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Smart Pets Monitoring System Using Motion Sensor Based On IOT

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Abstract: In recent years, farms and gardens have also witnessed cases of theft and destruction of crops. This causes farmers to be unable to sell their produce, resulting in little or no profits for them. Often, when farmers want to employ a gardener to take care of their farm field, it causes financial turmoil/challenges that can impact their livelihood. Therefore, the development of this smart pets monitoring system is to overcome the issue. The main objective of this project to design and develop a smart pet monitoring system. After that, to validate or identify the reliability for smart pets monitoring system. After that, by using Smart Pests Monitoring System it can protect the farms from the monkey that can steal and damage the crops. This system comprises of two parts, which are hardware and software. The development of The IOT Based Smart Pests Monitoring System based on the hardware unit such as IR sensor, NodeMCU ESP8266 and Speaker and software unit such as MQTT. IR Sensor is responsible to detect the movement of monkey to entering farms area. The NodeMCU being used to control the hardware part that can be programmed using NodeMCU ESP8266. After that, Speaker will be used to produce the sound of dog barking and lastly MQTT being used to send and receive data to the user. By implementing this Smart Pests Monitoring System, it allows farmers to experience an efficient smart pest monitoring system that can provide better and more effective security to protect farms from pests.

Keywords: Smart Pets, NodeMCU, Arduino, Sensor, MATLAB GUI

1. Introduction

In recent years, farms and gardens have also witnessed cases of theft and destruction of crops. This causes farmers to be unable to sell their produce, resulting in little or no profits for them. Often, when farmers want to employ a gardener to take care of their farm field, it causes financial turmoil/challenges that can impact their livelihood.Farmers do not have enough money to pay the gardener's salary and, at the same time, farms are too large to employ many gardeners to take care of their farms. Therefore, because of many things, farmers cannot detect any incoming pests or humans. In this case, there may

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be theft and injury. In addition, it is also out of human capacity to anticipate an incoming pest against their own.

The Smart Pests Monitoring System will also help to recognize or identify any incoming pests such as monkeys when farmers are at home or somewhere else. In this era of modernization, technological innovation is evolving very rapidly, and all this technology has created a lot of options that will enhance the quality of life of people and make it simpler. For this project, it is important to build and install a combination of sub-systems within the farms or garden areas. Thus, to improve the safety features, this Smart Pests Monitoring System project is extended to all areas of farms.

An integrated system that integrates software and hardware in one project is often called a sub-system combination. The Active Infrared Sensor that monitors and detects infrared radiation in its external environment and is stored in memory is one of the examples of hardware used in this project. This technology for the Smart Pests Monitoring System can only enable the measurement and detection of infrared radiation in its surrounding environment, and this is the best approach to solve these cases. The aim of this project is to research the application of ESP8266 to the development of the Smart Pests Monitoring System based on IOT. Therefore, the Smart Pest Monitoring System is also being established to reduce theft and damage to crops in agricultural areas. Finally, it is to evaluate the awareness of farmers by using the proposed Smart Pests Monitoring System. In addition, the project scope for this project focuses on the most effective NodeMCU ESP8266-based system creation design to detect incoming monkeys. Therefore, an overview of the system by using the IR sensor on any movement of monkeys facing farmers in the farm area and deploying the Smart Pests Monitoring System during managed experiments on the farms

1.2 Problem Statement

The Increasing of theft and damage to crops nowadays become easier due to no security or gardener to taking care the areas of farms all the time and don't have enough money to pay the salary of gardener. By using this Smart Pests Monitoring System, we ensure that environment of farm is clean and safe from pests especially monkey [2]. The goals of this project are to monitor the environment of farmers periodically, to ensure the farmers can feel the result of their crops well, to reduce time to take care of the farms from monkeys [3].

The purpose of this project is to help farmers to protect their farms areas from pests like monkeys from entering the area and destroying crops using advanced technology and affordable [4]. This device is equipped with IR sensor, NodeMCU ESP8266, Speaker and MQTT which is sensor can detect the pests within 7m to 10m and sent data to NodeMCU and speaker will be used to produce dog barking to drive away the pests. Lastly, MQTT being used to send and receive data to the user.

