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Smart Collar: Tracking Location and Monitoring Animal Health

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ABSTRACT: IOT has gained huge importance in world of digitization age technological age. Health and safety of an individual are important aspects. Same is in the case with animals. In recent decades, many cases related to animal abuse, accidents, loss of animals have been exponentially increasing. Constantly many efforts and research have been done in area of safety and taking care of animals to protect them and providing them a safer environment to flourish. The proposed device in the paper has done to avoid these problems. The main aim of proposed device is to track the location of animals using GPS and also basic health care monitoring is taken care of. We have used sensors to detect heartbeat, body temperature, etc of animals. To make the proposed device availability at cheap rate, solar technology is used to reduce the cost of batteries and also, use of radium colors for the safety of the animal during night time to avoid accident. Use of radium colors instead of LED lights cause low power consumption, therefore battery-life would be increased. The health readings and current location can be timely updated to the concerned person's smartphone.

KEYWORDS: GPS, Temperature sensor, radium color, light reflector Tape.

I. INTRODUCTION

From 20th century, new technologies had evolved which has IOT as one of the emerging technology which has change the approach of interacting, communicating and connecting with the world. The major use of IOT is that it makes possible to interact with every possible situation with the people and surrounding. Tracking location and safety of animals is one of the IOT device which helps to track location details and also monitor the health of animals. The paper reviews tracking the animals using GPS and monitoring health using various sensors (heart beat sensor, temperature sensor). The data collected from the sensor and GPS is sent to the user end interface via message using GSM technology when the health of the animal is critical.

The proposed device is very helpful to the peoples who loves to keep pet animals and takes care more than themselves. It can be also useful at zoo parks and sanctuaries to keep a track and monitor health of animals remotely. As it uses GSM technology there is less risk of losing connection with the device whether it is out of town. The solar panel is the main feature which plays an important role in Emergency situations (e.g.: if the device gets discharged and there is no mode of charging it and we have to track the animal the solar panels helps the device to get charge and make the device run again). The objective of proposed device is to provide basic health monitoring parameter and ensure concerned person that their animal are safe and they can be easily located using GPS module. Also, the use of light reflector tape can prevent accident of animals during night time and use of solar mini panels which can be used to have a battery-backup source in case of emergency if battery power is over.

The following sections in the paper consist of related work done using same technologies. In methodology section we have specified our software and hardware requirements and also their working, and in experimental results we elaborated our results for proposed device and ended with conclusion and future scope of our proposed device.

II. RELATED WORK

In [1] Jorge et.al. proposed a GPS collar which uses SIGFOX technology to send the data to the server. SIGFOX is an LPWAN network operator that uses Binary key phase-shifting keying (BSPK) modulation in an ultra-narrow band. Due to this, the power consumption used is less. To optimize the consumption GPS unit uses a hot start mechanism. In [2] Sumit et.al. proposed all health parameters (temperature sensor, heartbeat sensor, rumination sensor) interfaced with MP3008 and Raspberry-pi. Thinkspeak and channel is created for collecting data from the sensors when the devices go out of range. Data is sent to thinkspeak using the Wi-Fi of Raspberry -pi. In [3] Aswiniet.al. proposed various sensors like heartbeat sensor, temperature sensors and GPS are being fitted to cattle and states that the normal

temperature of cattle is 38.5°C to 39.5°C and normal heartbeat rate is 48 to 84 beats per minute. He also checks the environmental temperature and humidity which affects the health of the cattle. He uses Arduino Uno which helps to transfer the sensor values through esp. Wi-Fi module to the internet. The health parameters can also be monitored in mobile by using a widget called IOT Thinkspeak monitor widget. In [4] Shaheen et al. proposed the advantages and disadvantages of GPS and used wireless sensor belts which track the location of the pet. It shares the graphical illustration on the mobile with every spike indicating the pet is within or outside. It also has a Fitbit device to calculate the distance and the distance is calculated by walking steps and running steps. In [5] Sudarsono et al. proposed Physiological data that can be accessed through ZigBee and WBAN, pulse Oximeter sensor, temperature sensor. This helps in monitoring health condition by comparing the person's data with the normal condition data. In [6] Tejaswini et al. proposed NodeMCu based network. Here the system introduces a brand-new application which consists of two architectures one for animal health monitoring and another is a crop monitoring system that will achieve smart irrigation, animal and crop disease forecasting as well as will also fill the gap between farmers and expertise thus by giving the solutions on animal disease and crop disease, for example, medicine, pesticides, etc.

