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Automatic Pet Monitoring and Feeding System Using IoT

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Abstract : Pets need special treatment and special care. Due to nowadays busy life style, this task is not as simple as it used to be. The goal of this work is to introduce, design and implement a *smart pet system*. The interaction between human and physical devices and devices in the real world is gaining more attention, and re-quires a natural and intuitive methodology to employ. According to this idea and living well, life has been a growing demand. Thus, how to raise pets in an easy way has been the main issue recently. This study examines the ability of computation, communication, and control technologies to improve human interaction with pets by the technology of the *Internet of Things*. This work addresses the improvement through the pet application of the ability of location-awareness, and to help pet owners raise their pet on the activity and eating control easily. Our study not only presents the key improvement of the pet monitor system involved in the ideas of the Internet of Things, but also meets the demands of pet owners, who are out for works without any trouble. The objective is to allow pet owners to automate simple things, like monitoring, and feeding controls. Implementing smart pet houses will assure pets owners an increased comfort and peace of mind especially when pets are unattended.

Keywords : Internet of Things, Pet feeder, Smart pet system.

Introduction

Our project is automatic pet monitoring and feeding system using Internet of Things. The emphasis on choosing this as the title is because, to initially give solution to a problem faced by almost everyone. Human interference on the part of taking care of pet when they are busy is difficult. And hence our system will be efficient enough to overcome the hurdles faced by human in taking care of pet. This Pet care System is a complete equipment for monitoring all the pet activities and also by making the pet feel free. Furthermore, the project is subdivided into several modules each of which has the IR unique feature. They are pet monitoring door, pet food feeder and pet collar system.

A)Pet Door

IR sensor consist an IR LED and photodiode, in which IR LED emits IR radiation and photodiode detects the radiation. Photodiode conducts current in reverse direction, whenever light falls on it, and voltage across it changes, this voltage change is sensed by voltage comparator (like LM358) and generates output accordingly. In this IR based security alarm circuit, we have placed IR LED in front of photodiode, so that IR light can directly falls on photodiode. Whenever someone moves through this beam, IR rays stops falling on photodiode and Buzzer start beeping. Buzzer automatically stops after some time, as buzzer is connected to 555 timer in monostable mode. Here on implementing the system in large scale a gear motor or a servo

motor with an internal driver can also be implemented with the same principle to get the desired output . Gear motor having an rpm of 600 must be used and is connected to Arduino Uno which also gets connected to relay.

B)Pet Food Feeder

These feeders must be disassembled for cleaning and then reassembled before further use. The pet feeder produced by the trading company has the general appearance of a conventional feeder, but has a moat-forming cavity surrounding the food bowl. This pet feeder can keep the pet food and water clean until the pet is ready to eat. This pet feeder also has a bowl cover that opens and closes automatically. The bowl cover is actuated by an infrared proximity sensor and battery-operated electric motor. The sensor detects the presence of the pet and then opens the cover, enabling only the pet to have access to the food. When the pet is out of sensor range, the bowl cover closes automatically. This keeps dust, flies, and bugs from reaching the food and keeps the food fresh. The pet feeder system consists of on control server, one smart pet feeder, and the tag on collars.

C)Pet Collar

The pet collar system which is provided with a GPS tag for continuously transmitting and identifying the whereabouts of a pet. If a pet goes out somewhere for a longer time, we cannot go and search it everywhere. Therefore it continuously monitors the pet location and updates the user every now and then. This particular part helps the owner to enhance its security. The collar and door system are continuously in contact with one another for its safety

Concept

Monitoring pets is an area of concern to the mankind. This project presents the design and implementation of Automatic Pet Monitoring and Feeding System. Unfortunately, the current technology does not offer the purpose with utmost security and indulge more delays.

Block Diagram

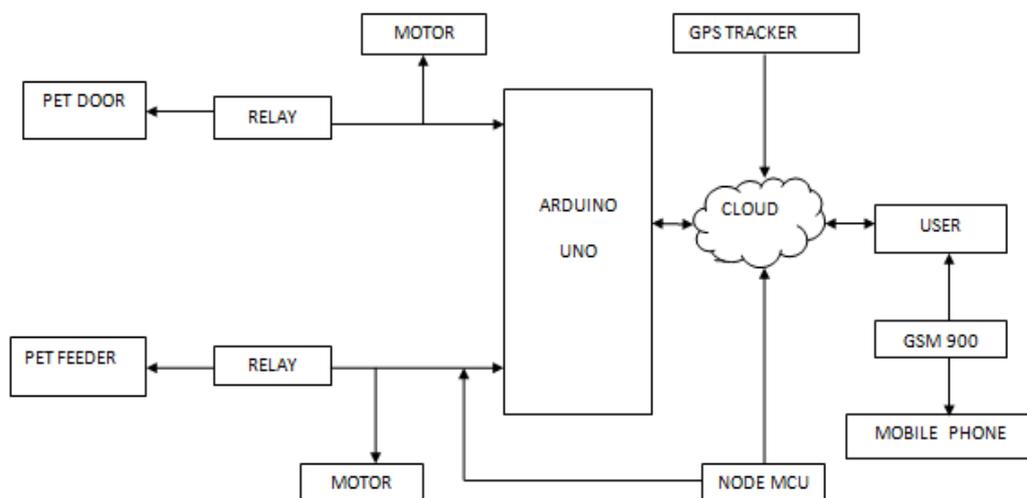


Fig: 1 Block Representation of Automatic Pet Monitoring and Feeding System

Construction

The hardware kit consists of Arduino Uno, Sensors, Wi-Fi module. The supply of +5V is given directly from the adapter to Arduino. Here Arduino acts as Microcontroller and also as a gateway. Using the concept of IoT Arduino sends every details to the cloud via Wi-Fi module. The data from the cloud is sent to Mobile Phones and is automated by the NodeMCU.