1.3 Objective

- To design and develop a system for smart pets monitoring system.
- To validated or identify the reliability for smart pets monitoring system

1.4 Project Scope

- Focus on the Smart Pest Monitoring System Design Hardware
- Studying and knowing how the unit is mounted by the smart pest monitoring system
- Build a software that in its surrounding environment can calculate and detect infrared radiation

2. Methodology

2.1 Methods

In this chapter, will be discussing about method and equipment involved to develop the project. It also will list the involved equipment, block diagram of this project operation, flowchart of project operation, design of project model and software and relationship between the components.

2.2 Overview Design and setup

To construct this project, it has divided phase; first of it is collect the data using PIR sensor and will give outcome which is bark sound using speaker, LED blinking and the second phase is to build a software design using NodeMCU ESP8266 via access point and control it operation [6]. To understand how the operation of Smart Pets Monitoring System Based IOT. Figure 2.1 has shown that design planning of smart pets monitoring system from side view and Figure 2.2 has shown the design of smart pets monitoring system from top view and proposed Smart Pets Monitoring System diagram below to explain how the Smart Pets Monitoring System Based IOT works.

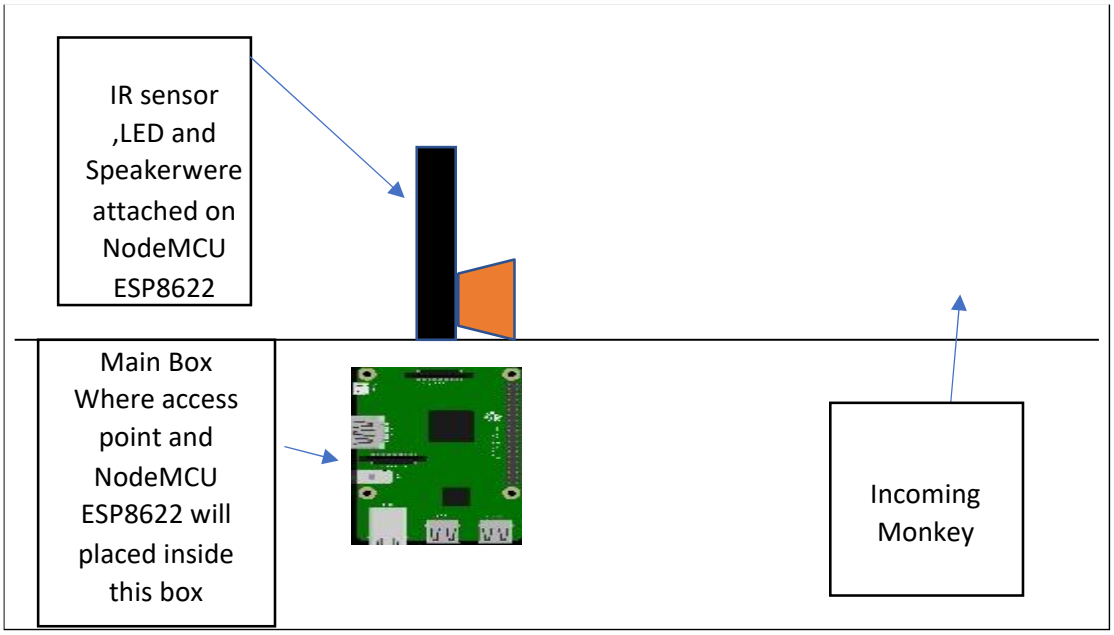

Figure 2: Preliminary process of FEA

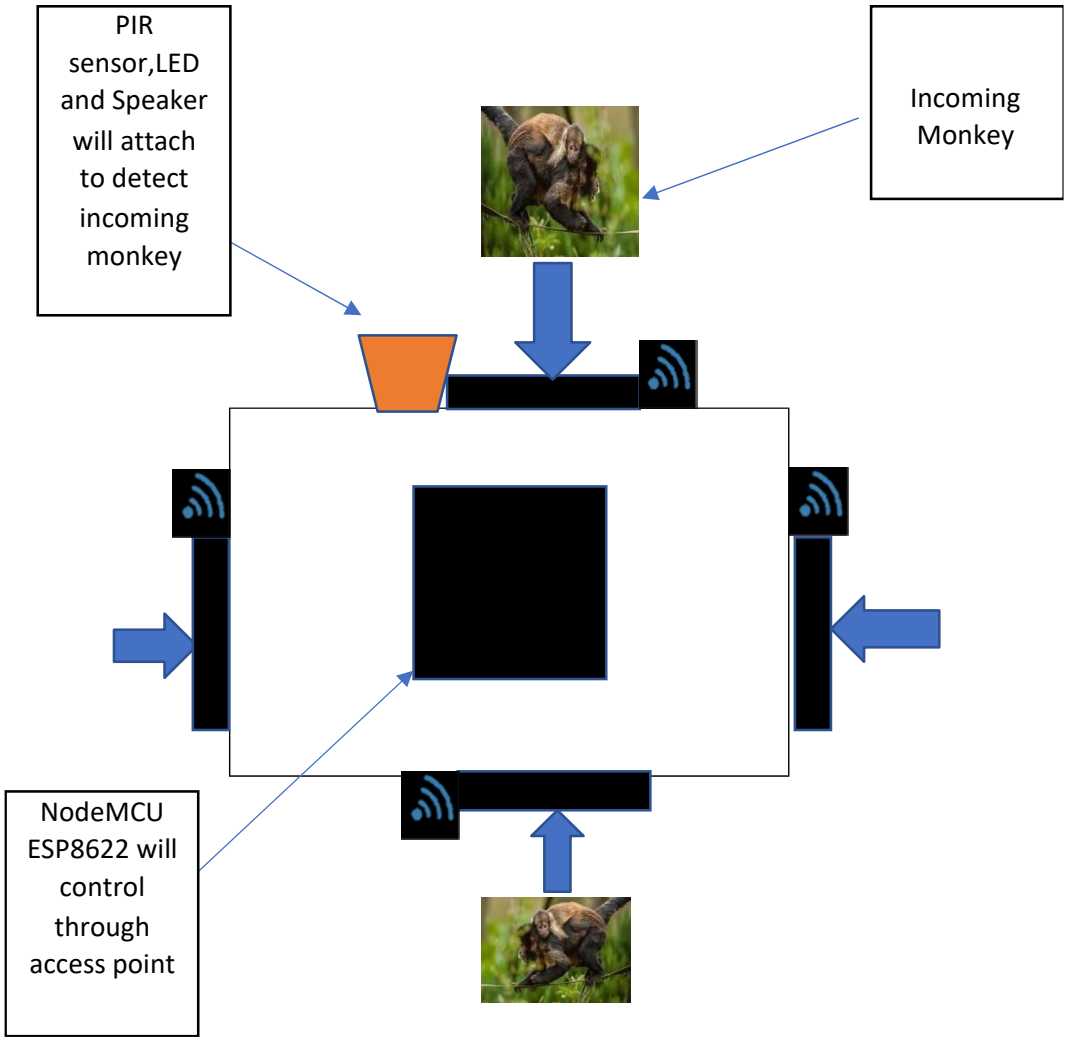

Figure 3: Smart Pets Monitoring System from top view

2.3 Block Diagram

This section will show how Smart Pets Monitoring System Based on IOT operation. As shown in Figure 4 and Figure 5 the section how the Smart Pets Monitoring System works based on this operation and sensor is an input and it will sent the data to main process which is NodMCU ESP8266 and speaker, LED and MQTT will be triggered.

