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Outdoor Pet Tracking and Health Monitoring System

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Abstract: This study focused on pet tracking and health monitoring systems using Blynk cloud technologies. Today, Internet of Things (IoT) applications are prevalent. However, the chances of finding out about pets are low. This work aims to develop a tracking and health monitoring system incorporating Internet of Things (IoT) technology. Furthermore, this framework uses the Blynk application to connect to the system for data exchange and the global positioning system (GPS) to monitor the precision of the location. The suggested approach can determine the system's operability under various weather circumstances. According to the proposed method, the mean accuracy is 79.08% respectively. This project's objective of developing an outside pet tracking and health monitoring system and determining its functionality has been achieved. In the future, the researchers may utilize a precise temperature sensor and monitoring capabilities for pet health components such as heart rate and recognition behavior.

Keywords: Pet, Monitoring, Tracking, Technology

1. Introduction

In recent years, pet ownership has been pushed to enhance mental health. In general, it was apparent that pets improve people's lives, regardless of the circumstances. [1] A pet tracker and health monitoring system are crucial for allowing pet owners to monitor their pets and determine their location and state of health through smartphones. These days, the number of missing pets is gradually increasing. However, the chances of finding out about pets are low.

In addition, numerous tracking devices, such as the IoT belt concept [2] and the left leg-and-neck-connected bracelet [3], have been developed based on researchers' results. Consequently, this project proposes to develop a mobile cloud-based monitoring application that would enable pet owners to track the whereabouts and health of their animals. It consists of input, processing, and output components. Additionally, it employs sensors that may give data and transfer it to the processor, such as the ESP32 microcontroller as the processor, the Neo-6M GPS for the position, the MPU6050 for step activity monitoring, and the DHT11 for temperature. The result would be shown in the Blynk application, indicating that Blynk is the platform for exchanging data over Internet networks. Following that, its cloud-based system becomes more efficient and convenient for monitoring pets.

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The system was connected to the GPS, which uses a network of 24 satellites in orbit to determine the location of an object on the earth. GPS enables us to provide accurate data on movement and position [4]. In addition, a temperature sensor in the body is a crucial indicator of physiological processes. The monitoring of body temperature gives insight into health issues. Since the health supervision and treatments of the pet are critical to ensure their well-being [5]. Then, the step activity is a fundamental movement that is one of the primary metrics for measuring daily exercise and is significantly associated with health variables. The accelerometer sensor is utilized to track the animal's motion [6]. Besides, it allows the users to determine the pet's energy level based on its average number of steps [7].

Finally, this application helps raise awareness in society. Undoubtedly, the most significant issue as users has fewer options for choosing the most efficient and reliable methods. The current problem in Malaysia is the need for appropriate and practical strategies. Further, it is a more dependable and efficient system.

2. Materials and Methods

The phases included in this study are the input sensor, the processor, the cloud-based, and the performance evaluation. Neo-6m GPS, MPU6050, and DHT-11 are the input sensors powered by the power source. The processor stages are comprised of ESP32 microcontrollers, which may communicate sensor data to the cloud system, which consists of the Blynk program and the Arduino IDE. The cloud-based phases display the collection of data. This controller would process all the data and send it to the Blynk application as an output. Figure1 shows the block diagram for a proposed system.

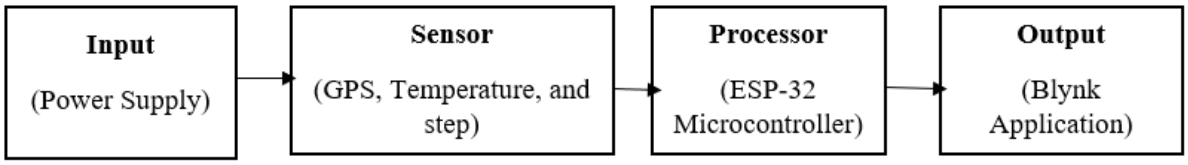

Figure 1: The Block diagram for proposed system

2.1 Hardware Design

This study aims to evaluate the performance of design monitoring systems using the software. The effectiveness of the implementation of this device was analyzed and proven using the Arduino IDE software and Blynk. The system receives the input and then transmits the data to the main processing unit. The obtained data is subsequently analyzed by the ESP32 and displayed on the cloud platform. The Arduino IDE software is widely used in IoT applications. The applications were generally user-friendly, comprehensive, and open-source software. The researchers then display the data using the Blynk program. Data may be monitored using both desktop and mobile apps.

