Smart System Monitoring of Ficus Carica and Controlling Rattus

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1. Introduction

The agriculture sector is one of the major economic sectors in our country besides the industrial and business sectors. In fact, many farmers and agricultural entrepreneurs in the country still use the old method of farming through the manual way. In tandem with the development of science and technology, all the things only using the tip of the finger. The Internet of Things (IoT) used to monitor agricultural activities which work using sensors.

The use of IoT also not only reduces dependence on manpower but most importantly increases production and maintains quality. With this IoT, farmers can compete with local and international farmers. Among the challenging plants in Malaysia are Tin trees, because Malaysia has a humid temperature while Tin trees are suitable for dry temperatures to produce beautiful and delicious fruit.

The various pesticides, herbicides and other repellent are toxic and are risk for human health. Electronic Pest Repellent (EPR) is an emerging technology which is cheap, eco-friendly and effective and produces no risk to human. Electronic Pest Repellent is an electronic device that can generate sound of ultrasonic frequency range, not audible to human ear but to pests like rodents, birds, insects etc. Because of the sound of this frequency (10-100 kHz) pests feel unpleasant and due to intense auditory stress, they move away from the device. The device can be utilized by general public to repel mosquito, farmers to repel rodents, insects and other pests as in Figure 1.

In this project, we had decided to build a system that can keep crops from moisture and pests. This project takes care of plants from pests, that had pest off the plant from entering the plant. This project has been monitor the status of soil moisture and take data to determine soil moisture on some trees. NodeMCU have been used as the microcontroller, piezoelectric as the buzzer and soil sensors as the data collection in this system. The data that sent to the cloud have been connected through the *Blynk* app to store the data. This system facilitates workers to collect data and identify their crop problems.

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Figure 1: The pest that eating the fruit at plants

2. Literature Review

For this project, we use system that, farmer can detect the condition of the soil automatically and it also can display the data of the soil. This method can give a lot of benefits to the gardener to make sure the quality of the trees always in good condition.

This smart system [1] via IoT is the simple project but has lots of benefit to the user and easy to use to all user. By using the soil moisture sensor to detect a condition of soil and buzzer for repel the rat that connected to NodeMCU. This project only needs the low power consumption which is can supply it using power bank to active it and the circuit was covered with the box to protect all the equipment inside and durability of the project. Other than that, this is portable product can bring and used it everywhere.

Smart system monitoring ficus rica and controlling rattus [2][3] via IoT [4] is not quite expensive. It can be bought by all person especially to the farmers that need to care their plant whether in small or big scale of plant. The concept of environmental care, that gaining attention from the community which cannot give something harmful toward plant and human. Based on this project, we are not using the materials or any equipment that may harm to environment or others. In fact, using of smart system monitoring and controlling via IoT [5] which is not give the bad effect to our environment even more important, can improve the quality of agriculture's sector.

3. Methodology

For smart system monitoring ficus rica and controlling rattus, the NodeMCU is used in this project as microcontroller that connected with soil moisture sensor and a buzzer [6]-[9]. Soil sensor have been located at the plant of project and a buzzer have been located at upper left side of the casing circuit. Figure 2 shows the block diagram of the smart system monitoring and controlling for agriculture via IoT. *Blynk* apps is used as the platform of the IoT that used for displaying the output.

In this part, there has several conditions of testing the project which is the condition where has no any presence of water, the condition when only has presence of water and the last one is the condition that has presence of lot of water at the plant. The condition of presence the rat during night also is consider for this study. All the information has been display on the serial monitor and handphone that has *Blynk* apps [10] to show the information about the project testing. Figure 3 shows the prototype design of soil moisture detector via IoT.

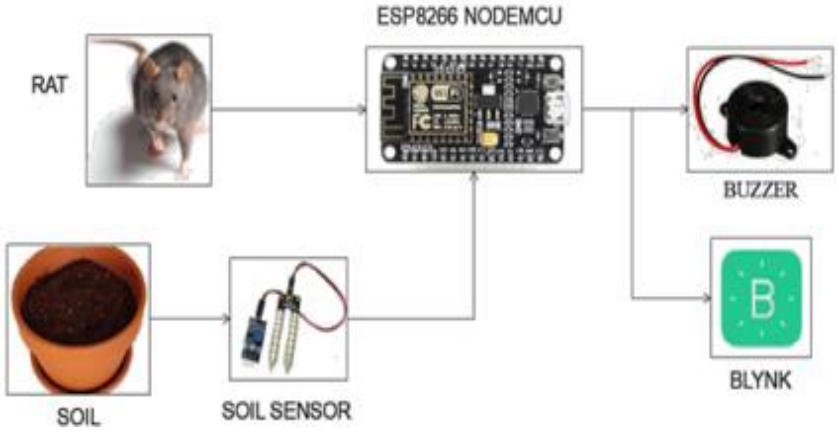

Figure 2: Block diagram of the smart system for agriculture

Figure 3: Prototype design of smart system monitoring ficus rica and controlling rattus

4. Results and Analysis

Smart system monitoring and controlling for agriculture via IoT has been tested for two different conditions which are when has no need water and when need water of the soil. The output from the testing process have been display in serial monitor that come out from the Arduino Software and *Blynk* apps.

