

INTERNET-BASED DESIGN OF AUTOMATIC LIQUID FERTILIZER FOR AGLAONEMA ORNAMENTAL PLANTS OF THINGS (IOT)

Teddy Pratama, Thoyyibah. T

Faculty of Computer Science, Informatics Engineering Study Program, Pamulang University, South Tangerang City,
Indonesia

E-mail: tedypratama28062000@gmail.com, dosen01116@unpam.ac.id

Abstract

In general, the application of plant fertilizer to aglaonema ornamental plants is still done directly, where the aglaonema plant farmer must bring a container filled with fertilizer and then pour it on the plants one by one. This may not be a problem for farmers who have free time, but for aglaonema plant farmers who have other activities or are in distant places, then this becomes a problem that occurs for plant owners because when an aglaonema plant is not given the fertilizer it needs, it causes aglaonema plants do not develop properly. Therefore, a tool is needed that can help farmers in applying liquid fertilizer automatically. This tool for administering liquid fertilizer to aglaonema ornamental plants functions to automatically apply liquid fertilizer to aglaonema plants using the ESP8266 nodemcu and can be accessed remotely using the Telegram application which functions to regulate the application of fertilizer automatically or manually. This tool is also equipped with the concept of the Internet of Things (IoT) which will be connected to each other so that use is easy and can monitor directly by opening a web server/application that is connected to internet access about the time to apply fertilizer in the plant area.

Keywords : Automatic, Nodemcu, Waterfall, IOT (Internet Of Things)

1. INTRODUCTION

IoT (Internet of Things) is a concept that aims to expand the benefits of internet connectivity that is connected continuously. Basically IoT (Internet of Things) refers to objects that can be uniquely identified as virtual representatives in internet-based structures. How IoT (Internet of Things) Works is the interaction between fellow machines that are connected automatically without User intervention and at any distance. In order to achieve the above-mentioned IoT (Internet of Things) way of working, it is the internet that is the link between the two machine interactions, while the user only serves as a regulator and supervisor of the working of the tool directly. The benefits derived from the IoT (Internet of Things) concept itself are that the work done can be done faster, easier and more efficiently. Therefore, utilization of fertilization media using IoT (Internet of Things) will be carried out. (Nandika, 2020)

Currently, fertilization on ornamental aglaonema plants is still done manually by still using human power, using simple equipment such as dippers and buckets by circling the land to fertilize each plant clump. This method certainly takes a long time and is also quite draining for workers or aglaonema plant farmers. This may not be a problem for farmers who have free time, but for aglaonema farmers who have other activities or are in distant places, this becomes a problem for plant owners because when an aglaonema plant is not given the fertilizer it needs, it causes the plant not to develop properly.

This research was conducted at Udin Aglaonema located on Jl. Mutiara Kp. Dongal, Ms. Asih, Pondok Jagung Timur, North Serpong District, South Tangerang, Banten. Mr. Sefudin usually applies fertilizer on aglaonema plants directly use liquid fertilizer. Farmers also still use buckets to make fertilizer and apply fertilizer to aglaonema plants. This results in a lot of energy being used during the process of applying fertilizer and requiring a lot of time, sometimes Mr. Sefudin has other activities or is outside, so this becomes a problem that occurs with aglaonema plants because when an aglaonema plant is not given the fertilizer as needed, it causing the plant to not develop properly.

2. MATERIALS AND METHODS

2.1 Definition of Scheduling

The definition of automatic is the replacement of human power with machine power that automatically performs and manages work so that it no longer requires human supervision. Automation is carried out to achieve the goal of facilitating humans in performing complex and detailed tasks.

Another definition of automation is the application of technology carried out with minimal human intervention, so that the visible use of various control systems for operating equipment such as machinery, factory processes, boilers, heat processing ovens, turning on the telephone network, steering and stability of ships, aircraft, and other vehicle applications with minimal human intervention.(Mumtaz, 2022)

2.2 Definition of Plant Fertilizer

Fertilizer is an important component for plant growth and productivity. Fertilization is an effort to add nutrients to plants, either in the plant canopy or soil according to plant needs, which aims to supplement the availability of nutrients. Fertilizers are divided into organic and inorganic fertilizers (Fathin et al., 2019).

