VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY

VESIT Renaissance Cell

Project Report
On

IoT Belt

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Abstract :-

Concerned pet owners are increasingly looking for an easy to use and accessible solution to monitor their pets which has subsequently caught the attention of the pet care field. The interaction between human and physical devices in the real world is gaining more attention and requires a natural and intuitive methodology to employ. The basic vision behind the Internet of Things is to have a new method of operation. The IoT belt not only presents the key improvement of the pet care system involved with the new method of the Internet of Things, but also meets the needs of owners, who are out for work without any trouble.

Introduction :-

Estimates suggest that as many as 59 percent of dogs and 52 percent of cats worldwide are overweight. Since a lot of owners work in offices or at remote locations, the pet's exercise needs are ignored which creates the need to monitor the food habits of the pet according to its activity throughout the day.
According to the findings of a national survey, 15% of pet guardians reported a lost dog or cat in the past 5 years. Hence, a GPS tracking system is required to locate and assess the proximity of the pet wrt to its home.
Hence, the IoT belt will be provided with features that will help with monitoring –
A. Location
B. Temperature
C. Heart rate
D. Activity

Problem Statement :-

The livestock and domestic needs of humans depend on animals. There are an increasing number of issues regarding various animal health conditions and movements. So to overcome this we are going to design and implement an IoT belt for monitoring and tracking the activity, health, location, and other parameters of pets.

Literature Review :-

1] Reinforced Pet Healthcare Monitoring System using RSSI Technology and IoT :-

This paper proposes the methodology using wireless sensors based PMHS (Pet Health Monitoring System) to detect the health status of the animals, which prevents widespread diseases and also helps in early diagnosis of diseases. In this PHMS, the parameters affecting animal health such as heart rate ,pulse rate ,respiratory ,temperature and stress level are monitored using sensors .For the implementation of the sensor module we used an RSSI device and Raspberry pi microcontroller .

2] Integrated Animal Health Care Using Iot :-

In this paper the author has the sensor data that is transmitted from a LoRa Node to a LoRa Gateway and eventually passed to a Node-Red cloud server for storing. The data from the server is then passed to an IoT dashboard for viewing as well as to a mobile application. This research has attained social sustainability as there is environmental health monitoring of factors such as humidity, temperature as well monitoring of the quality of air produced.

3] Movement Monitoring of Pet Animal Using Internet of Things :-

In the proposed system four main applications have been installed: location tracking, health monitoring, habitual movement monitoring and sending data on cloud. GPS is used for getting animal coordinates. In health monitoring unit temperature sensors are used for measuring the temperature of animals. Generally, each animal has a particular variety of body temperature. If the animal has any wounds or fever, the temperature can be mechanically multiplied.

