batteries, hence this system is rendered non-intrusive.

Keywords— Wireless Sensor Network, Anti-poaching, Network coverage, Long Range Transmission

I Introduction

According to authors in [1], since the introduction of safari hunting tourism ban on rural livelihoods including elephants, the incidents of poaching has risen. Safari hunting tourism ban on rural livelihoods was one of the method used as a way of wildlife conservation, this paper focus on introducing a real time system for protecting one of the most endangered species in Botswana which is an attraction for tourism

Anti-poaching system is one of the most studied topic by researchers, in order to prevent or end poaching at all if possible. Various poaching detection technologies have been studied in relation to this topic. Poaching detection technologies is said to be classified into four domains by authors in [2]. The four domains are: perimeter based, ground based, aerial based and animal tagging based technologies.

This paper will be looking at animal tagging based technology where by a sensor node will be a part of

WSN that will collect data from the target based on animal behavior. Animal behavior has been identified by researchers as a way of prevent poaching as animals have sensitive sensing as compared to humans [2].

The focus of this paper is to develop an anti-poaching wireless sensor network with a real time monitoring system, with improvements in network coverage employing probability algorithm schemes. Lastly analyze performance of various algorithm schemes.

II Literature Review

There is already a number of techniques and studies that have been implemented with an aim of combating poaching in Africa. Discussed below are some of the techniques;

In work [3] authors Mogomotsi and Madigela state that regardless of recent reductions in rhino poaching in Namibia and South Africa, it remains a worry. In their studies authors states that in response, the government of Botswana has implemented a (shoot-to-kill) policy, targeting poachers. The authors also goes further to say that the adoption of the green militarization in the form of a shoot-kill-policy has made a tension in northern Botswana where communities have complained of successive raids by the Botswana Defence force.

Nevertheless the study explains that militarized response effectively reduce poaching as the study went on say that Botswana had 1.12 percent of Africas rhinos in 2015, but accounted for only 0.1 percent of mortality's. In regard to analysis, this policy is intended to deter poachers by threat of death. (Shoot-to-kill) models are cheap to implement [4].

In a work [5] Mulero proposed utilizing drones as an anti-poaching strategies, authors mentioned that drones requires two fundamentals components which are the air frame and the ground station. Further the author stated that communication is facilitated between the air frame and the station, and that the aerial vehicles or drones use cameras and sensors in the gath-

ering of information. Mulero went on and state that he plane can operate at three various modes: autopilot, first person view mode and manually (radio control conventional mode/third person mode). An on-board first person view video camera, a GPS data logger with a barometric altitude sensor and an autopilot are equipped in the plane. The onboard screen board gives GPS data about the position, speed, course and height of the plane. The data is joined with the video from the camera is sent to the ground station.

In work [6] Mohan Rao and Sairam proposed that a communication system developed in wireless sensor networks should be able to achieve low power consumption for sensor using encoding of data at client nodes and decoding at the server node. The proposed system that use raspberry PI gadget to give web page and exchange the information onto web page so as to visualize the data from any location in this way accomplishing long distance transmission. The low power consumption is achieved based on encoding the data.

In a work [7] by Philip et al ,the authors strategy was based on dehorning the engaged species at Kruger National Park, the authors put into thoughts that the horns will grow again. The authors states that according to statistics while dehorning was actualized then the country saw that there was 29.1 percent possibilities of survival of dehorned elephant as compared to horned rhinos. Dehorning technique is not viable as it is just a delaying strategy and also the execution cost is high, in addition poachers can retaliated by killing species or for the short stub that is left after dehorning.

In a work [4] the author state that DNA mapping is a one of strategies used to determine the precision location where the animal was killed. The authors went on to mention that a results of the implementation of the DNA mapping system was in 2002 by Singapore officials to trace back a container with 6.5 tons of ivory to Zambia, using a micro satellite a DNA is collected from the elephant dung and DNA was extracted from the tusks captured. However the method is ineffective because seizing the ivory does not save the elephants.

III Methodology

Based on the animal behavior of the animal, the parameter of interest was temperature. The sensor node interfaced with temperature sensor was used to detect difference in temperature from the elephant. The captured data was processed by the micro-controller. The processing function was to compare the detected temperature with already known data from studies.

From studies the normal temperature of an elephant is between 36.2 to 38.1. The processing was to check if the detected data is within this range if the data is not within this range.

Basically, since the WSN consists of 3 components: sensor nodes, gateway and observer. This network consists of similar components which are sensor node and gateway. The sensor nodes comprise of more individual components which are: power management circuit, temperature sensor , micro-controller and transceiver. While the gateway comprise of individual components like: transceiver, server and receiver station.

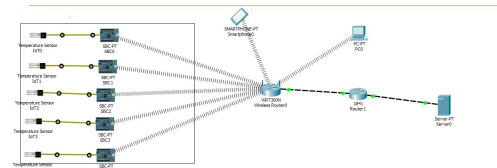


Figure 1: Network Diagram

The figure 1 shows the diagram of network arrangement from sensor node to the base station. The sensors are incorporated to the microprocessor to form a node. The temperature sensor captures analogue data of interest from the species and through micro-controller ,the data captured is processed and it is sent remotely to the wireless router. From the router a message will be sent to the base station through the antenna that is connected to the wireless transceiver. The obtained data is compared with known values. The authority in charge of the anti-poaching system will be notified of changes in the parameters of interest hence an alert will regarding the poaching activity. Therefore an action will be abruptly.

IV Results and Discussion

In the section regarding the outcomes, this is where the final stage of the network is encountered. The information received by the officers through the phone or computers at the receiving station. The officers will take relevant action based on the information they received.

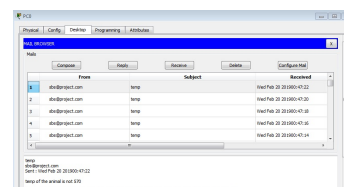


Figure 2: Results

Figure 2 shows readings are captured from the sensor, thereafter the data is being sent to the network through the wireless router. The data is meant for officers to see the situation of the animal and take relevant actions.

V Conclusion

The simulation was successful with the use of cisco packet tracer simulation tool. The simulation was based on wireless sensor network and data transmission where the sensor node temperature sensor was connected to the micro-controller for capturing and processing data. The micro-controller was also used to transmit the collected data to the base station where analysis was done and relevant action taken. In the future, Global positioning system will be incorporated in the system so as to enhance the tracking of endangered species.

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