The purpose of fertilization is to optimize plant growth and productivity, reduce competition for nutrients with weeds and resistance to pests and plant diseases. Applying fertilizer can increase and accelerate the production of a plant. Applying fertilizer to the soil and plant roots can increase levels, increase nutrients and make plants in the planting medium grow fertile again.

Plant fertilizers are divided into 2, namely liquid fertilizer and solid fertilizer, one example of liquid fertilizer is NPK fertilizer. NPK fertilizer is a fertilizer that contains three macronutrients, namely Nitrogen (N) Phosphorus (P) and Potassium (K). The form of NPK fertilizer products circulating in the market is quite varied. Solid NPK fertilizers can be in the form of tablets, pellets, briquettes, granules and powders, while liquid NPK fertilizers come with various levels of solubility. Each type of NPK fertilizer brand has a different composition of ingredients depending on the needs of the plant.



Figure 1. 1 NPK Fertilizer

Basically the benefits of NPK fertilizer in general are that it can help plant growth so that plants develop optimally. Each nutrient element in NPK fertilizer has a different role in helping plant growth. All three are primary macronutrients because they are most needed by plants.

1. Element N (Nitrogen). Nutrient N serves as a constituent of amino acids (proteins), nucleic acids, nucleotides and chlorophyll. This will make the plants greener, overall plant growth will be faster and increase the protein content of the crop.
2. Element P (Phosphor). The element P serves as a storage and channel of energy for all metabolic activities in plants. The positive impact is the acceleration of root growth, spurring tissue development, stimulating flower formation and fruit ripening, increasing disease resistance.
3. Element K (Potassium). One of the K nutrients in plants is as an enzyme activator that participates in plant metabolic processes. It also helps the process of absorption of water and nutrients in the soil. Nutrient K also helps channel the results of assimilation from leaves to all plant tissues.

2.3 Definition of Aglaonema Plants

Ornamental plants are currently in great demand by the public because they have become a current trend and ornamental plants have become a business field for ornamental plant lovers. One of the most popular ornamental plants is Aglaonema. The Aglaonema plant or by another name "sri sustenance" is an ornamental plant without flowers but has a variety of leaves which include motifs, shapes, colors and sizes. This is what makes this plant traded by counting the number of leaves, leaf color and pattern. Aglaonema has the potential to be used as a business area because the price offered is quite high according to the color of the aglaonema leaves. (Suryani R et al, 2020)

2.4 Understanding the Internet of Things (IoT)

The Internet of Things (IoT) is a network that connects various objects that have identifiers and IP addresses, so that they can communicate with each other and exchange information about themselves and the environment around them. Objects that are in IoT can use or produce services and work together to achieve a common goal. With this capability, IoT has shifted the definition of the internet as computing anywhere anytime, anyhow, to anything, anyone and any service. (Adani & Salsabila, 2019)

The internet of things is a concept where an object or object is embedded with technologies such as sensors and software with the aim of communicating, controlling, connecting and exchanging data through other devices as long as they are still connected to the internet.