Working

A) Smart pet door

The pet door uses two IR sensors respectively for the function of detecting if pet was inside or outside and it constantly sends notification to the connected wifi module called ESP8266. The controller used here is arduino ATMEGA328P which is used as both as a controller and IoT Gateway. The mentioned part can also be upgraded with RFID tag so that we may detect if the pet is ours or some other. To enhance the security purpose many surveillance cameras may also be used. SIM900A module is used as a GSM module in order to send texts to mobile phone and an android application can be used to send details to the mobile phone so that it becomes a complete internet covered pet system.

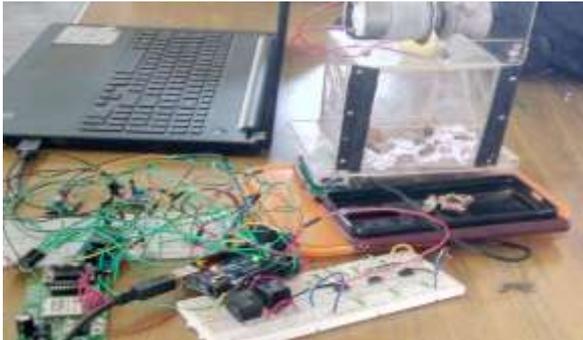


Fig:2 Circuit Diagram of Smart Pet Door

Fig 2 gives the Circuit Connection. It works under 5V power supply. A gear motor is connected at the output for the purpose of opening and closing of door.

B) Smart pet food feeder

Pet food feeder module uses specialized 6kg load cell which is to be configured for the required amount of time. The sensitivity of this load cell is not very accurate so very minute variations have also be taken into account. Here we use Hx711 24-bit analog precision controlling adc in order convert the milli voltage value of load to voltage value and so a multimeter can be used at the ends to check if there is any voltage variation and hence is sent to arduino to control the motor. Here again language used is embedded C in arduino uno. The sensitivity of load cell is 0.02.

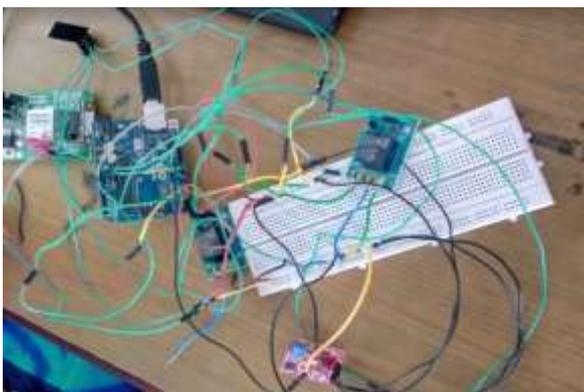


Fig:3 Circuit Diagram of Smart Pet Feeder

B) 1) Load cell

The Load Cell Amplifier is a small breakout board for the HX711 IC that allows you to easily read load cells to measure weight. By connecting the amplifier to your microcontroller you will be able to read the changes in the resistance of the load cell and with some calibration you'll be able to get very accurate weight

measurements. This can be handy for creating your own industrial scale, process control, or simple presence detection. The HX711 uses a two wire interface (Clock and Data) for communication. Any microcontroller's GPIO pins should work and numerous libraries have been written making. Load cells use a four wire Wheatstone bridge to connect to the HX711. These are commonly coloured Red, Black, White, Green. Each colour corresponds to the conventional colour coding of load cells:

- Red (Excitation+ or VCC)
- Black (Excitation- or GND)
- White (Amplifier+, Signal+, or Output+)
- Green (A-, S-, or O-)

Features:

The features of load cell includes the following,

- Operation Voltage: 2.7V-5V
- Operation Current: < 1.5mA
- Selectable 10SPS or 80SPS output data rate
- Simultaneous 50 and 60Hz supply rejection

C)GPS Tracker

A8 is the product applies the newest technology in Taiwan and has following advantages: small size, long stand-by life, simple operation, stable functions and convenient installation. It is widely used for household monitoring; children, the elder, and pets' care and the trace for lost cars or other possessions.



Fig:4 GPS tracker for pet

The pet collar system is kept on the pet's neck so that it continuously sense the pet and let know if any changes occur in its regular activity. The pet is given with an IP address which is generally local and hence is used to send information. SIM card like GSM module and hence be used.