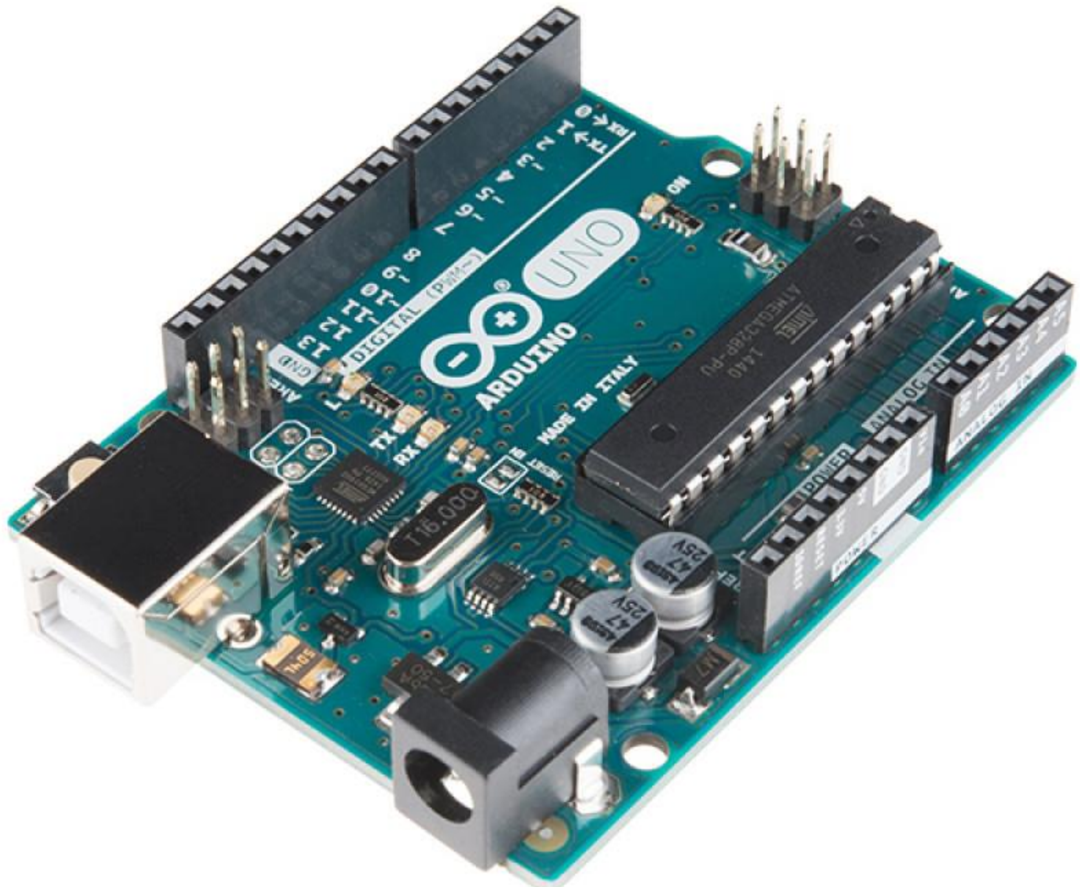
4] The Study and Application of the IoT in Pet Systems :-

In this the author's studies 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 the pet owners raise their pet on the activity and eating control easily.

Technology Used :-

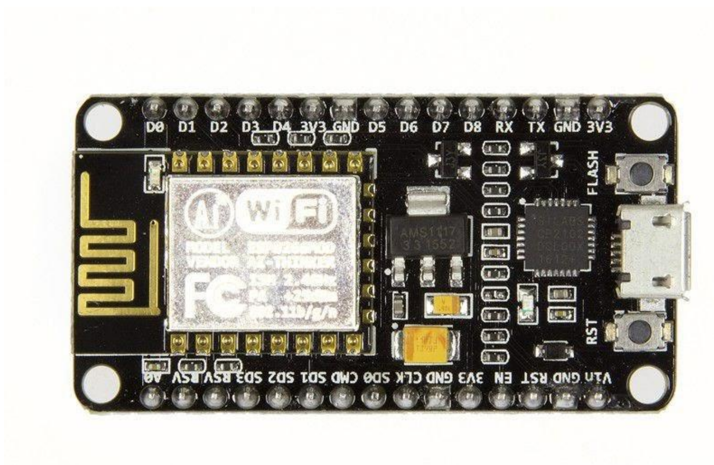
1] *Components :-*

- *Arduino Uno R3 Development Board*



1. Microcontroller : ATmega 238P
2. Operating Voltage : 5V
3. Input Voltage : 7-12 V
4. Digital I/O pins : 14
5. DC current : 40 mA
6. Flash memory : 32 KB
7. SRAM : 2 KB
8. EEPROM : 1 KB

