Indonesian Journal of Educational Research and Technology

Journal homepage: http://ejournal.upi.edu/index.php/IJERT/

Easy-Mushroom Mobile Application Using the Internet of Things (IoT)

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ABSTRACTS

The cultivation of mushrooms is not a simple task for traditional mushroom farmers, because the productivity of the mushroom farm depends on the ability to regulate the environment surrounding the mushroom farm. In addition, another problem for traditional mushroom farmers is that they cannot grow various types of mushrooms related to marketing. This research presents a mobile application for assisting mushroom farmers to understand the growing situation. The proposed mobile application called the easy mushroom application is based on the Internet of things (IoT) concept. The easy mushroom has been designed to analyse the humidity and light intensity relationship at a specific time. The experimental results show that the Easy-Mushroom mobile application provides a relationship between light intensity, humidity, and tolerance humidity level of mushroom.

ARTICLE INFO

Article History:
Received 01 Jan 2021
Revised 04 March 2021
Accepted 10 March 2021
Available online 12 March 2021

Keyword:
Humidity sensor,
Internet of things,
Light sensor,
Mobile application,
Mushroom

1. INTRODUCTION

In 2015, each person in the United States consumed, on average, around 3 pounds of mushrooms, according to the Agricultural Marketing Resource Center. The antioxidant content in mushroom may help prevent lung, prostate, breast, and other types of cancer, according to the National Cancer Institute (Chuang *et al.,* 2020).

Antioxidants are compounds that have a function to combat the negative effects that come from free radicals. Free radicals are a by-product of the process of processing food into energy. In addition, you can be exposed to free radicals from food, air, and even from your body's reaction to sunlight. For that reason, the human body needs antioxidants. There are two types of antioxidants, namely endogenous produced by the body, and exogenous obtained from outside the body, especially from food. Although it can produce its own antioxidants, the body tends to rely more on antioxidants that come from outside. This compound will work by donating electrons to free radical molecules so that they neutralize their bad properties.

The way antioxidants work is related to the way free radicals work. Free radicals in the body are molecules that have free electrons, where electrons should be in pairs. These free electrons make free radicals so reactive that they can cause damage to surrounding cells. Due to the nature of the paired electrons, the free electrons contained in these free radical molecules can donate electrons or accept electrons from molecules of healthy body cells. Healthy body cell molecules will then behave the same as free radicals, giving rise to many other free radicals.

Lots of researcher have developed their own systems for automating the growth of plants. Keeping the environment under tight control leads to better yield (Ferrante *et al.,* 2017).

This research presents a mobile application for assisting mushroom growers to understand the growing situation. The proposed mobile application called easy mushroom application is based on internet of things (IoT) concept. The easy mushroom has been designed to analyze the humidity and light intensity relationship in specific time.

2. METHODS

Basically, the main key of mushroom growing is to regulate the surrounding humidity of mushroom (Chang & Wasser, 2018). However, in Thailand, there is difference of mushroom growing. Because mushrooms will not grow into squares where the light level is greater than 12, the farmer must consider carefully with the placement of light sources (Paulauskienė, *et al.,* 2020). In order to analyze the mushroom environment properly, the connected sensors would measure the light intensity and humidity and real-time upload into the cloud as shown in **Figure 1**. **Figure 1** shows system flow chart, including start, measuring the light intensity, data analytic (using matlab), humidity analysis, criticize the data, and stop.

DOI: http://dx.doi.org/10. 17509/xxxxt.vxix
p- ISSN 2775-8419 e- ISSN 2775-8427

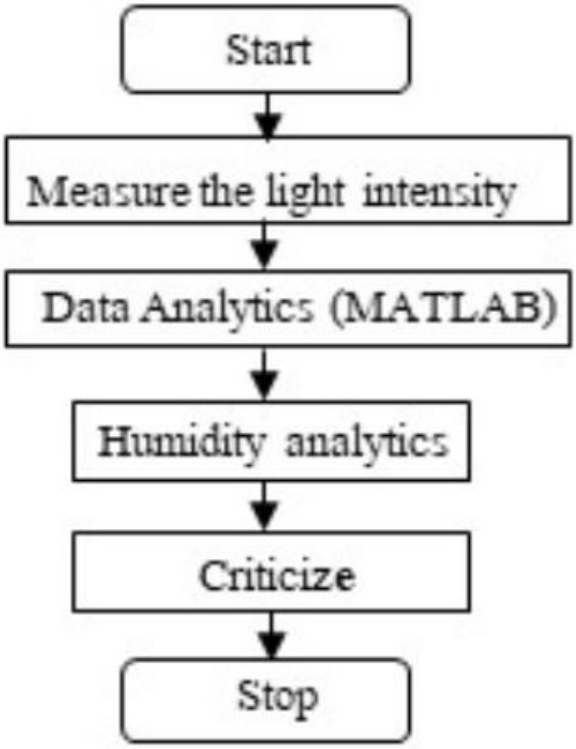

Figure 1. System flow chart.

Figures 2 and **3** show the proposed algorithm and mobile application of the Easy Mushroom application respectively.

The data analytics would be designed to analyze the critical situation of humidity. **Figure 2** explains the data was obtained in real time. Data was collected using connected devices. Data also was added using user interface. All data were connected to the cloud. Then, the cloud also gives data to user interface as a feedback. Data from the cloud is connected to the data analytics in computer.

Figure 3 shows mobile application as a data analytics. This figure shows real-time data getting from connected devices and user interface. ‘

3. RESULTS AND DISCUSSION

To evaluate the proposed concept the Easy Mushroom application has been tested in the real environment.