For the first condition which is when need water, the serial monitor have been displayed percentage below of 50% for soil moisture sensor. For the Blynk apps that platform of IoT, it displayed the percentage of the soil. This means the farmer need to water the plant manually.

When the condition of soil more than 70%, the serial monitor have been displayed the percentage of the soil moisture sensor. It is also same with the output of Blynk apps that displayed the percentage of soil moisture. The farmer must reduce the water level. It is also same with the output of Blynk apps that displayed the percentage of soil moisture. The graph at the Blynk apps showed results depends on the condition of soil. When the graph was decline, its means that the soil need a water. When the graph was increased, its means that the soil no need a water. When the graphs were static, its means that the soil were in a normal condition. All the condition was shown in Figure 4 until Figure 9.

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Moisture Percentage = 25.51%

Moisture Percentage = 25.51%

1
Moisture Percentage = 25.51%

Moisture Percentage = 25.51%

1
Moisture Percentage = 25.51%

Moisture Percentage = 25.51%
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Figure 4: The output from serial monitor when soil is dry

Figure 5: The output from Blynk apps when soil is dry

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Moisture Percentage = 58.65%

[717640] Connecting to blynk-cloud.com:80
Moisture Percentage = 58.36%

1
Moisture Percentage = 56.99%

Moisture Percentage = 56.99%

1
Moisture Percentage = 56.40%

Moisture Percentage = 56.40%
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Figure 6: The output from serial monitor when soil is normal

Figure 7: The output from Blynk apps when soil is normal

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Moisture Percentage = 76.25%

Moisture Percentage = 76.25%

1
Moisture Percentage = 81.23%

Moisture Percentage = 81.23%

1
Moisture Percentage = 80.55%

Moisture Percentage = 80.55%

1
Moisture Percentage = 78.69%
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Figure 8: The output from serial monitor when soil is wet

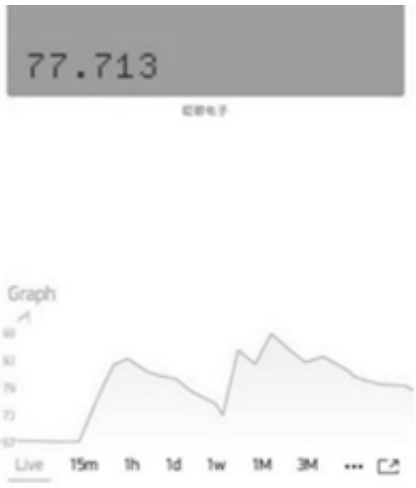

Figure 9: The output from Blynk apps when soil is wet

On the other hand, Table 1 shows the behavior of rat depends on buzzer condition. The farmer has switch on the repellent at night and switch off during the daytime. Hence, the frequency that used on the repellent was 40kHz. This able to prevent the rat from entering the greenhouse because the rat afraid of the frequency signal. Therefore, the farmer able to collect more healthy fruit than usual.

Table 1: The behaviour of rat depends on buzzer condition

BUZZER	RAT BEHAVIOUR
ON	STAY IN A PLACE
OFF	MOVE AROUND

Based on our project, there are several aspects that we consider for analysis which is based on our site visit in one of the nurseries, which checking the presence of rat and soil of plant is one of the farmer's routine. This is because, they need to care the plant growth in good condition without any interruption. They are going to check the condition of soil and presence of rat manually every day. From the site visit at the Pokok Tin nursery they still use manual method to repel the rat and checking the soil instead of automatic approach. This method is not practical if they use in larger scale of the plantation since it requires a lot of workers to check the growth of the plant day by day. In addition, checking manually also waste a lot of time thus in order to solve this problem by propose this project that use soil moisture sensor to detect the presence of water in plant and use a buzzer to repel the rat.

5. Conclusion

Through proposed method, we implement the instrumentation method which is by using the combination of sensor and program that used to detect the condition of soil and to repel a rat. This project also connected with the Internet of Thing (IoT). The user known the status of the plant either has a lot water or not. By using this instrumentation method Tin Tree and controlling rat via IoT, its more accurate and detect automatically compare than we are checking manually.

For smart system monitoring and controlling project, it has few advantages which is, reduce the total of workers or the workers can do any work other than checking the condition of soil and rat for good plant growth. Checking is one of the examples of repetitive works that normally human are overlook while doing this work. By replacing the human energy with the instrumentation methods which is use the sensors, it more accurate and give the good impact to the plant growth.

In this project, we combine the soil moisture sensor, a buzzer with the NodeMCU that been program to control the soil moisture sensor and Internet of Things together. Compared to alternatives now that just do checking manually by using human energy that sometimes has overlook happened. It has been used for small scale or large scale of plant and give lot advantage for farmers.

This project has developed an excellent system that can help people especially farmer to prevent it product from rat and overfloat of water. Besides that, this project safe to use for others. To construct the circuit, we are just need simple component which is we just use small voltage supply for this circuit and it used the power bank as a supply. It is affordable for the others to buy it. This project can be used as mass production and high marketing because it is having many advantages for user.

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