III. METHODOLOGY

Questionnaire regarding the proposed device was created and sent for getting responses from people involved in taking care of street animals and also to people who have pets at their homes. The proposed model going to be developed was in brief explained to them and they responded to the questions being asked. We gathered 60 responses which we used to test our hypothesis for proposed model. The questionnaire included questions in yes or no format or agree or disagree to ideas and concepts used in proposed model. Fig. 1 represents the Block Diagram and Fig. 2 represent a proposed device. Selection of software and hardware requirements were done by conducting survey of technologies and using literature survey. Then we shortened our list to requirements which satisfied our project.

- Proposed model:

- a) Microcontroller :

Arduino –NANO the small and breadboard-friendly board based on ATmega328p is used .

- b) Sensors:

Temperature sensor to measure temperature and converts the input data into electronic data to record and monitor. Heartbeat sensor to measure the speed of heartbeat which returns the count of heartbeat.

- c) Mini-solar panels:

The panels conduct solar power by receiving energy from sun and using it to provide the power to product. Also these panels are portable. These will provide a battery –backup to our device in case of emergency.

- d) Reflective tapes:

Reflective tape is durable ,high-strength adhesive used to clearly make object shine in darkness. The main aim of using these tapes to reduce accidents at night time .

- e) GPS:

GPS(Global Positioning System) is a navigation satellite which gives information about the location, velocity and time synchronization. The live location of animal if its lost or lost its way can be found by owner using GPS technology.

- f) Softwares:

The proposed model used SIGFOX which is a LPWAN and is used for transmission of data from the SIGFOX station via Internet and then the data is sent at the user's end, Arduino 1.8.13 is the open source Arduino software(IDE) which makes easy to write the code and upload it to the board.

The above stated hardware and software requirements would be used while creating and satisfying the objectives of our project.

- Working:

The GPS, heartbeat sensors, temperature sensors will be connected to the Arduino-Nano. The heartbeat sensor and temperature sensors are embedded in vest mesh. The data which is collected from the sensors sent to the Arduino Nano which is further sent to the SIGFOX station and then the data is processed to user's end. The collar is made up of with the use of light reflector tapes and radium color which will help in avoiding accidents at night. The mini solar panels which will be embedded at the outer side of collar which will help in charging the battery at emergency situation, this increases the life span of battery. ForExample, in case animal is lost for longer duration and owner want to find it but if battery power goes down, this stored energy will add a battery-backup.