Figure 4 shows the measured light intensity and humidity. According to the results, the Easy Mushroom application user would be able to compare the appropriate mushroom type with the humidity and light intensity situation. Thus, the mushroom growers can predict the yield of their mushroom farms easily.

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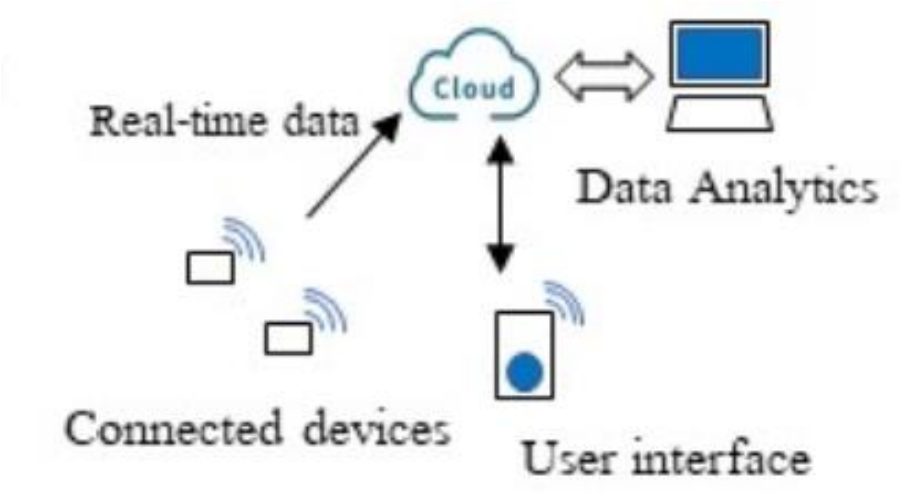

Figure 2. System flow chart.

Figure 3. Mobile application.

Figure 4 explains data by making curves between lighting, humidity, and timestamp. In the case of lighting, we used blue curve. Int the case of humidity, we used red curve. We compared straw mushroom, yamabushitake, shitake mushroom, and peak light. The analysis of the timestamp was done on 4 November 2020 from 10.56 to 11.16. the analysis of the timestamp is similar to previous study (Nandiyanto et al., 2016).

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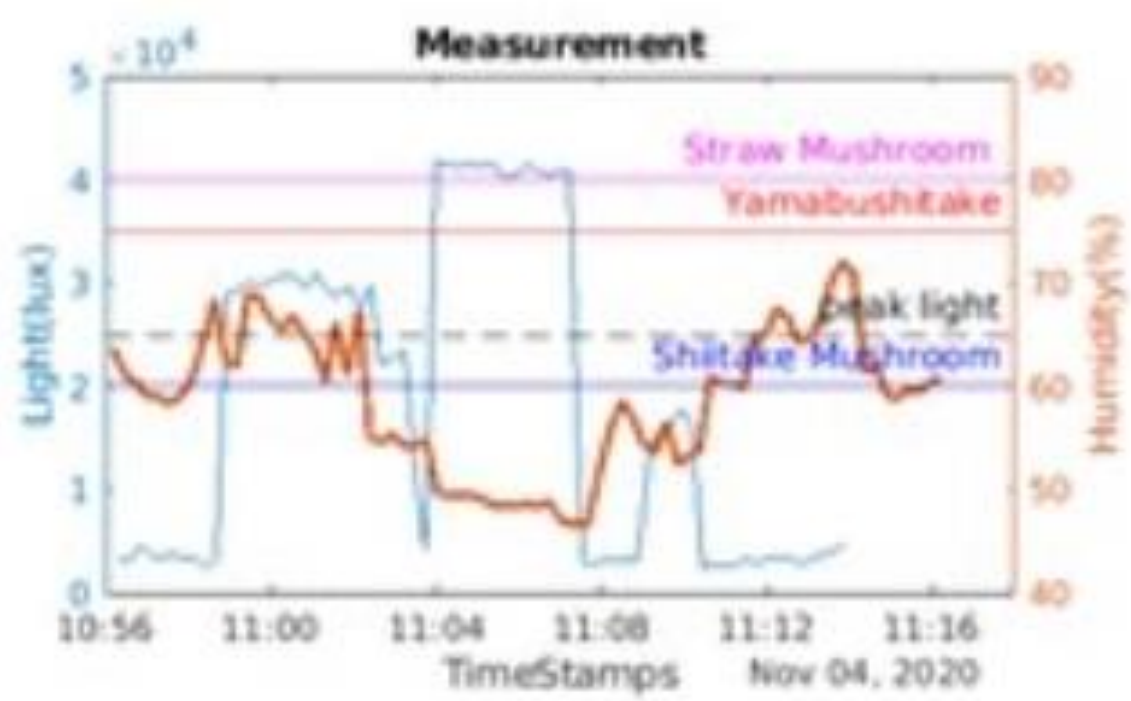

Figure 4. Data analytics.

4. CONCLUSION

This research presents the Easy Mushroom mobile application. According to the proposed concept, the Easy Mushroom application consists of four basic components the connected sensors, cloud, data analytics and a user interface. The experimental results show that the proposed concepts would be able to provide the useful information for any mushroom grower to compensate or predict their mushroom yields.

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DOI: http://dx.doi.org/10.17509/xxxx.vxix
p- ISSN 2775-8419 e- ISSN 2775-8427

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DOI: http://dx.doi.org/10. 17509/xxxxt.vxix
p- ISSN 2775-8419 e- ISSN 2775-8427