❖ *NodeMcu ESP8266 V3 Lua CH340 Wifi Dev. Board :-*



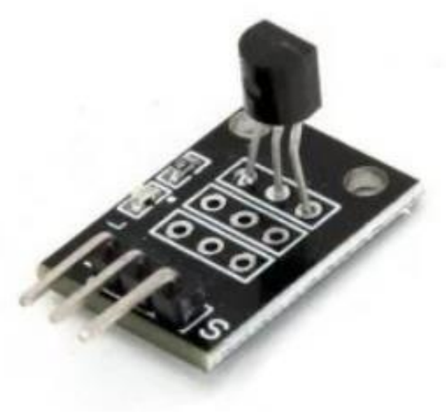
1. Power input: 4.5V ~ 9V (10VMAX), USB-powered
2. Transfer rate: 110-460800bps
3. Support UART / GPIO data communication interface
4. Support Smart Link Smart Networking
5. Working temperature: -40°C ~ + 125°C
6. Drive Type: Dual high-power H-bridge
7. Don't need to download resetting
8. A great set of tools to develop ESP8266
9. Flash size: 4MByte
10. Lowest cost WI-FI

❖ *MAX30100 Pulse Oximeter Heart Rate Sensor Module :-*

1. Optical sensor: IR and red LED combined with a photodetector
2. Measures absorbance of pulsing blood
3. I2C interface plus INT pin

4. 3.3V power supply complete pulse oximeter and heart rate sensor solution, simplifies design, integrated LEDs, photo sensor, and
5. high-performance analog front
6. Ultra low power operation increases battery life for wearable devices

❖ *DS18B20 Temperature Sensor Module*



1. Digital signal output
2. 18B20 Temperature Sensor Chip
3. Resolution adjustment ranges from 9-12 bytes.
4. Send data via a pin
5. Temperature measurement ranges: -55°C to +125°C, be accurate to 0.5°C

❖ *NEO-6M GPS Module with EPROM*

1. 5Hz position update rate.
2. The cold start time of 38 s and Hot start time of 1 s.
3. Configurable from 4800 Baud to 115200 Baud rates. (default 9600).
4. SuperSense ® Indoor GPS: -162 dBm tracking sensitivity.

5. Support SBAS (WAAS, EGNOS, MSAS, GAGAN). 6. Separated 18 x 18mm GPS antenna.

❖ *PIR Motion Detector Sensor module HC-SR501*

1. Working voltage range : DC 4.5 – 20V
2. Current drain : <60uA
3. Detection range : <140
4. Voltage Output : High/Low level signal : 3.3V TTL output
5. Detection range : 3 to 7 m
6. Work temperature : -20 to 80 degree C

❖ *Infrared Obstacle Avoidance IR sensor Module*

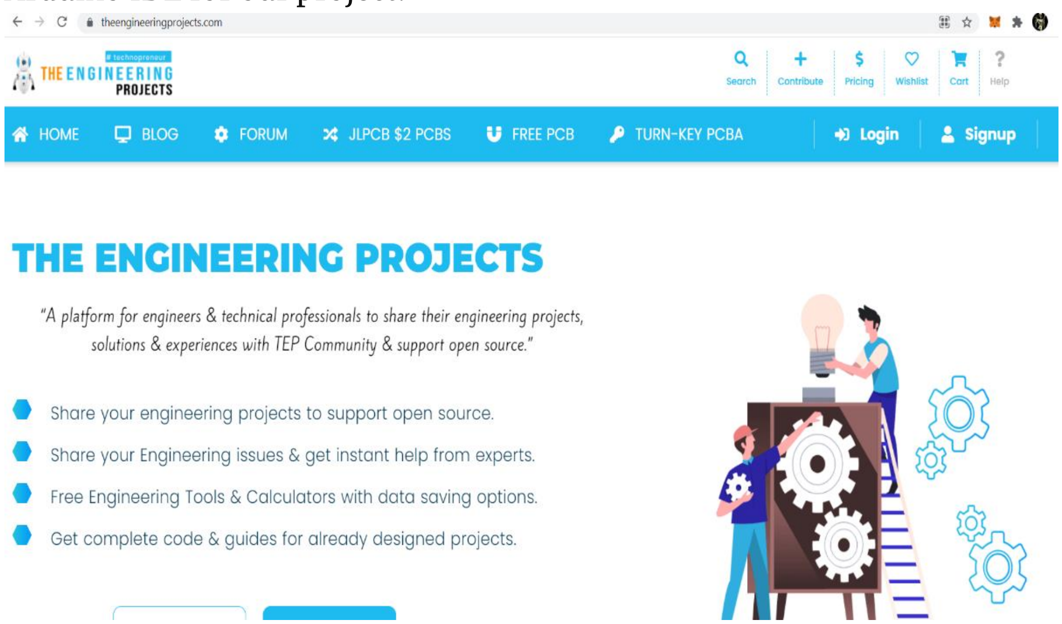
1. Working voltage range : DC 4.5 – 20V
2. Current drain : <60uA
3. Detection range : <140
4. Voltage Output : High/Low level signal : 3.3V TTL output
5. Detection range : 3 to 7 m
6. Work temperature : -20 to 80 degree C