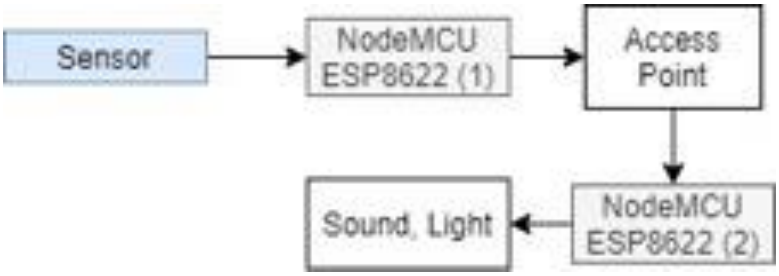

Figure 4: Block Diagram

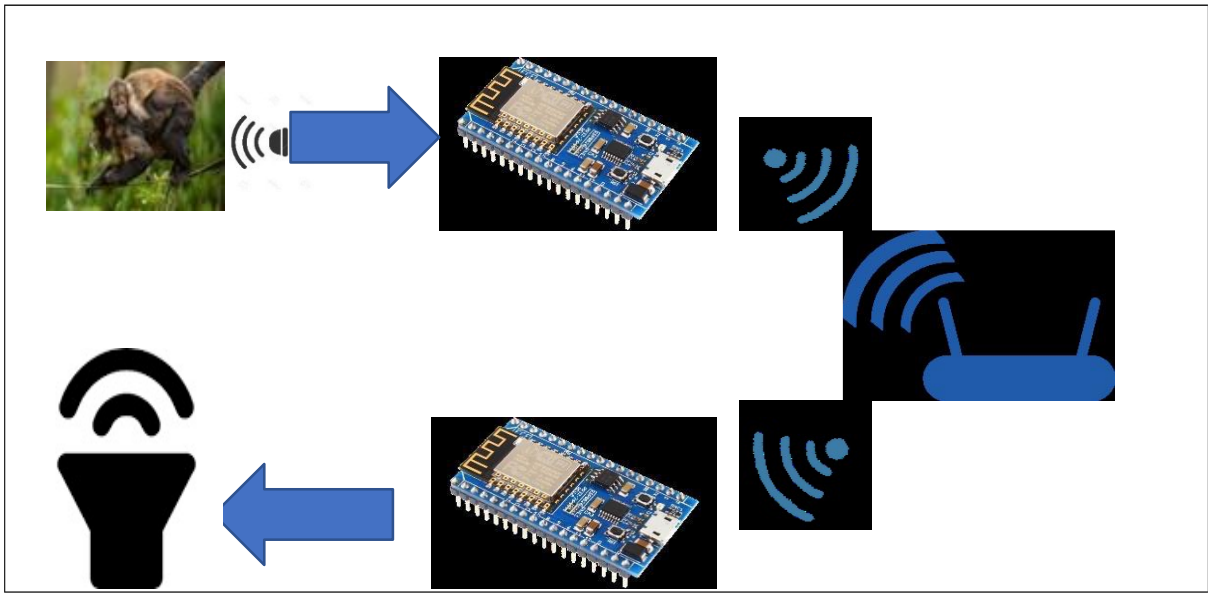

Figure 5: block diagram with symbol

2.4 Flowchart of Operation Project

As shown in Figure 6 Flowchart of Smart Pets Monitoring System operation in this part the first thing must do is to check battery level if the battery level full the process can proceed to the next part and if not, battery should charge first. After that, if the sensor detects the movement in area of farms it will send the data to the NodeMCU ESP8266 and automatically speaker, LED will be turn on. Next, at the same time owner of the farmers will receive the notification through MQTT. Has shown in Figure 7 Flow Chart of Operation in this part the main component has been used to run the system by focusing on the main animal which is monkey in farms area. If the animal will be detected the signal will be sent to the main component which is NodeMCU ESP8266, speaker, sensor, LED and MQTT. In the second operation all the components will be turn on if animal detected.

