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Automated Moist Control for Mushroom Production Information System with Mobile-Based SMS Notification

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Abstract—Growth of the mushroom can be inhibited if its temperature and humidity are not well controlled. Automated monitoring system was an alternative solution for controlling the mushroom bed's temperature and humidity. The project entitled automated moist control and mushroom production information system with mobile-based sms notification was design to develop an automated real-time monitoring system that monitors real-time temperature and humidity of the mushroom bed. The project utilized android based application, and a prototype that use arduino uno v3.0 ch340g as the microcontroller for the system's prototype, a dht11 temperature and relative humidity sensors, single channel relay module, gsm module and a 12volts washer pump components. Based on testing and evaluation, the study found out that 50 respondents who evaluated the project obtained an average rating scale of 3.65, remarked as "agree" means that the automated moist control for mushroom information system with mobile-based sms notification is truly functional, reliable and usable for mushroom production. It is the therefore concludes that for monitoring the mushroom bed's temperature and humidity purposes, the project can help mushroom farmers grow mushrooms less consuming time and less effort in producing mushrooms.

Keywords—***Mushroom Production, Automated Moist Control, Relative and Humidity Sensors, Mushroom Farmers, Mushroom Monitoring System***

I. INTRODUCTION

Mushroom is one of the mainstream famous agriculture products not only in the Philippines but around the world. Mushrooms are classified as vegetables in the food world, but they are not technically plants. They belong to the fungi kingdom. Although they are not vegetables, mushrooms provide several important nutrients and they have a very important part in the food market. As it is enriched in nutrients and they possess medical benefits such as decrease the risk of obesity and overall mortality, diabetes, and heart disease [1].

Mushrooms are cultivated and processed by means of manual methods such as from spawn production to packing, as a result, cultivators need to spend more time in the cultivation area, which is difficult and thus chances of occurrence of pests and diseases are much more which sometimes damages mushroom crop to a great extent thereby leading to an severe loss to the cultivator. The mushroom growers are growing mushroom in thatched mud houses, in which maintaining the required temperature and humidity for mushroom cultivation is very difficult. These kinds of structures need upgrades by modern techniques to develop an appropriate low cost farm design [1].

Implementing a modern technology for agricultural production is a significant tool for efficient and rapidly growth of the production. The developer is able to create a windows application with SMS notification. The client platform is design for the farmers to register their information to the system. The system will automatically send mobile notification after it detects different various movements in the farm. The admin has the authority to add, update or delete clients and set up parameters for the actual use of the study.

The Automated Moisture Control for Mushroom Information System with Mobile-based Notification is a project that enables to develop and design an automated Moisture Control System Prototype for mushroom information system with mobile-based notification in mushroom beds production. It helps the farmer to adopt modern technology for mushroom production that can lessen different crisis to their farm with the application of the project that provides higher and better technology cares for farming. In addition it has a water sprinkler to produce the level of temperature inside the mushroom beds. And it has a water solenoid to automatically on and off the watering plant inside the greenhouse. The module will send notification to the owner if the temperature and humidity when it is in critical level. The software will record the complete details of moist detector using line graph. The scope of the project was only to establish the mushroom beds and create a system application that monitors the temperature and humidity inside the greenhouse, save the generated data from the sensors to database, presents data in a table to for interpretation into graphs displayed in the phone. The system can easily detect the temperature and humidity of the mushroom beds. It's also notifies the owner if the temperature is in high or in low and to be converted into graphs, and to evaluate the effectiveness and usefulness of the system.

II. METHOD

A. *Development of the system*

The development of Automated Moisture Control for Mushroom Information System with Mobile-based Notification study uses Agile System Development Life Cycle model to maximize the capability of the system, Requirement Analysis phase is for gathering of information and analyzing the problem in order to have a deep understanding about the study and decide what are the best options or method that could possibly apply to the study.

For Design phase is for making the system completing the user interface and decides what are the best ways to make the interface user-friendly to have a flexible

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user interface and making a database design for the system, for the Implementation phase is for checking and coding of functions if the system solved the problems to have a better user experience and improve functions if needed.

Testing phase is to test the system on its effectiveness in order to have a better result and the questionnaire is designed to determine the status and performance of the system and includes Functionality, and usefulness the subjects need to rate the performance of the system to test the system effectiveness, for the release and for the improvement of the system based on the test result to maximize the capability of the system and to decide if the system is ready to use or not, if not it then run the loop for improvement.

B. *Details of the Technologies Used*

The hardware section includes the designing of the prototype structure and electronic circuits. Software section designed to control to automate the culture mushroom. The system has a function to collect a data from a prototype of Volvariella volvacea.

Technologies needed in the development of the proposed project Automated Moisture Control and Information System with Mobile-based Notification are cited below.