- *Cloud server/online database for storing sensor data – Firebase*

- *App development using Blynk App*

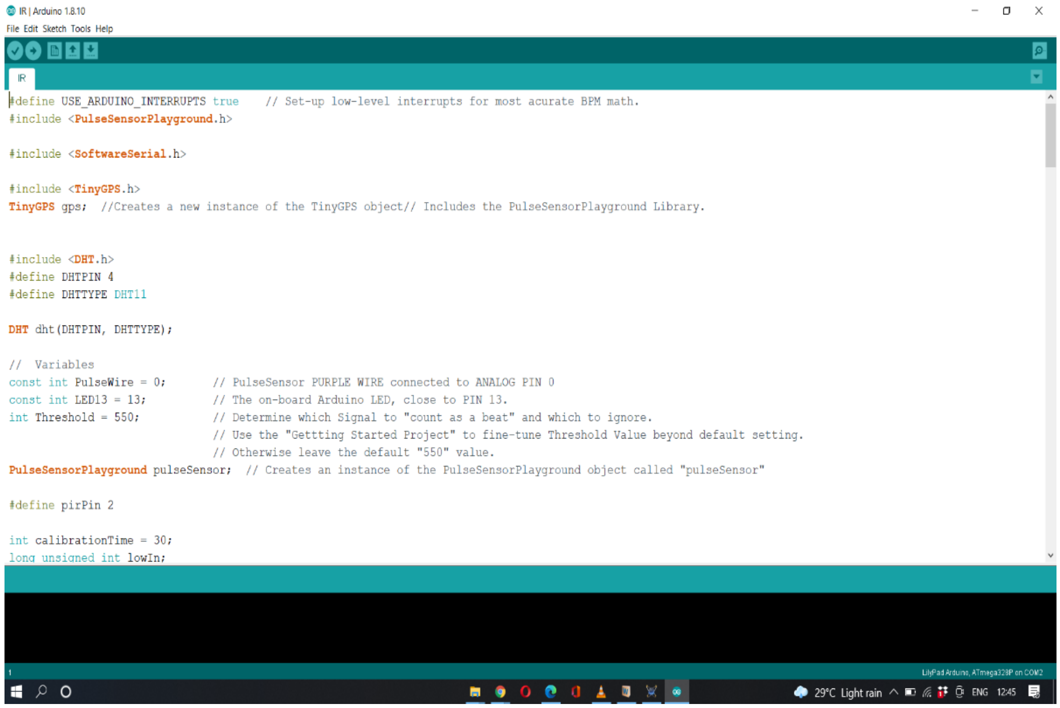
Methodology :-

1. For the simulation, we chose the Proteus Software pertaining to the components libraries and that bore a similarity with those present in the Arduino IDE. Also, most of the components (boards and sensors) required for our project were available within proteus.
2. https://www.theengineeringprojects.com/ was our go to resource in acquiring all the apt libraries which also bode well with those in the Arduino IDE for our project.