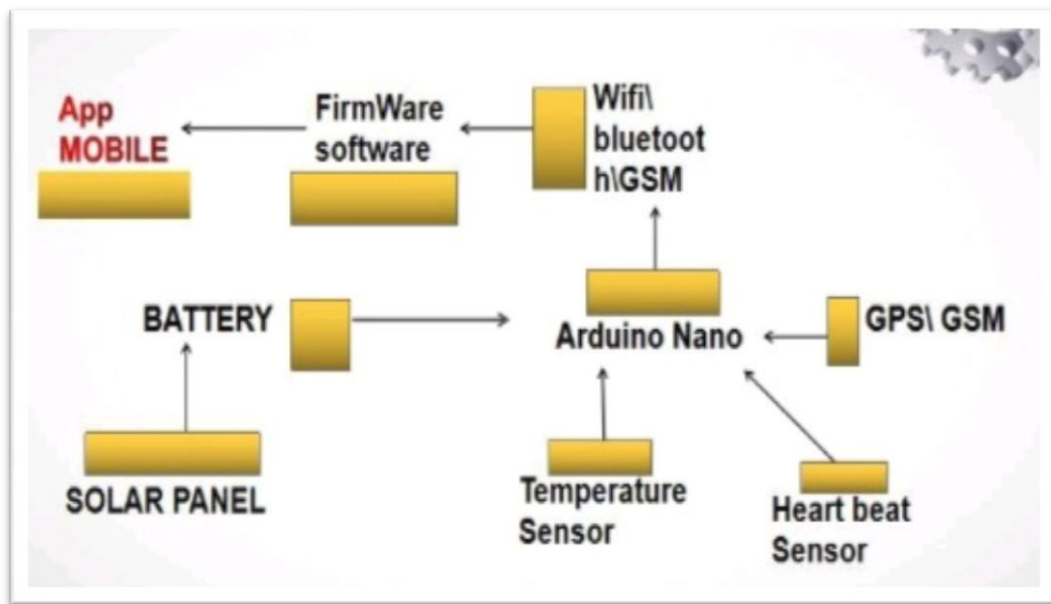


Fig.1 Block-Diagram

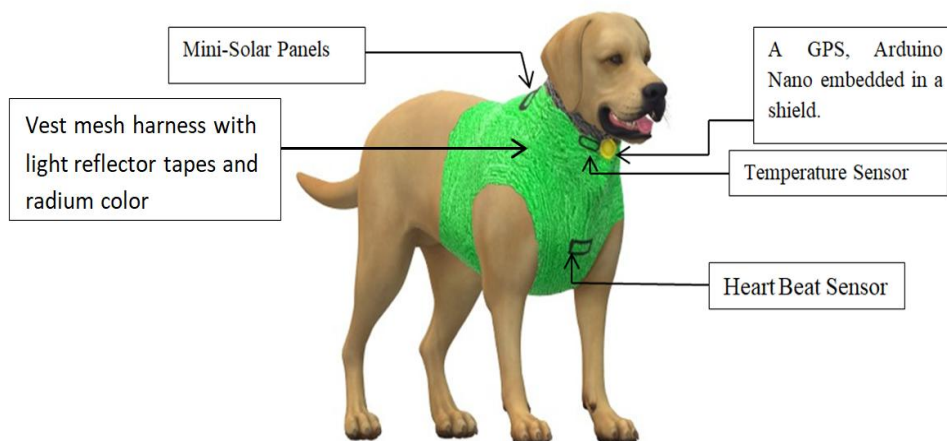


Fig.2 Proposed device

IV.EXPERIMENTAL RESULTS

The questionnaire was distributed among selected sample and responses were collected. Then as our questionnaire was

categorical data we performed chi-Square test on sample and we estimated on 95% confidence level and results favour in our proposed device objectives. Also, our objective of using reflector tapes and solar panels which is something vital part for device was satisfied from the sample responses. The Fig.3 shows the percentage of yes and no answers for question as how many people want to know the location of their pet animals using this device. And in Fig.4 the percentage of people response who don't want to have health monitoring system in the proposed device.

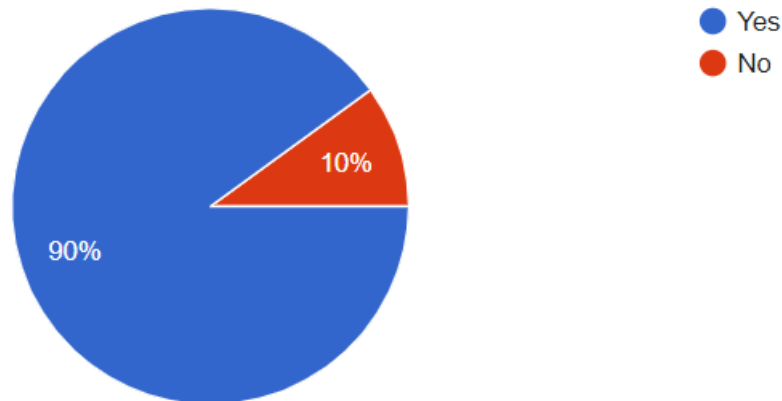


Fig.3 Percentage of people who think device is useful for tracking location

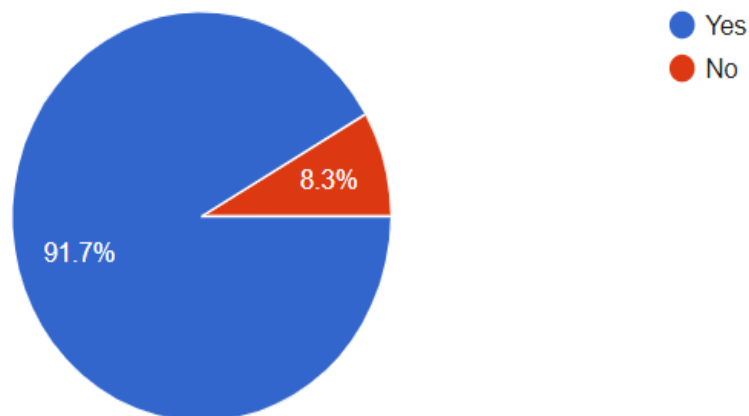


Fig.4 Percentage of people who think device is useful for animal health monitoring.

V. CONCLUSION

The proposed paper gave objectives and aim behind the creation of these device. The paper gave a brief introduction of hardware and software list which will be used for creation of these device. Also, a diagrammatic representation is given as referred in Fig.1. By collecting data using questionnaire, we received a greater success of response for our proposed device. The GPS module would give live location of animal to his owner or organization whenever required, so the owner is satisfied or can find animal if its lost. In future use the proposed device will be created as proposed and again test would be done on created device. Further, we would also like to add many more features in our device and update it so it can smartly take care of our animals.

VI.ACKNOWLEDGEMENT

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VII.GLOSSARY

GPS – Global Positioning System.

LPWAN – Low Power Wide-Area Network

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