doi: 10.30750/ijrast.537

Wireless Sensing Element Network-Based Pet Location Observation System for Domestic Situations

H.Shaheen[1*], V.Soniya[2], C.G. Nava Durga[3], K. Vinitha[3]

[1]Associate Professor, [2]Assistant Professor, [3]UG Scholar, [3]UG Scholar

[1,2,3]Department of Computer Science and Engineering, St. Peters Engineering College, Hyderabad, India

***Correspondence: Dr.H.Shaheen,** Associate Professor, Department of Computer Science and Engineering, St. Peters Engineering College, Hyderabad, India. **E-Mail:** shaheen66@gmail.com

Abstract

Pets need special care and tracking system to track their path in case of lost. Due to our busy life style, this task is not simple as it used to be. The aim of this work is to design and implement smart pet house and tracking system. The objective of this paper is to allow pets owners to automate simple things like monitoring and tracking of the path of pets. Also lighting, feeding and air-conditioning controls. The proposed work addresses the implementation and analysis of a wireless sensor networks based pet location monitoring system for domestic scenarios. These systems describes, finding the path of lost pet using fitbit flex scale device and also using GPS tracker. Pet begin moving before you get a GPS signal, the tracker will calculate distance using steps and stride length as described above until a GPS signal is found.

Keywords: Smart, pet, house, tracking system, GPS, fitbit flex.

Introduction

Finding a lost pet is a very nerve-racking and sometimes complex process. Today, thanks to advances in the Internet of Things (IoT) and GNSS tracking, things can be very different. By using IoT application for pet pursuit, individual are far more likely to find a missing pet. Nowadays, observance of objects as well as of live beings can be easily carried out thanks to a wide variety of transceivers working together with increasingly compact devices and the use of different wireless communication standards. These plan of action fall within the reach of the Internet of Things (IoT), where devices are connected to the internet and the information is sent without the interaction of human beings. Thus, a high variety of variables can be monitored in real time and in the case of living beings, their physiological parameters or location can be accurately measured.

In relation to animal tracking numerous identification systems have been developed over the years, especially for wildlife tracking and analysis, attaching radio transmitters to animals to monitor their location, behaviour or migratory habits. For farm animals or best-loved some determination systems have also been developed and deployed, although these systems are not based on wireless networks and therefore owners must extract the information indirectly.

In recent years, Wireless sensor network for animal monitoring using both antenna and base-station diversity(WSN) is proposed for animal monitoring, Enabling large scale ad hoc animal welfare monitoring the location of cows is monitored thanks to navigational system location system and GSM telecommunication.

GPS tracking is the surveillance of location through use of the Global Positioning System (GPS) to track the location of an entity or object remotely. The technology can pinpoint longitude, latitude, ground speed, and course direction of the target. GPS works by providing information on exact location. A GPS tracking system uses the Global Navigation Satellite System (GNSS) network. This network incorporates a range of celestial body that use

microwave communication that are transmitted to GPS devices to give information on location, vehicle speed, time and direction.GPS units receive signals from United States Government satellites that they use to determine location. The noteworthy thing about GPS is that the satellite navigational information is available to anyone, anywhere, free of charge.

Advantages of GPS

The GPS signal is available anywhere on the globe. Hence user will not hold back GPS facility anywhere.
There is no charge to utilize the GPS service as US Defence bears cost of GPS system. It is retained and uphold by US Department of Defence. It is cheaper compare to other navigational systems.
The GPS system gets calibrated by its own and hence it is easy to be used by anyone.
It provides user with location based information. This will be helpful in various applications such as mapping (used in cars), location (geocaching), performance analysis (used in sports), GIS etc.