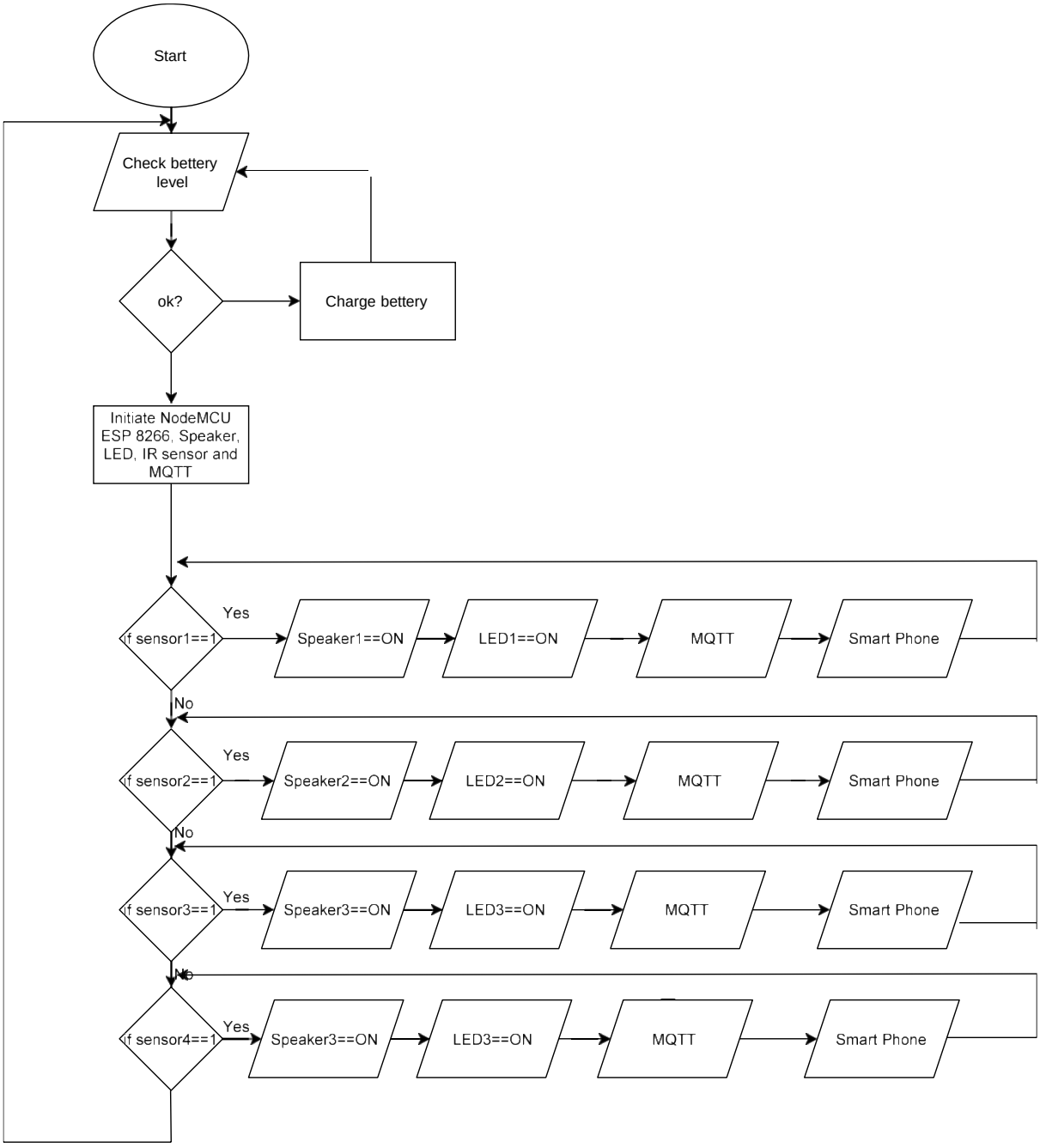

Figure 6: Flowchart

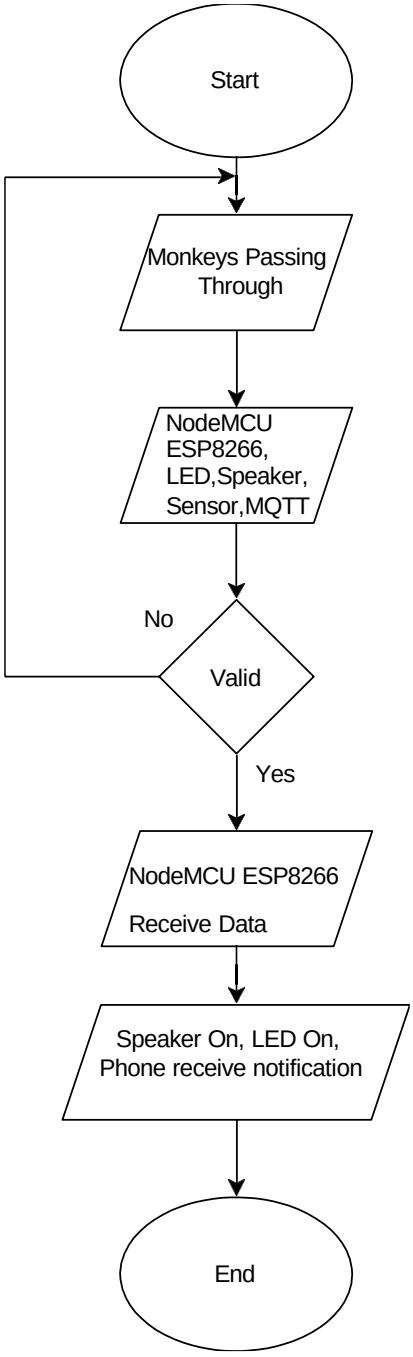

Figure 7: Flowchart operation

2.5 Material Cost

As shown in Table 2 the total cost of this product prototype is accounted for RM178.00. The components and other related materials are listed in the table.