TABLE 1 SOFTWARE REQUIREMENTS.

SOFTWARE	USAGE
Windows 7,8,10	Operating system controls the operation of a computer that process the program
Arduino Software	Used for program and Coding the sensors
Android Studio	Used to Develop the Mobile Application.
MySQL Administrator	Used to Stored Data gathered

TABLE 2 HARDWARE REQUIREMENTS

HARDWARE	USAGE
Arduino Uno	Functions as the Microcontroller
GSM Module	Transmit and receives Used with Arduino
Moisture detector	sense a moisture
Humidity Sensor	sense temperature
Water Sprinkler	sprinkler a water from the water source

Operational Framework

Figure 3 shows the network model of the Automated Moisture Control and Information System with Mobile-based Notification with the microcontroller inside the greenhouse with automated system; and the microcontroller connected to the GSM was to moisture sensors to data base from computer to android.

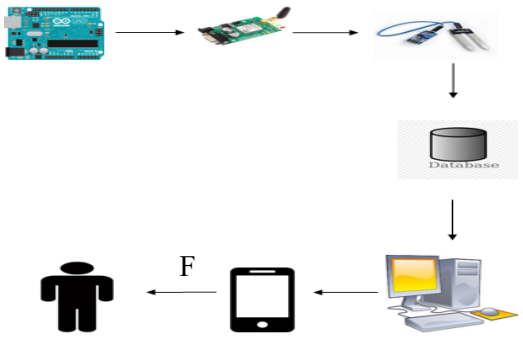

Fig 3. Operational Framework

C. *Input-Process-Output Model*

System Architecture consists of three processes; the input, process and output. The input for the proposed project from a cultivated mushroom and calculate moist and measures using sensors. The System and the GSM send Arduino transmitter and process the output into the graphs which receive information.

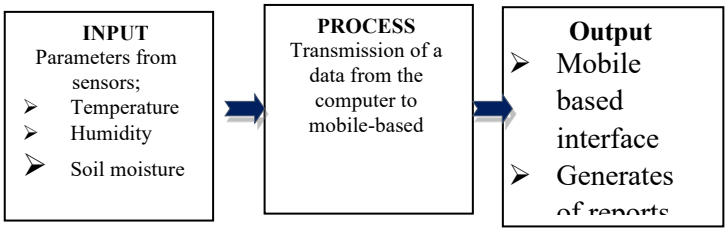

Figure 4. Input-Process-Output Mode

D. *System Architecture*

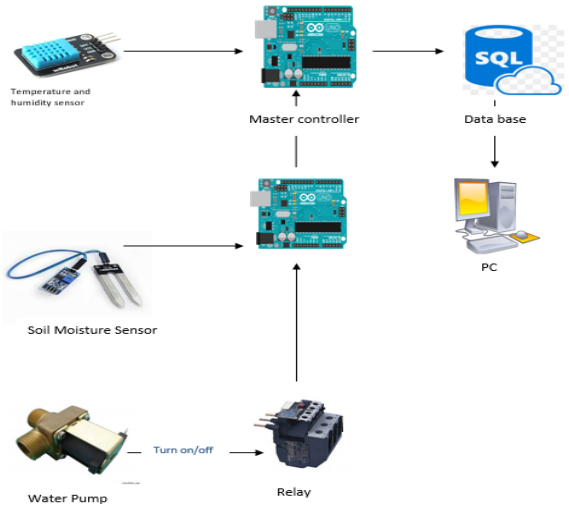

Fig. 5. System Architecture

The system architecture of the "Automated Moist Control for Mushroom Information System with Mobile-based Notification" describes the function of the project.

E. *Use Case Diagram*

Figure 6 explains the capability of client of the proposed Automated Moisture Control and Information System with Mobile-based Notification. It is the simplest representation of grower interaction with the system and depicting the specification of a use case

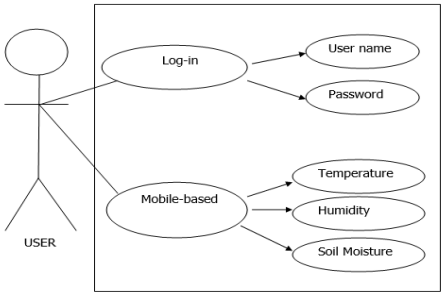

Fig 6. Use case diagram of the Automated Moisture Control for Mushroom Information System with Mobile- based Notification.

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F. *Data Flow Diagram*

Figure 7 shows the illustration of the flow of data through information system, modeling its process aspect. It illustrates what kind of information the input and the output is in the system; where the data comes from and where it goes; and where the data is stored. In general, it show how data being transmitted upon the different process of the system.