Results and Discussion

This section shows the output of all the system been connected to internet via an online cloud portal called as ThingSpeak which monitors the information continuously and gets updated every single second. The data are continuously monitored and if any changes occur, the application which was basically created with a local IP address and monitors and gives the information. Here in this case Arduino is used as a gateway. An additional application gets installed in android host and hence is configured.

A) Thing Speak Output

The Figure 5 shows the data change as everytime the parameter gets measured by the microcontroller. The data gets uploaded in the cloud portal using ESP8266 module.

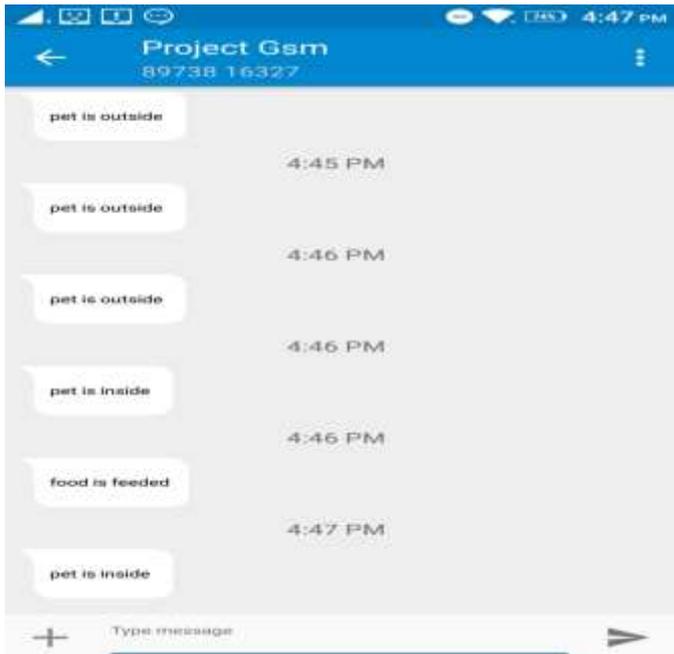


Fig:5 Cloud Output from ThingSpeak

B) Output to Mobile Phone

The graphical representation of pet door and feeder with each spike indicating the pet is inside or outside and if the pet was assumed to be inside, if pet has had its food or not and the information is feeder to the mobile phone. The cloud gets enriched with all the information by using code in Arduino Uno which is in embedded c. As the Wi-Fi module gets configured, the data are independently sent with some delay and any traffic or chaos can be aborted.

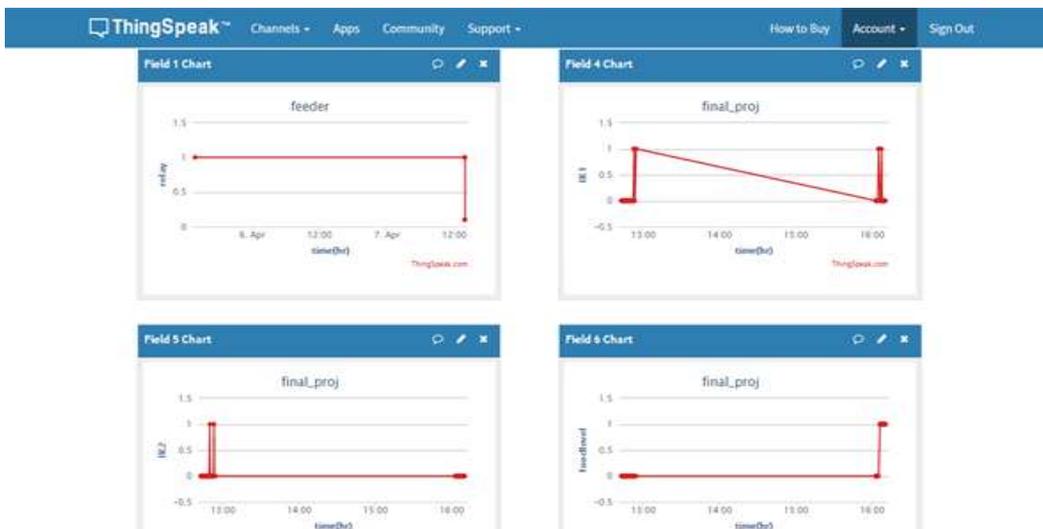


Fig:6 Cloud Output to Mobile Phone

Conclusion and Future Scope

IoT is a platform which can embed both software and hardware. It is obvious from that IoT is an efficient way to access data. As suggested, SOAP based mechanism with web services is an ideal choice for managing diversified devices and appliances in home environment. Various sensors are used to monitor various activities of the pet say, an IR sensor is used to monitor if food is available in plate or not. An RFID tag which

is used in pet collar enables the pet to transmit its identity. Arduino acts as a gateway to send the information collected to the cloud storage, where the data can be retrieved and accessed using mobile number or any other electronic gadgets. The whole network is wireless and hence loss of can't be achieved. To realise, two smartphone based SDR prototype, it involves IEEE 802.15.4 and IEEE 802.11. For 802.11p, the minimum required sampling rate is 10MS/s, thus we use PBSC and QPSK each is 4bytes. The work can further be improved by adding RTC to the feeder.

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