Disadvantages of GPS

- GPS chip is power hungry which drains battery in 8 to 12 hours. This requires either battery replacement or recharge.
- GPS signal does not pierce through the solid walls or structures. Moreover it is affected by large building framework. Due to this, user will not be able to utilize GPS service in indoors or under water or in dense tree regions or in underground stores or places etc.
- GPS accuracy depends on sufficient received signal quality. GPS signal gets affected due to multi path, atmosphere (i.e. ionosphere), electromagnetic interference etc. This leads to error of about 5 to 10 meters in GPS signal.
- Though currently system is managed by US DoD and users are utilizing the system free of cost, it is in the hand of US to allow or deny the GPS service at any time.

- It is better not to rely completely on GPS system. Backup travel maps with directions will help in the event of GPS system failure.

So here in particular on concentrating 3rd point we are using fitbit flex scale device which take foot step counts and find the location. When WSN are developed for pet-oriented applications, the main purpose of these systems is animal wellness and security. Thus, a remote feeding system is developed. The proposed system therefore provides a pet location and monitoring system using device called as fitbit flex scale device where GPS doesn't work, which provides an interactive context in order to retrieve parameters such as pet location, biomedical signal retrieval or behaviour patterns, among others[1-5].

The Challenges of victimization IoT Technology for Pet following

An estimated 15 percent of lost dogs and cats area unit found victimisation microchips, identification collarsor alternative pet following IoTdevices, which figure is growing year over year. However whereas these devices area unit already in high demand among pet house owners, truly obtaining these devices onto the market are often sophisticated. To start, IoT pet following device makers got to build a wearable that isn't excessively giant or large. This implies that the following technology employed in a dog collar, must be as moveable as potential while notsacrificing following accuracy over long distances. If the collar is simply too serious, it'll be impractical for smaller dog breeds, since it may strain on the pet's neck, leading to health problems and general discomfort. nonetheless makers World Health Organization build a tool that's too flimsy may risk harm to the merchandise throughout everyday use. A pet following IoT device must be sturdy enough to face up to the weather and a pet's rough and tumble lifestyle—without adding important weight or bulk to the merchandise.

Moreover, the following package and hardware that these devices utilize should be quick, reliable, long and correct enough for pet house owners to trace their lost companions inside a number of yards. once youuse high-quality wireless modules and good SIM cards that invariably connect with the most effective accessible network, therefore regardless of wherever your pet gets lost, you'll be able to get Associate in Nursing correct location. against this, following collars that use subpar parts might solely be ready to verify that a pet is somewhere within the neighbourhood, that doesn't provide the owner enough info to zero in on the animal's precise location. Additionally, a reliable pet following IoT device additionally must have enough battery life to face up to days, months or perhaps years of use. You'll got to make sure that your device's battery

doesn't die before the owner has the possibility to seek out a lost pet.

Wireless sensor belts

Tracking collars that think about slow networks or leverage weak GPS or GNSS signals are too inaccurate for patrons to use dependably. Most pets wander off comparatively on the point of their owners' homes, and intrinsically, if the signal has too abundant "wobble,"an owner won't be ready to pinpoint their pet's precise location. {this are often} exactly wherever good SIM technology can be helpful, because the device mechanically connects to the strongest accessible network, making certain that you simply in variably have stable association, no matter location.

Proposed System

Our project is automatic pet observance system victimisation net of things. the stress on selecting this because the title is as a result of, to ab initio provide resolution to a haul long-faced by virtually everybody. Human interference on the a part of taking care of pet after they area unit busy is tough. And thence our system are economical enough to beat the hurdles long-faced by human in taking care of pet. This Pet care System could be a complete instrumentality for observance all the pet activities and additionally by creating the pet be happy. What is more, the project is divided into many modules every of that has the IR distinctive feature. They're pet observance door and pet collar system.

Pet Collar

The pet collar system that is given a GPS tag for endlessly transmittal and characteristic the whereabouts of a pet. If a pet goes out somewhere for a extended time, we have a tendency to cannot go and search it everyplace. thus it endlessly monitors the pet location and updates the user each currently and so. This explicit half helps the owner to reinforce its security. The collar and door system area unit endlessly involved with each other for its safety.

