

Animal Tracking and Caring using RFID and IOT

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Abstract: *Animals are important part of human life and they are to be taken care of. A proper, suitable and safe environment has to be provided to them with appropriate care of their diet. A system to track and monitor the animals remotely is required. This system should be intelligent enough to message the owner of the pet with the current situations, it should be able to supply animals with required amount of food and water, maintain the room temperature favored by the animal, live streaming of animals movement and behavior and should also be able to locate animal at a remote distance. Here we have developed the system with all this above mentioned features.*

Keywords: *firewall security, IOT, RFID, sensor, Animal Tracking.*

I. Introduction

As the years pass new technologies are evolving. RFID (Radio Frequency Identifier) has grown as major enabler technology for tracking things around the world. RFID tags can be active or passive. Active RFID tags require battery as a power supplier for running the circuitry of microchip and transmit signal to the RFID reader. Passive tag does not contain battery. Rather they take power from the reader. With active tags tracking can be done to a longer range than that of passive tags. The main work of RFID is to identify and track the product, goods or person (here animals).

IOT (Internet of Things) is an emerging technology. It has all together change the approach of interacting, communicating and connecting with the world. IOT can possibly interface all of us. Information from sensors, monitors and trackers can be gathered to work more proficiently. The major use of IOT is to connect together every possible infrastructure over the internet. Libelium manufactures and designs hardware and SDK (Software Development Kit) for wireless sensors to deliver reliable IOT. They provide Waspote, a libelium's wireless sensor platform [1]. CUJO is a smart firewall [2], that provides firewall, anti-virus and anti-malware and protects devices.

II. Literature Review

RFID in animal- tracking applications tells about the implementation of tagging of domestic animals by various countries which helps them in tracking those animals. The tracking is done using RFID (Radio Frequency Identification) chip which is associated with the tag. This tag can be attached to animals (like cow, goat, etc.) by clamping on the ear or implanted inside the animal. Insertion can be done in various places depending on animal. For example, tag can be implanted in front shoulder of cat or dog; breast of a bird [3].

This paper proposes a Web of object architecture (WOA) which provides a web-based IOT services to not only humans but also to animals and living beings. Here the objects can be pet animals, plants, etc. It objectifies services, resources and devices and uses the knowledge which is obtained by analyzing relations between these objects. Smart pet-caring system is built on the concept of WOA, it provides notifications, real-time alarm and recommended services in absence of pet master when there is change in service environment. The data from various sensors is analyzed and on that bases pet status is notified [4].

The people who are in continuous contact with the animals like veterinarians or pet owners can keep track of their animals and can diagnose their behavior with Dynamic RFID-based Mobile monitoring System (MMS). If a pet attached with a RFID tag is lost, a PDA or any device embedded with RF reader and within a particular range of that device can retrieve the information in the tag and identify the owner of the pet so that the pet can be taken to its owner again. The pet owners can be alerted by RFID readers covering high risk areas, such as, if their pets are in high risk areas for infections (like flu) or traffic accidents [5].

For tracking and identification of animals for a Digital zoo this paper has use together RFID with wireless camera sensors. Here RFID is just used for identifying the animals individually while the cameras are used for tracing, tracking and monitoring their behavior. The location information of animals can be obtained using semi continuous tracking (network of camera sensors) and labels associated with individual animal (RFID reading) [6].

This paper proposes service that tracks animal situation which includes technologies like RFID that identifies animals based on the information from the tag attached to their body, sensor nodes that sense body temperature of animals and GPS (Global Positioning System) that locates the animals and their cages. All the data from the above technology is stored in the database and then provided to the users (zoo visitors, zookeepers and veterinarians). Zoo visitor can get knowledge and information about a particular animal from the RFID tag attached with it. Zookeepers can track and locate animals with GPS. Veterinarians can examine animal's health status and can give necessary medications if required [7].

The communication between devices and human has gain more demand. IOT helps in interaction of such objects over the internet. The objects can be readable, located, recognized and controlled through internet. In this paper a pet caring solution is addressed which includes a smart pet door and a smart pet feeder. This pet system has improved the pet monitoring and also fulfills the demands of pet owners. This paper also gives a thought process to future work and improvement so as to centralize the study of IOT gateway and detecting pets at far distance [8]. The next section of the paper is Section 3 which sketches the architecture, Section 4 illustrates benefits of this model and the uses. Finally, in section 5 the conclusion is drawn.