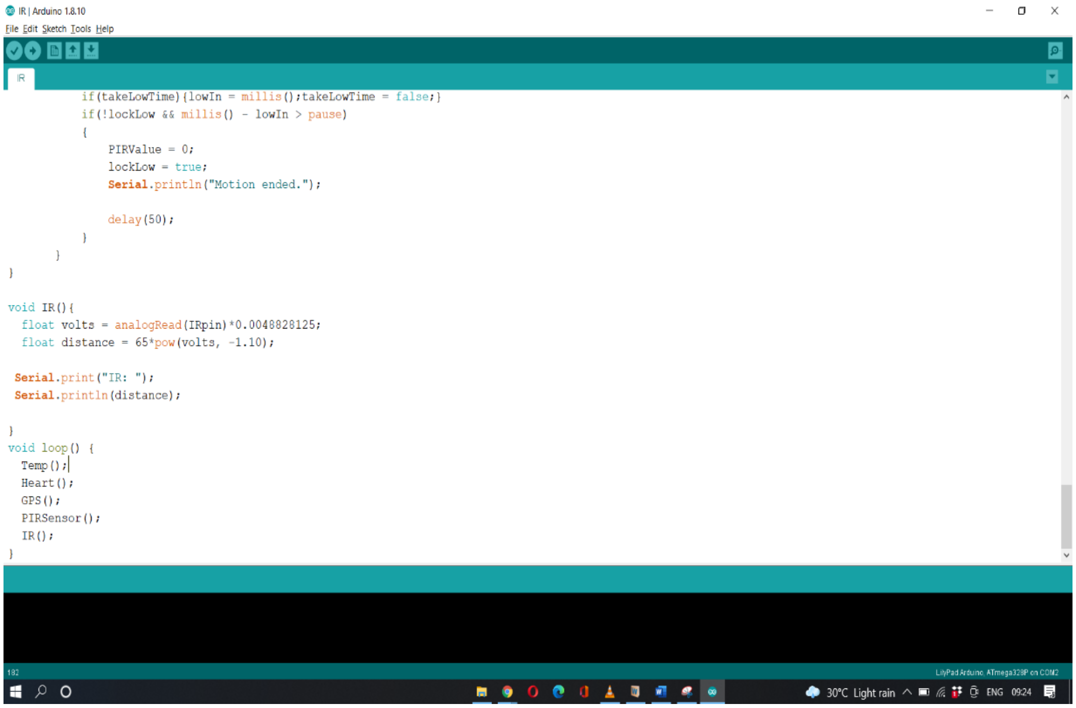
3. In the Arduino code, there are 2 main functions; setup() and loop() respectively.
4. Before setting up the serial communication baud rate and the pin modes, we declare all the required variable for each sensor and include all the libraries for the same.
5. For example, #include <PulseSensorPlayground.h> is the library for the heart rate sensor, #include<TinyGPS.h> is the library for the GPS

module and so on.



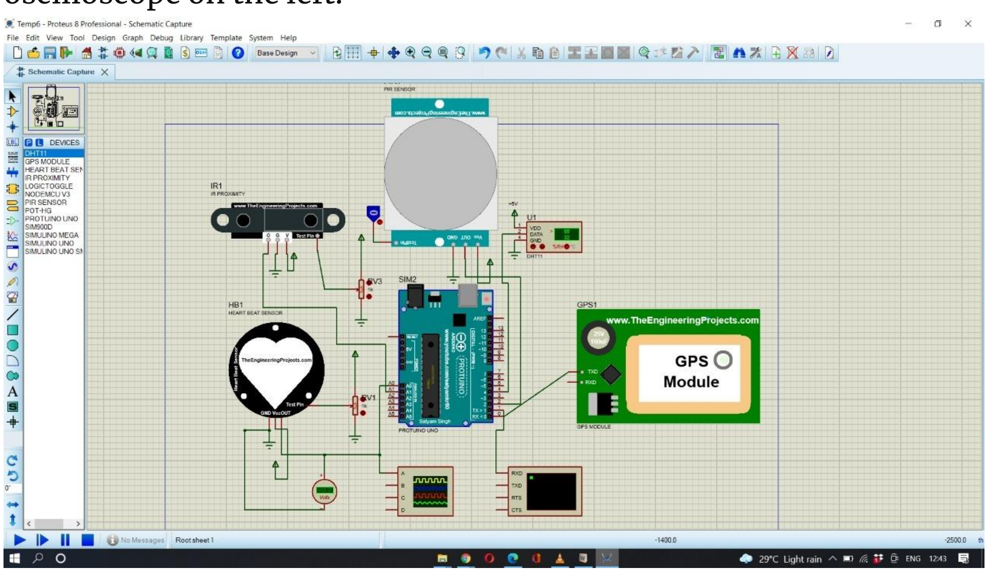
6. Each sensor is ascribed an individual function which digests all the raw data and presents the final values after performing some mathematical calculations.
7. Finally, these functions are called in the concluding loop() function which keeps processing the data until the Arduino is turned OFF.
8. The option to generate hex file on simulation is checked so that the generated file can be upload to the Arduino in Proteus catering to the