Hence, the design approach for an outdoor pet tracking and health monitoring system includes components such as ESP32 microcontroller, MPU6050, Neo-6M GPS, and DHT11. However, the process of developing measured factors were included in the design of this model to attain functionality and dependability. Therefore, it is essential for checking the continuity in the sensor for identifying defective components at an early stage. Although, it also assists in evaluating the soldering quality.

In general, the MPU6050 sensor for step tracking was to determine whether a pet is active based on the number of steps it takes. Then, the GPS would provide the accurate latitude and longitude of the location. The temperature sensor would read the data once it was sensing the temperature.

2.2 Software Design

The software is a vital component of the programming created by to develop the project. In this study was utilizing an Arduino IDE and Blynk application to implementing the hardware. Furthermore, the Arduino IDE is widely used in IoT applications. In fact, it was a user-friendly and open-source

software. Thus, it simpler to create and submit the code to the device. Besides, it is establishing a connection with hardware to upload and interact with programs.

Next, a Blynk application is an IoT platform for iOS and Android devices that enables internet-based control [8]. The Blynk program can display all the device's input parameters. When a microcontroller is connected to a power source and Wi-Fi, it immediately links to the Blynk. Although it would display on the serial monitor of the Arduino IDE and the Blynk application.

2.3 Integration software and hardware

Figure 2 illustrates the development of process system for outdoor pet tracking and health monitoring system. A pet tracking would merge software and hardware into an effective device. Initially, need to design coding using Arduino IDE. Then, setup for detect the locations, temperature, and step tracking activity. Thus, the hardware part needs to check the functionality such as checking the continuity of each component.