Pet Door

IR device consist Associate in Nursing IR light-emitting diode and photodiode, during which IR light-emitting diode emits IR radiation and photodiode detects the radiation. Photodiode conducts current in reverse direction, whenever lightweight falls on that, and voltage across it changes, this voltage modification is perceived by voltage comparator (like LM358) and generates output consequently. During this IR based mostly security alarm circuit, we've got placed IR light-

emitting diode before of photodiode, in order that IR lightweight will directly falls on photodiode.

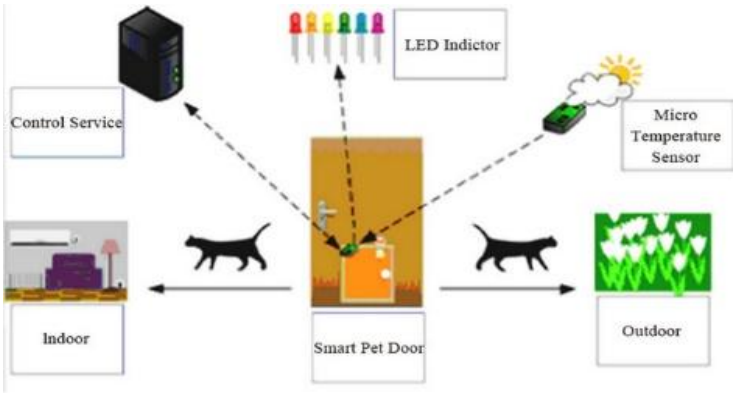
Whenever somebody moves through this beam, IR rays stops falling on photodiode and Buzzer beginbeeping. Buzzer mechanically stops when a while, as buzzer is connected to 555 timer in monostable mode. Here on implementing the system in giant scale a gear motor or a servo motor with an enclosed driver may also be enforced with constant principle to induce the required output.

Gear motor having Associate in Nursing revolutions per minute of 600 should be used and is connected to Arduino Uno that additionallygets connected to relay.

Construction

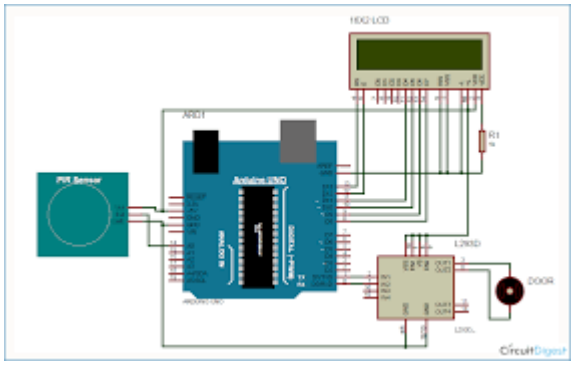
The hardware kit consists of Arduino Uno, Sensors, Wi-Fi module. the availability of +5V is given directly from the adapter to Arduino. Here Arduino acts as Microcontroller and additionally as a entree.

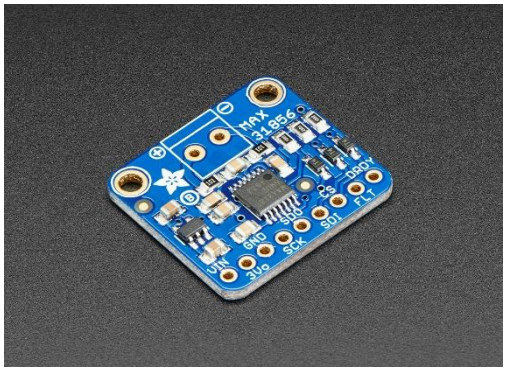
victimisation the idea of IoT Arduino sends each details to the cloud via Wi-Fi module. the info from the cloud is shipped to Mobile Phones and is machine-controlled by node MCU.