III. Architecture Of The Proposed System

Fig. 1 depicts the overall architecture and setup of the whole idea of this paper. It shows how animals can be tracked, monitored and cared using various technologies all together. Technologies such as RFID, IOT and sensors are been used. All animals in this have to be tagged or implanted with RFID. This helps and makes it easier in locating and tracking the animals. These tags are embedded with sensor for mobile tracking with GPS (Global positioning system). And hence a remote sensing can be done even if the animal is at a far distance from the zone or area it belongs to. For tracking such animals the satellite emits signal and this signal is reflected back by the sensor which is embedded in the tag. This gives the exact location of that animal. The owner then can track such animals at far distance.

An animal inside the zone or area can be tracked, but does not actually need to be tracked rather they need to be monitored. For monitoring, cameras are distributed over the area for capturing there movement. These movements are analyzed for better understanding of their behavior. The cameras can detect the animals with their motions.

For taking care of animals not only monitoring is required but also keeping track of the food and water of animal is required. Specific amount of water and food level is to be maintained to keep the animal healthy and not letting them starve or over feeding. A libelium's sensor [1] is attached with the food dispenser and the water dispenser of animal. This sensor sense and analyze the level of the water or food in the dispenser. If the water or food is below the expected level the sensor sends messages to the owner and the owner then respond in order to refill the feeder to the appropriate level. All this happens over internet and it is possible because of IOT. If the animal is obese then a limited amount of food should be supplied to the animal. Excess of food can lead to pressure on animal's kidney, which will be harmful for that animal.

Sensors which are attached to the animal's body have the capability of monitoring the body temperature and health of animal. This help in identifying if the animal is sick, diseased or perfectly fit. Accordingly, actions can be taken to improve their health.

Data from camera and sensors (attached to food feeder, water feeder and embedded tags) are stored on the server. This data can be used for analyzing behavior and health of the animals. This information can be viewed on computers which are connected to the internet. When the devices are connected to the internet, it has to be secured. The security of devices and appliances is managed by CUJO [2].