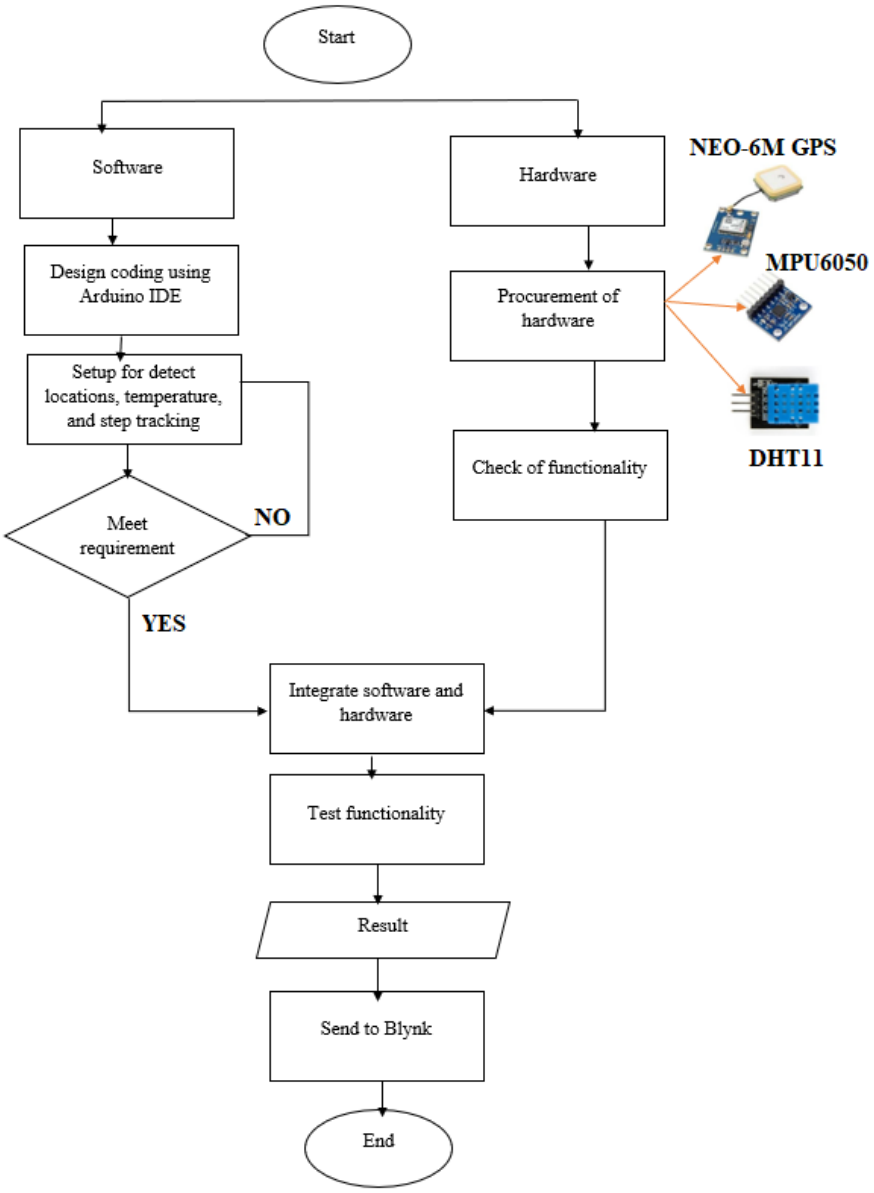

Figure 2: The process of development

Furthermore, integrate the software and hardware. And then the process flow consists of many

phases, including connecting to Wi-Fi on Blynk and the ESP32 microcontroller. Once the system connects to Wi-Fi following the activation of the device, the sensors begin working. Consequently, it would continue to read the value and show the data on the serial monitor in the Arduino IDE and the Blynk application on the web and smartphone.

In short, the design the outdoor pet tracking and health monitoring system according to the desired criteria, such as GPS position, temperature, humidity, and step tracking. The obtained data was then uploaded to a cloud-based platform, where it was instantly stored and evaluated. Afterwards, the data were examined using a website and application that leveraged a platform for data display.

3. Results and Discussion

The data obtained by the outdoor pet tracking and health monitoring system is gathered under two conditions: sunny and rainy days. The information would be tabulated in Excel and interpreted using a graph plot.

Table 1 illustrates the data collection on a sunny day using a laptop and a power bank as power sources. In this experiment, the distance travelled, the temperature and humidity, the step rate, and the latitude and longitude coordinates are measured. However, longitude and latitude locations vary with distance. Then, the step depends on the animal's movement. Afterwards, Figure 3 shows the relationship between the distance and the measured value of temperature and the actual temperature of the pets.

Table 1: Data collection on a sunny day

Type of power supply	Distance (Meter)	Temperature	Humidity	Step	Latitude	Longitude
Laptop	1	34	80	9	3.255846	101.311966
	3	34	61	9	3.255855	101.311996
	5	34	62	9	3.255835	101.311806
	8	34	65	9	3.255779	101.311714
Power bank	1	34	64	32	3.255824	101.312073
	3	34	65	35	3.255900	101.311974
	5	34	67	35	3.255867	101.312042
	8	35	66	36	3.255874	101.312042

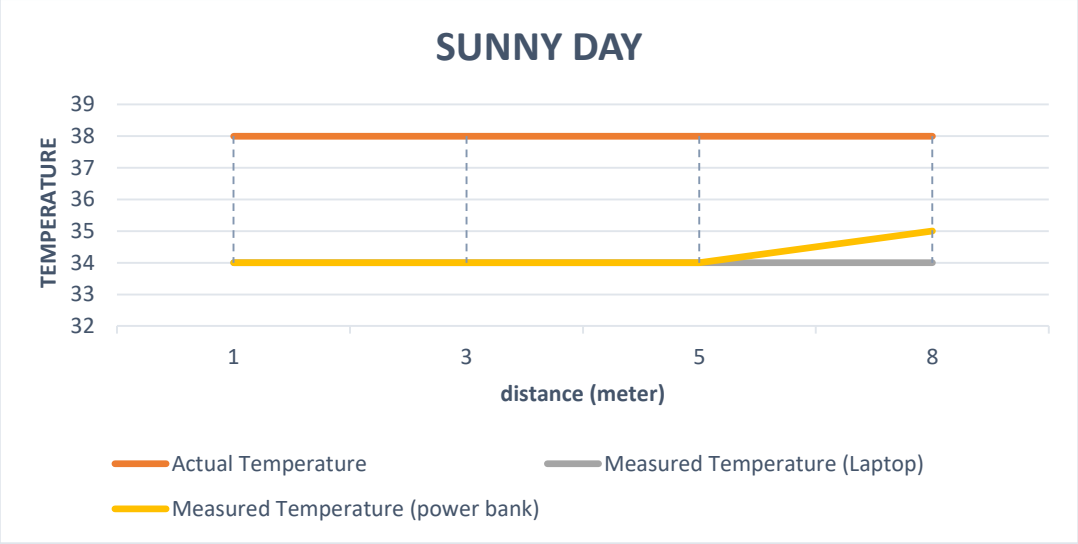

Figure 3: The value of distance and temperature on a bright day

Table 2 depicts data collection on a rainy day using two different power supplies: a laptop and a power bank. However, during rainy days the value of humidity is higher it is because of the process of evaporation. In comparison to cold air, warm air contains more water vapor. Moreover, Figure 4 depicts the relationship between distance travelled and temperature on a rainy day. The laptop and external power bank had an average temperature of 28 degrees Celsius, whereas the actual temperature was 38 degrees Celsius.