fact that it can only process hexadecimal values.

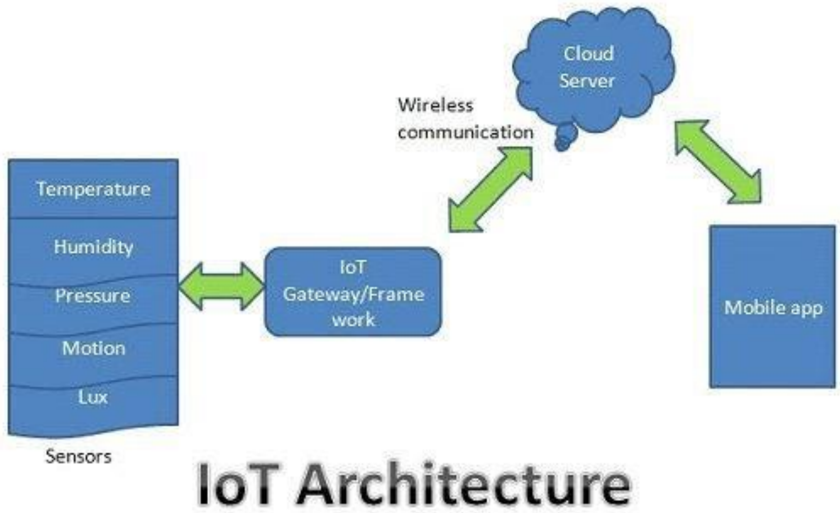


```
          if(takeLowTime){lowIn = millis();takeLowTime = false;}
          if(!lockLow && millis() - lowIn > pause)
          {
              PIRValue = 0;
              lockLow = true;
              Serial.println("Motion ended.");

              delay(50);
          }
      }
}

void IR(){
  float volts = analogRead(IRpin)*0.0048828125;
  float distance = 65*pow(volts, -1.10);

 Serial.print("IR: ");
 Serial.println(distance);

}
void loop() {
  Temp();
  Heart();
  GPS();
  PIRSensor();
  IR();
}
```

9. All the sensors are connected to Arduino development board according to the figure given below.
10. In the simulation, the values will be represented on a virtual terminal whose Rx terminal is tied with the Tx of the Arduino.
11. The use of logic gates and potentiometers is to toggle the logic of the sensor dynamically to see changes in the sensor values on the terminal.
12. The peaks in the heart rate values are shown by the digital oscilloscope on the left.