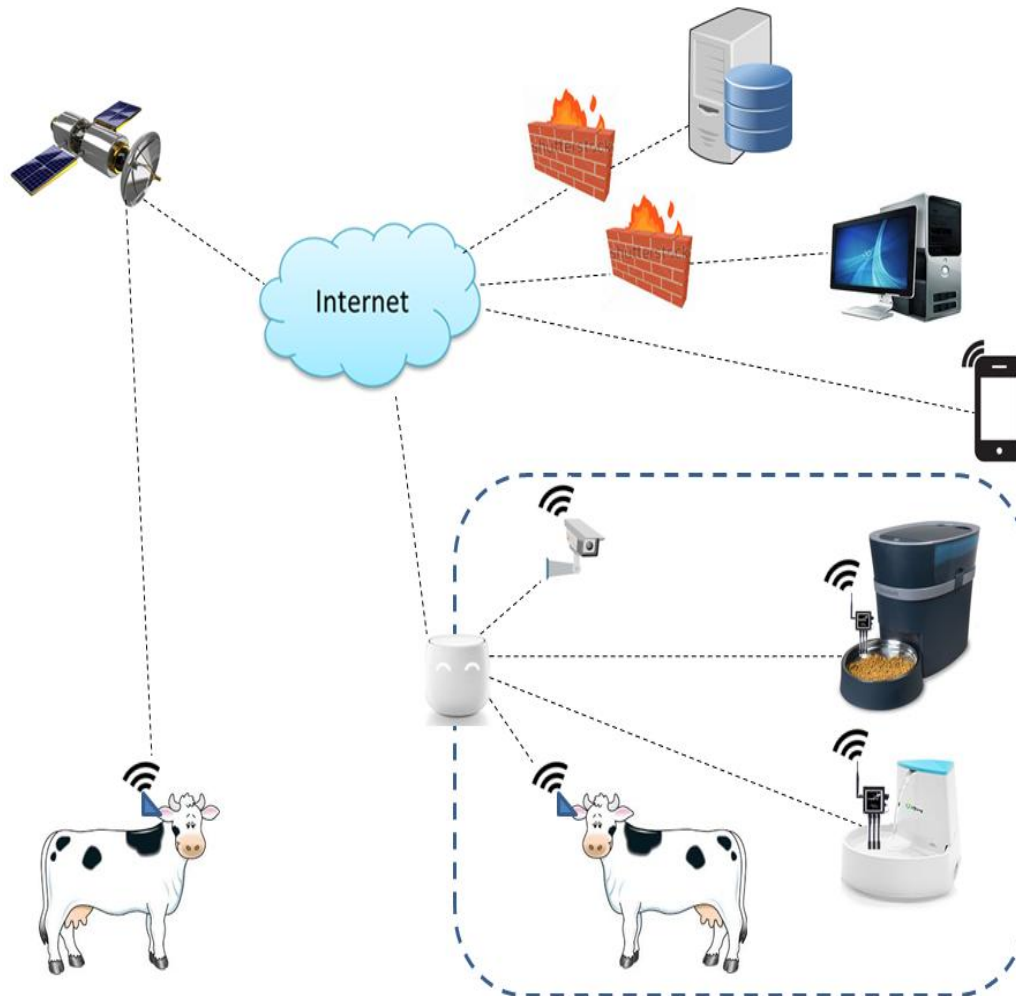


Figure 1: Architecture

The CUJO is a smart firewall which sits between the appliances or sensors of appliances and the internet. CUJO is provided with IP addresses of the devices which are to be protected. The CUJO can only protect those devices whose IP address is known and stored in CUJO. It cannot protect the devices which are in the zone but whose IP address is unknown. All the incoming and outgoing data traffic passes through CUJO. It not only provides firewall but also antivirus and antimalware system. IOT security is implemented by CUJO [2].

With this construction the owner of the animals can track their animals, monitor and can take care of them for their better well-being.

IV. Benefits And Uses

With the help of attached RFID tags embedded with sensors it is very easy to track the animals not only inside the area/zone but also outside (with GPS). Their body temperature and their health conditions can be known with these sensors. Cameras distributed over the area detects the animals with their motion, monitors them and their movement which help them to analyze their behavior and the part of area where they spend most of their time. The amount of food they eat and water they drink can be controlled remotely and this controlling has to be done to keep the animals fit and healthy.

If the animal is in house pet then the temperature and humidity of the house or the closed area can be maintained. For example, if the weather is chilled then the heater can be on.

This architecture is of greater use for a pet owner who goes for work and cannot be with the pet 24/7. The pet owner can control and monitor his/her pet from anywhere and on anytime. An owner of animal farm with proper use of this technologies and this setup can increase the productivity and income. The zookeeper on the other hand can identify and track all the animals in the zoo individually. These technologies are of greater interest for a veterinarian, he can detect the disorder or disease in the animals even before examining them.

V. Conclusion

With increasing in interaction between humans, object and living things (Animals, plants) there is a need to build and maintain connection between them globally. IOT does this work of connect humans, object and living things with the world. In this paper, we have addressed a model for locating animals and keeping track of them. It also takes in account the caring factor. As every animals care is ought to be taken. With IOT a remote monitoring, feeding, analyzing of body temperature and other health disorders can be diagnosed. We have also address the issue of long distance identification of animals using sensors embedded in the RFID tag which can be tracked using GPS.

References

- [1]. Smart Farming: Monitoring Horses and Equine Facility Management with Waspnote | Libelium [Online]. *Libelium.com* 2017. <http://www.libelium.com/smart-farming-monitoring-horses-equine-facility-management-waspnote/> [28 Nov. 2017].
- [2]. CUJO Smart Firewall - Stay Safe Online [Online]. *CUJO Smart Firewall* 2017. <https://www.getcujo.com/> [28 Nov. 2017].
- [3]. Floyd R. RFID in Animal-Tracking Applications. *IEEE Potentials* 34: 32-33, 2015.
- [4]. Lee N, Lee H, Lee H. Things-aware smart pet-caring system with internet of things on web of object architecture. *2016 International Conference on Information and Communication Technology Convergence (ICTC)* (2016). doi: 10.1109/ictc.2016.7763419.
- [5]. Ting J, Kwok S, Lee W, Tsang A, Cheung B. A Dynamic RFID-Based Mobile Monitoring System in Animal Care Management Over a Wireless Network. *2007 International Conference on Wireless Communications, Networking and Mobile Computing* (2007). doi: 10.1109/wicom.2007.521.
- [6]. Karlsson J, Ren K, Li H. Tracking and Identification of Animals for a Digital Zoo. *2010 IEEE/ACM Int'l Conference on Green Computing and Communications & Int'l Conference on Cyber, Physical and Social Computing* (2010). doi: 10.1109/greencom-cpscom.2010.69.
- [7]. Kim S, Kim D, Park H. Animal Situation Tracking Service Using RFID, GPS, and Sensors. *2010 Second International Conference on Computer and Network Technology* (2010). doi: 10.1109/iccnt.2010.40.
- [8]. Own C, Shin H, Teng C. The Study and Application of the IoT in Pet Systems. *Advances in Internet of Things* 03: 1-8, 2013.
- [9]. Shih Y, Samani H, Yang C. Internet of Things for human — Pet interaction. *2016 International Conference on System Science and Engineering (ICSSE)* (2016). doi: 10.1109/icsse.2016.7551607.
- [10]. Wuchen Xiao, Hua Zhang, Qiaoyan Wen, Wenmin Li, Passive RFID-supported source location privacy preservation against global eavesdroppers in WSN, *Broadband Network & Multimedia Technology (IC-BNMT) 2013 5th IEEE International Conference on*, pp. 289-293, 2013.