Component	Quantity	Unit Cost (RM)	Cumulative Cost (RM)
NodeMCU ESP8266	1	RM 18.00	RM 18.00
Speaker Sound	1	RM 48.00	RM 48.00
LED	2	RM 8.00	RM 8.00

Breadboard	1	RM 8.00	RM 8.00
Audio driver	1	RM 10.00	RM 10.00
MP3 Player Module	1	RM 6.00	RM 6.00
Miscelaneous (jumper wire,sensor,led, Strip breadboard)	N/A	RM 60.00	RM 80.00
			Total RM 178.00

3. Results and Discussion

In this chapter, the results are being analyzed and discussed. The developed prototype Smart Pets Monitoring System for Farmers are completed, and their functionality has been fully tested which strive to achieve the main aims of the work. The transmitter part which comprises of several devices such as IR sensors and NodeMCU ESP8266. The transmitter part is installed at outside of farms area. As the data transmitted to the receiver part, the NodEMCU esp8266 will received the data and when has motion detected it will trigger the alert unit which is LEDs and Speakers [10]. Functionality test of the developed prototype work has been carried out on real scenarios and the overall system work well. Figure 8 shown the prototype model for The IOT Based Smart Pets Monitoring System.

Figure 8: Completed Project

3.1 Built in LED Blinking Using NodeMCU ESP8266

Figure 9 has shown the NodeMCU ESP8266 built in LED is blinking. On this project step, Arduino IDE software has provided a coding for internal LED blinking using NodeMCU ESP8622. Then, open it and compile the code. After success compile, upload it into NodeMCUESP8266. Finally, the built in LED is blinking.

Figure 9: NodeMCU ESP8266 built in LED is blinking

3.3 IR Sensor Using NodeMCU ESP8266

As shown that Figure 10 the circuit of IR sensor using NodeMCU ESP8266 On this project progress session, we try and error to find a coding to make this simulation success. The operation of this simulation is we has declared that port 13 is for output which is LED and port 12 is for input which is IR sensor. Then any movement passing by the IR sensor, the LED will be blinking.

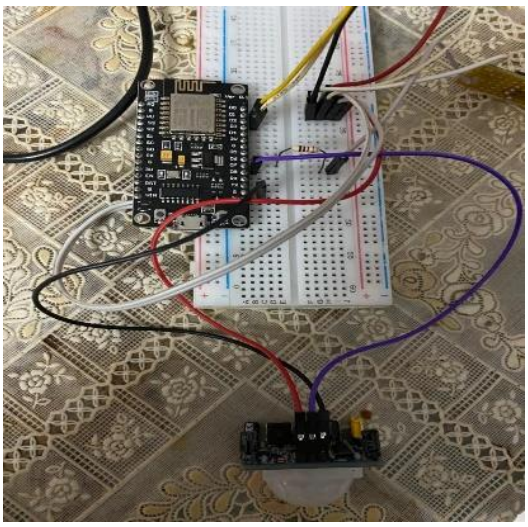

Figure 10: circuit of IR sensor

3.4 LED Blinking When Signal Received

Figure 11 and Figure 12 shown that the circuit for this progress which is LED blinking when received any signal from ESP8266. In this progress, after completing established the connection on ESP8266 there need to put which is LED as an output to indicate the signal has successfully received.