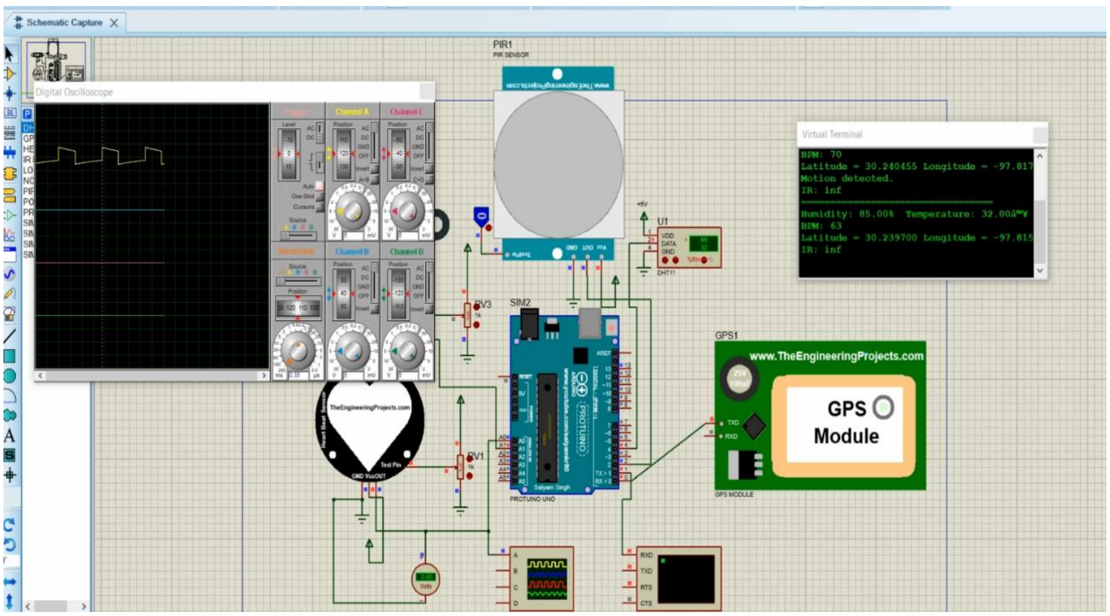


13. The simulation's results can also be displayed on an app for a user to actually interact with. This is made possible with a virtual communication device which is superceded in the place of the virtual terminal.
14. The data is transferred to a cloud (Blynk's inbuilt cloud functionality) and then presented on the mobile application.
15. The standard IoT architecture is being followed according to layout below.

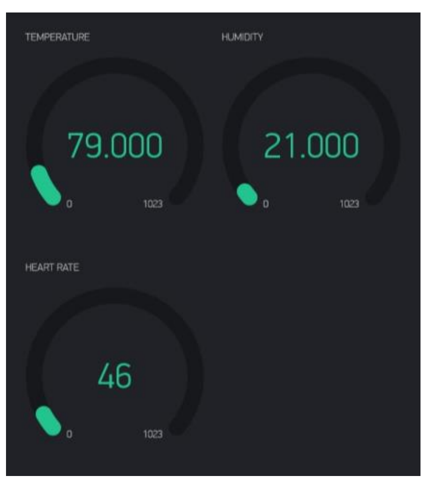


Result Analysis :-

After implementation of the model, it is the time to see the result analysis of the system. The system will be mounted on a Velcro belt so that it will be comfortable enough for the pet to wear and sturdy enough to stay mounted for long.



In the above image you can see the connection and the system design of our model. The Arduino relates to different sensors so that the data is collected and sent to the cloud.



From the above system you can see that the result uploaded in the cloud will be displayed by the mobile application so that if you are away from your pet you don't have to worry about them and can keep track of their status.

Conclusion :-

With this product, the owner will be able to track several facets of their pet's activities like -
1. Heart rate
2. Temperature
3. Location
4. Activity

References :-

1]https://ijisrt.com/wp-content/up loads/2018/04/Reinforced-Pet-Healthcare-monitoring-System-Using-RSSI-Technology-and-IOT.pdf

2]https://www.researchgate.net/publication/339488120_Integrated_Animal_Health_Care_Using_Iot

3] https://www.irjet.net/archives/V5/i5/IRJET-V5I5638.pdf

4] https://www.scirp.org/journal/paperinformation.aspx?paperid=27420