Working
Smart pet door

The pet door uses 2 IR sensors severally for the operate of detection if pet was within or outside and it perpetually sends notification to the connected WiFi module known as ESP8266. The controller used here is arduino ATMEGA328P that is employed as each as a controller and IoT entree. The mentioned half may also be upgraded with RFID tag in order that we have a tendency to might discover if the pet is ours or another. to reinforce the safety purpose several police work cameras can also be used. SIM900A module is employed as a GSM module so as to send texts to itinerant Associate in Nursing an golem application are often accustomed send details to the itinerant in order that it becomes a whole net coated pet system.





Circuit Diagram of Smart Pet Door

The on top of figure provides the Circuit association. It works underneath 5V power provide. A gear motor is connected at the output for the aim of gap and shutting of door.

GPS Tracker

A8 is that the product applies the latest technology in Taiwan and has following advantages: little size, long stand-by life, easy operation, stable functions and convenient installation. it's wide used for family monitoring; kids, the elder, and pets' care and therefore the trace for lost cars or alternative possessions.

Pet Collar

The pet collar system is unbroken on the pet's neck in order that it endlessly sense the pet and let understand if any changes occur in its regular activity. The pet is given with Associate in Nursing scientific discipline address that is mostly native and thence is employed to send info. SIM card like GSM module and thence be used.

Fitbit with Bluetooth Activity Tracker

The wearable fitness huntsman is either connected to Bluetooth or Bluetooth good (aka, 4.0) synchronize relying upon your IOS or golem device's capabilities. The thumb-sized device measures steps walked, strides ran, stairs climbed, distances coated, calories burned, and even quality of sleep. Uniquely, it additionally measures pulse readings once inserting a finger on the heart-rate device on the rear of the device. Associate in Nursing OLED show graces the front whereas a two-week battery that charges via small USB are often found among. though it is not pictured, the good Activity huntsman ships with a belt clip and arm band for optimum flexibility. The new scale syncs via Bluetooth, Bluetooth four.0, or Wi-Fi to golem or IOS devices.

HOW DOES MY FITBIT DEVICE COUNT STEPS?

Fitbit devices have a finely tuned algorithmic program for step investigating. The algorithmic program is intended to appear for motion patterns that area unit most indicative of pet walking. The algorithmic program determines by setting a

threshold. If the motion and its succeeding acceleration mensuration meet the edge, the motion are counted as a step. If the edge isn't met, the motion won't be counted as a step.

Other factors will produce enough acceleration to satisfy our threshold and cause some over investigating of steps. Our engineers have worked diligently on your tracker's algorithms to confirm that it doesn't acquire false steps

Your device might register movements or restlessness as steps once you are sporting it whereas you sleep. the amount of steps usually measured throughout these periods is stripped-down. Any steps taken to and from alternative rooms throughout the night also will be half-tracked. Equally, it's potential for the algorithmic program to undercount (not meet the specified acceleration threshold). Examples here embody walking on a awfully soft surface like an opulent carpet.

HOW WILL MY FITBIT DEVICE CALCULATE DISTANCE?

-Walking steps

-Running steps

Fitbit devices calculate distance by multiplying your walking steps by your walking stride length and multiplying your running steps by your running stride length.

Note that once you are following Associate in Nursing activity with GPS, Fitbit calculates your distance victimization GPS information instead of steps. If you start moving before you get a GPS signal, the huntsman can calculate distance victimization steps and stride length as delineated on top of till a GPS signal is found[6-12].

Discussion

In this work a unique indoor canine observance system supported WSN is bestowed. because of this method, areas of the house that the pet has visited throughout the day are often simply noted victimization any golem based mostly device, and what is more, it are often monitored if the pet has entered into taboo areas.

This section shows the output of all the system been connected to net via a web cloud portal that monitors the knowledge endlessly and gets updated each single second. the info area unit endlessly monitored and if any changes occur, the appliance that was primarily created with an area scientific discipline address and monitors and provides the knowledge.