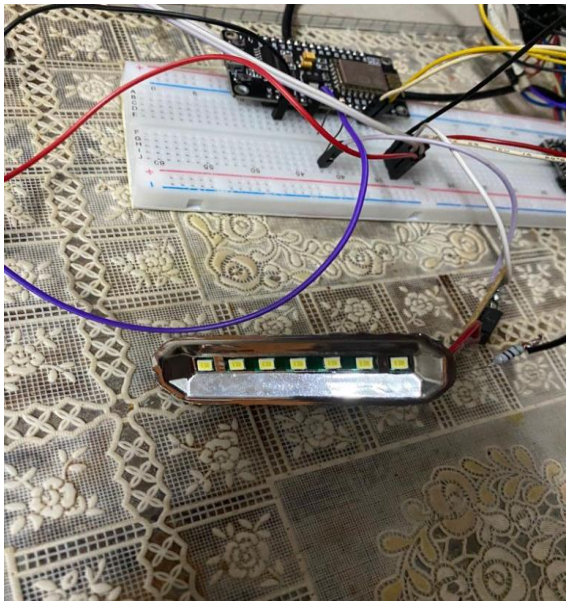

Figure 11: LED blinking when received any signal from ESP8266

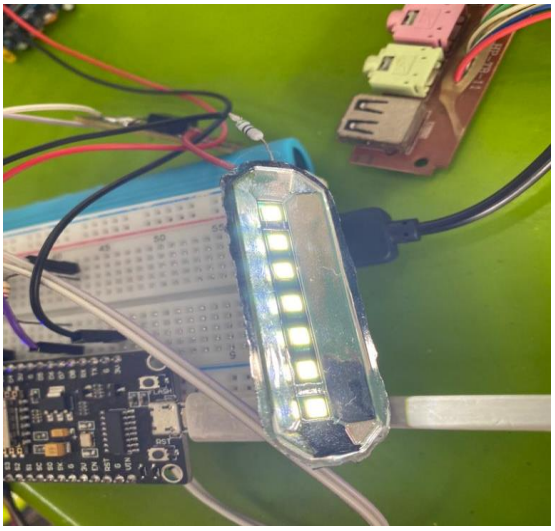

Figure 12: LED is blinking when sensor detected

3.5 Received notification from the apps when the sensor detected the movement

As shown in Figure 13 the owner of farms receive notification through MQTT from app sever. In this part the device sent signal to the MQTT, and apps server will receive the data and at the same time app server will update to firebase. Lastly, firebase will be sent FCM alert to all clients.

Figure 13: notification from apps

4. Conclusion

The problem of crop vandalization by wild animal has become a major social problem in the current time. It requires urgent attention and an effective solution. Thus, this project carries a great social relevance as it aims to address this problem. Hence smart pests monitoring system designed with low cost and consume less energy. The main aim is to prevent the loss of crops and to protect the area from intruders and wild animals which pose a major threat to the agricultural areas. Such a system will be helpful to the farmers in protecting their orchards and fields and save them from significant financial losses and saves them from unproductive efforts that they endure for the protection of their fields. This system will also help them in achieving better crop yields thus leading to their economic wellbeing.

The prototype of IOT Based Smart Pests Monitoring System for farmers has been successfully developed and validated. The prototype system is capable detect the motion of pets on the area of farms. The motion data are subsequently transmitted wirelessly via MQTT to the receiver unit to trigger the alert unit embedded on the LEDs. In this final year project also obtained the skill on uses of NODEMCU and MQTT system.

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References

[1] Al-Atiq, A. B. (november 1994). ISO 9000 Quality Standards in Construction. Journal of Management in Engineering 15(6), 1-40

[2] Chandan Sahu, P. B. (2015). A Low-Cost Smart Irrigation control System. IEEE Sponsered 2nd International Conference on Electronics and Communication System, 20-50

[3] Davide Adami, F. V. (March 2018). IoT Solutions for Crop Protection against Wild Animal Attacks. Iot solution, 20-40

[4] Hinze, J. (december 1995). Experience Modification Rating As Measure of Safety Performance. Journal of Construction Engineering and Management, 1-55

[5] Ibam Emmanuel Onwuka, M. O. (August 2018). Design and Implementation of Farm Monitoring and Security System. International Journal of Computer Applications (0975 – 8887), 30-70

[6] Jafari, A. (decembver 1996). Human Factors in the Australian Construction Industry: Towards Total Quality Management. Australian Journal of Management, 1-23

[7] Laxmi S. Shabadi, H. B. (January 2018). Design and Implementation of IOT based Smart Security and Monitoring for Connected Smart Farming. International Journal of Computer Applications (0975 – 8887), 179 – 180

[8] M. K. Gayatri, J. J. (2015). Providing Smart Agriculture Solutions to Farmers for better yielding using IOT. IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development,, 30-50

[9] Mohamed al ghamdi, B. a. (November 2019). Smart Farming Device. Technical Report for Engineering Design Process and Tools, 14-30

[10] P. Jayaraman, D. P. (2015). Do-it-Yourself Digital Agricuture Applications with semantically Enhanced IOT Platform. IEEE, 10-40

[11] Prof. Neil Opfer, U. o. (June 2014). Controlling Workers' Compensation Costs In Construction. UNLV Associate Professor Department of Civil & Environmental Engineering & Construction, 1-13