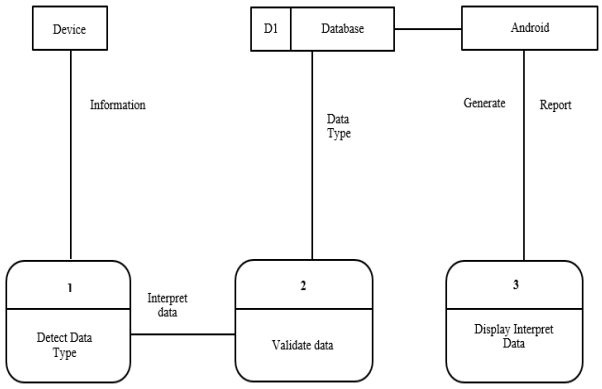

Fig. 7. Dataflow Diagram of the Automated Moisture Control for Mushroom Information System with Mobile-based Notification

III. RESULT

This chapter presents the result and discussion of the study entitled "Automated Moist Control for Mushroom Information System with Mobile-Based Notification". The results came from providing the solution on the objectives of the study that were respectively stated in order as how it was written on the objectives of the study in chapter 1 and set by the researcher.

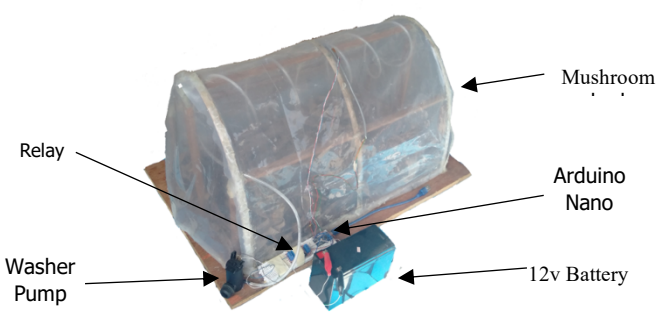

Fig. 8. Prototype of the "Automated Moist Control for Mushroom Information System"

Development of Prototype of the Automated Moist Control

Figure 8 shows the prototype of the project entitled "Automated moist control for mushroom information system" with its hardware components. As shows in the figure this includes: Arduino Nano, Relay, a 12V Battery and sensors that monitor the soil moisture, humidity and temperature. DHT11 sensor is used to get the humidity and temperature of the mushroom bed. Relay is also used to control the water pump. Arduino is used for controlling almost all the functions of the system. Power supply is used for supplying current to the system.

A personal computer is used for monitoring that were presented in graphical form. Process starts at running the desktop application that will be installed at a dektop computer or any personal computer and also starting on the the hardware component of the prototype which is the Battery. After turning on, the sensors will automatically detect the mushroom bed's temperature, humidity and moisture. In addition If the system detects or it exceeded the limited temperature and humidity that was being set, the washer pump will automatically turn on to water the plant on the mushroom bed, which will turn off after the system detects the mushroom bed that the temperature and humidity reach its average level.

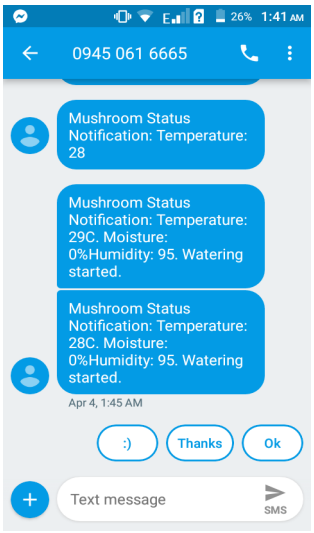

Fig 9. Mobile Application's SMS Notification

Figure 9 shows the SMS notification of the mobile application that was sent by the system to the owner. As shows in the figure the system will send this notification when the monitor data exceeded the temperature, humidity and moisture that was set on the system.

A. Mobile-based Automated Moist Control for Mushroom Information System with Mobile-Based Notification"

Fig. 10. Graphical User Interface of the Temperature of Mobile-Based Application.

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Figure above shows the graphical user interface of the mobile application of the "Automated Moist Control for Mushroom Information System with Mobile-Based Notification".

B. *Automated Moist Control for Mushroom Information System with Mobile-Based Notification"*

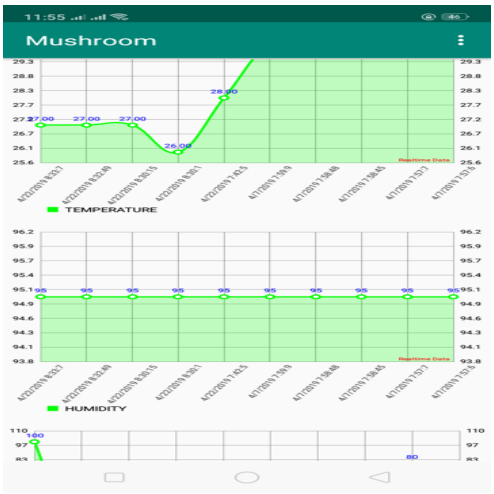

Fig. 11. Graphical User Interface of Mobile-Based Application.