Output to Mobile Phone

The graphical illustration of pet door with every spike indicating the pet is within or outside and if the pet was assumed to be within. The cloud gets enriched with all the knowledge by victimization code in Arduino Uno that is in embedded c. because the Wi-Fi module gets organized, the info area unit severally sent with some delay and any traffic or chaos are often aborted.

Table 1: **The comparison between our proposed smart pet door and the general product**

	Smart Pet Door	General Pet Door [15]
Cost	Higher	Lower
Power Supply	Higher	Lower
Pet Tag	Sensor Tag	Magnetic Tag
Active Schedule	Support	No
Remotely Control	Support	No
Position Indicator	Support	No
Environment Control	Support	No
Pet Identification	Support	No

Conclusion

In this work the viability of employing a WSN network for pet observance is studied. the most goal is that the analysis of the influence of wireless propagation limitations within the implementation of a selected pet observance system. The projected resolution are often scaled so as to produce interactive communication with totally different pets and in several sorts of eventualities, with low readying price.

References

1. Ahmed Mandy, Hassan Qazweeni, Mohammed Noureddine, Talal Al - Radhwan, Mohammed ElAbd (2016), 'Smart Pet House' IEEE.
2. Kim, S.H.; Kim, D.H.; Park, H.D. Animal situation tracking service using RFID, GPS, and sensors. In Proceedings of the Second International Conference on Computer and Network Technology, Bangkok, Thailand, 23–25 April 2010; pp. 153–156.
3. George Mois, Teodora Sanislav, and Silviu C. Olea, A Cyber - Physical System Environmental Monitoring' 2012;6(14):2189–2197.
4. Aguirre, E.; Arpón, J.; Azpilicueta, L.; de Miguel, S.; Ramos, V.; Falcone, F. Evaluation of electromagnetic dosimetry of wireless systems in complex indoor scenarios within body human interaction. Prog. Electromagn. Res. B 2013, *43*, 189–209.
5. M. Rohs and B. Gfeller, "Using Camera-Equipped Mobile Phones for Interacting with Real-World Object," Proceedings of Advances in Pervasive Computing, April 2004, pp. 265-271. http://catalog.hathitrust.org/Record/004761231
6. C. Sammarco and A. Lera, "Improving Service Management in the Internet of Things," Sensors, Vol. 12, No. 9, 2012, pp. 11888-11909. doi:10.3390/s120911888
7. Yongtae Park and Seungho Kuk, Inhye Kang,Member,Hyogon Kim (2016),'Overcoming IoT Language Barriers Using Smartphone SDRs', IEEE Transactions on Mobile Computing pp.15361233. 8
8. Sasloglou, K.; Glover, I.A.; Kae-Hsiang, K.; Andonovic, I. Wireless sensor network for animal monitoring using both antenna and base-station diversity. In Proceedings of the 11th IEEE Singapore International Conference on Communication Systems, Guangzhou, China, 19–21 November 2008; pp. 27–33.
9. Bozkurt, A.; Roberts, D.L.; Sherman, B.L.; Brugarolas, R.; Mealin, S.; Majikes, J.; Yang,

P.; Loftin, R. Toward Cyber-Enhanced Working Dogs for Search and Rescue. *IEEE Intell. Syst.* 2014, *29*, 32–39.

10. Thinagaran Perumal, A R Ramli, Chui Yew Leong,'Interoperability Framework For Smart Home Systems" IEEE 2014;2(2):659-663.

11. Kumar, A.; Hancke, G.P. A Zigbee-Based Animal Health Monitoring System. *IEEE Sens. J.* 2015;15:610–616.

12. Dr.H. Shaheen, "Web Innovation with IOT in Social Environment for Sharing Efficient Information ", "International Journal of Mechanical and Production Engineering Research and Development (IJMPERD)", Vol. 8, Special Issue 6, Aug 2018, 717-729.