Table 2: Data collection on a rainy day

Type of power supply	Distance (Meter)	Temperature	Humidity	Step	Latitude	Longitude
Laptop	1	28	69	10	3.128072	101.473518
	3	28	69	10	3.128072	101.473518
	5	28	69	21	3.128072	101.473518
	8	28	69	21	3.128072	101.473518
Power bank	1	28	70	0	3.128074	101.473518
	3	28	70	2	3.128074	101.311974
	5	28	72	4	3.128086	101.473518
	8	28	73	15	3.128086	101.473518

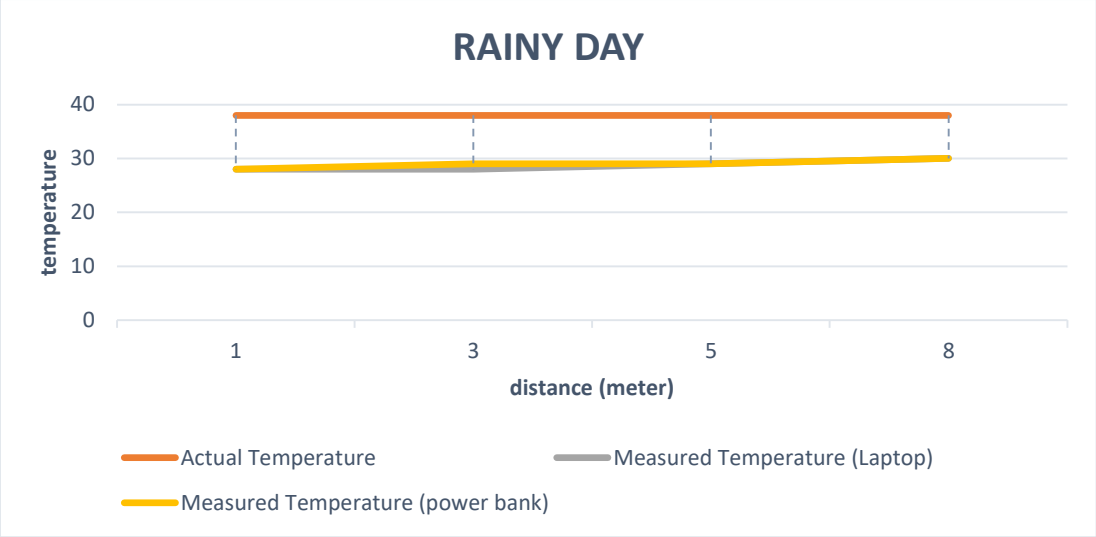

Figure 4: The value of distance and temperature on a rainy day

The calculation of the mean reading device is shown in Table 3. This computation illustrates the discrepancy between the actual and measured values. The error rate on a sunny day is 10.52 percent. Meanwhile, the error probability on a rainy day is 26.32%. It indicates that the temperature reading from the DHT11 sensor is not precise, and the error value is greater.

Table 3: Calculation of the Mean Reading Device

Weather	Temperature		% Of Error	% Of Accuracy
	Expected Value	Measured Value		
Sunny Day	38	34	10.52%	89.48%
Rainy Day	38	28	26.32%	73.68%
		Average	**18.42 %**	**79.08%**

4. Conclusion

In conclusion, the Outdoor Pet Tracking and Health Monitoring System has been successfully developed. To utilize this system, the owner must have a good internet connection for the device to operate properly. In addition, this technology is based on the ability to identify pets' location and body temperature. Thus, it helps increase the owner's awareness of the pet's whereabouts. However, it aids in reducing the number of lost pets. Considering this, it is a simpler and more effective method for resolving problems. Furthermore, the development of an outdoor pet tracking and health monitoring system has been effectively created concerning the objectives of this research. It effectively combines all software and hardware components into a prototype. The outcomes of integration have been successfully evaluated for their viability. Although it is a simple experiment, it is essential for future research.

Acknowledgement

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