Figure 11 shows the application if the water sprinkler is on /off and which is developed using Android Studio. In order to open the application, it must be connected to the desktop application which is the study of my partner on the same network. The desktop application will serve as the server of my mobile application.

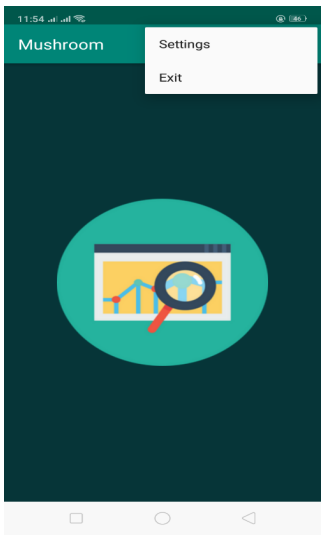

Fig. 12. Home Page of the Mobile Application

Figure 12 shows the main page of the mobile application which is developed using Android Studio. In order to open the application, it must be connected to the desktop application which is the study of my partner on the same network. Likewise the desktop application will serve as the server of my mobile application. Next step is to click the menu button at the top right corner of the application, then click settings. After clicking settings, click save. And it will now jump to the main page of the system.

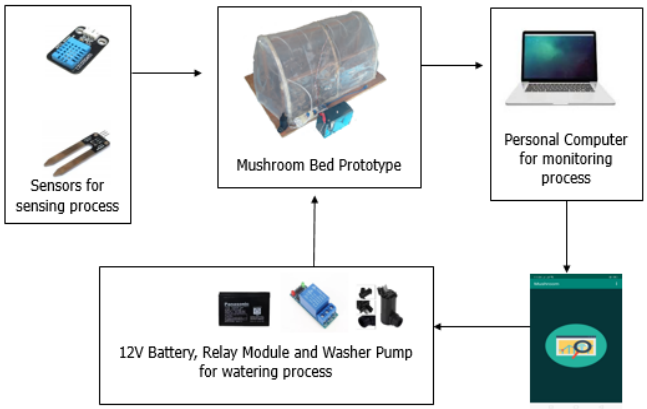

Fig. 12. Flow of the Automated Moist Control for Mushroom Information System.

This figure 12 shows the flow or the process of the prototype of the capstone project. Once the process starts, the sensors will automatically get the temperature, humidity and moisture of the mushroom bed which will serve as data or input of the system. After getting the data, it will now be monitored on the android application and can be seen in graphical form. On the monitoring process, once the system detects that the temperature, humidity and moisture of the mushroom bed exceeds the required temperature, humidity and moisture, the washer pump will now turn on.

TABLE 3. OVERALL DESCRIPTIVE RATING OF THE RESPONDENTS FOR THE AUTOMATED MOIST CONTROL SYSTEM.

Particulars	Weighted Mean	Description
Functionality	3.62	Agree
Reliability	3.32	Neutral
Usability	4.03	Agree
Consolidated Mean	3.65	Agree

Table 3 shows the overall rating of the respondents on the functionality, reliability and usability of the project. Based on the results, the functionality of the system has a weighted mean of 3.62, the reliability has a weighted mean of 3.32 and the usability has a weighted mean of 4.03. Thus, the overall rating of the respondents on the project entitled "Automated Moist Control for Mushroom Information System with Mobile-Based Notification"has a consolidated mean of 3.65 which means that respondents which are the students, faculty members and agriculture experts agreed that the functionality, reliability and usability of the system project is in agreeable.

IV. CONCLUSION

The project entitled automated moist control and mushroom production information system with mobile-based sms notification was design to develop an automated real-time monitoring system that monitors real-time temperature and humidity of the mushroom bed. The project utilized android based application, and a prototype that use arduino uno v3.0 ch340g as the microcontroller for the system's prototype, a dht11 temperature and relative humidity sensors, single channel relay module, gsm module and a 12 volts washer pump components. Based on testing and evaluation, the study found out that 50 respondents who evaluated the project obtained an average rating scale of 3.65, remarked as

"agree" means that the automated moist control for mushroom information system with mobile-based sms notification is truly functional, reliable and usable for mushroom production. It is the therefore concludes that for monitoring the mushroom bed's temperature and humidity purposes, the project can help mushroom farmers grow mushrooms less consuming time and less effort in producing mushrooms.

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