3. METHOD

3.1 Proposed System Analysis

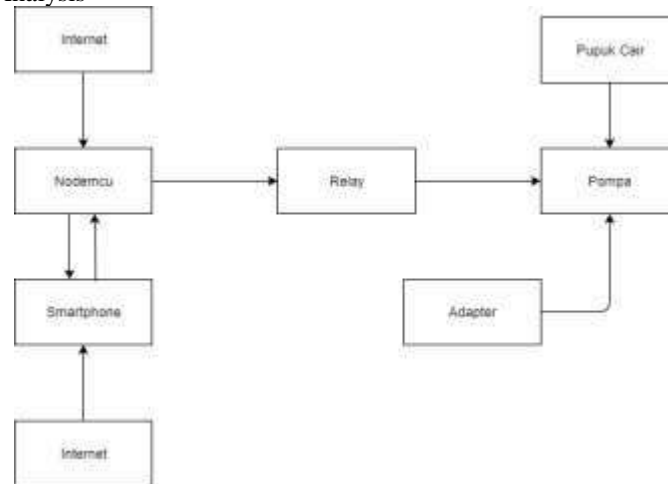


Figure 2. Research Design

3.2 Research Design

Research design is a design that is described by charts and certain symbols that use detailed process sequences and relationships between other processes in a program.

The following is a diagram depicting the design of a liquid fertilizer application for aglaonema ornamental plants:

The following is a description of the design diagram above:

1. NodeMCU
Used as a processing program that has been made to run devices that are already installed with the internet module.
2. Water pump
The water pump functions to push the liquid fertilizer that is in the bucket to the soil surface on the plants to be fertilized.
3. Relays
Relay has the function of controlling and flowing electric current. The relay functions to transmit electric current to the pump so that the pump can function to distribute fertilizer to the plants to be fertilized.
4. Telegram

Telegram is an application for IOS and Android OS that functions to control Arduino, NodeMCU, and the like via the internet. Telegram functions to send orders needed to apply liquid fertilizer to plants.

5. Adapters

Adapter is a circuit that is useful for converting high AC voltage to low DC. The adapter has a function to connect the tool that has been designed to the mains.

3.3 Use Case

To explain what is done by the user related to a process that is in the design of the tool, a use case diagram is made. At the design stage, this use case diagram will explain what things are done:

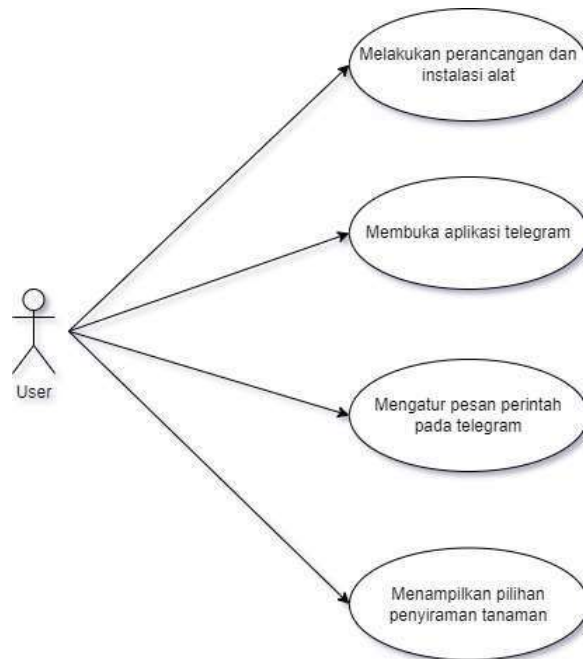


Figure 3. Use Case

4. IMPLEMENTATION

System implementation is the implementation of the results of the analysis and design that has been made before or an implementation process so that it is ready to operate. At this stage, the tools that have been made before will be implemented and will be tested.

4.1. Hardware Design Results

The following is the result of the hardware design of an automatic plant fertilizer application using the NodeMCU ESP8266, relay, and water pump which can be seen in the following figure:



Figure 4. Overall tool design



Figure 5. Automatic fertilization display

4. CONCLUSION

Based on the results and previous discussion, it can be concluded that, in this study resulted in:

1. By making this automatic liquid fertilizer application tool for ornamental aglaonema plants, it can be used easily and used remotely so that it can save the time and energy needed.
2. A tool for applying liquid fertilizer to aglaonema ornamental plants is made using NodeMCU ESP8266 as a microcontroller connected to the Telegram application as an application to control the liquid fertilizer application tool for aglaonema ornamental plants.

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