Analysis of Controlling and Monitoring System Growth Hydroponic Plants Grace

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1. Introduction

1.1 Background

Land on Earth at the present time more and more narrow, if people do not manage with optimal and efficient , Many urban residents who make a community greening or more known by the term *Go Green.*This community is in the form of re-greening the city, but not a few who are not interested at all in this green movement because they feel bothered to do so, not least from those who are lazy and afraid dirty.The last few years have been a lot of movement as a solution Hydroponics gardening for residents in urban areas. Hydroponics is the art plant with water media that works as a soil substitute alternative media. Hydroponics is derived from the Greek, *Hydroponic*meaning *hydro* means water and *ponous* means work. Many types of hydroponics quick to handle the narrow land as it can be arranged vertically, one of its kind is NFT*(NutrientFilm*Technique).

2. Basis Theory

2.1 Literature

To support this research used some theoretical basis of relevant and related to the subject as follows:Journal of research that first made by: Ida Syamsu Roidah entitled "Land Use Using System Hydroponics" Agriculture is a sector extremely important for society Indonesia.Sector agriculture as a source of income for some people, because large areas of Indonesia is partially ariculture. land farmers usually use land for the media. In developing the his farm. Result already become commonplace among the agricultural world. Seeing the number of land that is not used by the public for agricultural land, so this time there are other ways to take advantage of a narrow area in an effort to develop agriculture, by way of hydroponic cultivation. Hydroponics is the cultivation of agricultural land without the use of media, so that hydroponic farming is an activity that is run by using water as a medium for the lands. So that hydroponic farming system can make use of land narrow. Agriculture using hydroponics system does not require large tracts of land in the implementation, but in hydroponic farming business is only worth considering since it can be done in the yard of the house, roofs of houses and other land. The need for human food such as vegetables and fruits increased by the concomitant increase in the number population. But it is not accompanied by the growth of agricultural land even more cramped. Let alone in big cities covered agricultural centers to residential land use is not inevitable covered. So hydroponic system most appropriate for the business model of agriculture, as one of the solutions that should be considered to address the problem food. All types of crops can be grown hydroponic farming system, but usually many people who plant annual crops. Hydroponic cultivation methods is already widely used by some people to use the land that is not too large. Many advantages and benefits to be gained from this.System can benefit from the quality and quantity of crops, and can maximize existing agricultural lands because many. So not require large areas of the authors conducted a study entitled "land use using Hydroponics System".

The second study by Junaidi Apri study entitled "Internet Of Things, History, Technology and Implementation" used computer in the future be able to dominate the work of man and beat the man computing capabilities such as control electronic devices remotely using the internet, IOT (Internet Of Things) allows users to manage and optimize electronic and electrical equipment that uses the Internet. It is speculated that in the near future most of the communication between computers and electronic equipment capable of exchanging information between them, thereby reducing human interaction. It also will make more internet users increases with various facilities and internet services. IOT is the

main challenge in bridging the gap between the physical world and the world of information. Such as how to process the data obtained from electronic equipment with through an interface between the user and the equipment. Physical sensors collect the raw data from the scenario in real time and convert that into machine understandable format so that it will easily be exchanged between different forms of data formats (Thing) (Suresh Daniel & Aswathy, 2014).

A third study by research Fanny Astria, Mery Subito and Deny Wiria Nugraha entitled "Design of Ph and Temperature Measurement Based on Short Message Service (SMS) Gateway". Communications technology these days is growing rapidly. It is certainly easier for humans to communicate and get the latest information premises easily from one location. Seeing the current conditions, the use of communications technology in the monitoring system has been widely used even though there were many obstacles in the process of sending and receiving data. One use of communications technology in the form of a modem is how to monitor levels (pH) and temperature of a fish farming in order to get (pH) and temperature can be displayed on the computer. It aims to facilitate entrepreneurs pond for monitoring water conditions on their fish ponds. Measurement of acidity (pH) and temperature in the water is something very important in fish farming. Very so important to keep pH and temperature in the water remain stable. There are several methods to measure the acidity of a solution, such as by using a conventional method, using litmus paper or paper (pH). This method is less practical and less accurate measurement results and can only be used for one measurement only. This means it will increase costs. By looking at the above conditions created a new breakthrough ideas, to maximize the harvest of fish, it should be made a tool that monitors the levels (pH) and the water temperature in fish farms. So much easier for employers pond in monitoring levels (pH) and the temperature of the pond water.

The study, the fourth according to the research of Albert Gifson and Slamet entitled "Monitoring System room Distance With Sensor Passive Infrared Based Microcontroller AT89S52" Along with the development of science and technology in the field of control very fast this time, then so sooner development of tools semiconductors which is used for system security. A wide variety of shapes and models of rapid safety device is driven because of the high crime rate happen when this. Look frequent occurrence of crimes committed by thieves targeting both houses are being abandoned by their owners or not, it makes people uneasy when going to leave the house with uninhabited. Therefore the authors designed a "Space Remote Monitoring System With Passive Infrared Sensor Based Microcontroller AT89S52".

The fifth study according to the study Amanda Fahmi Ma'arif, Ikhlal Aldhi Wijaya, Nurulli Abdul Ghani, Aldhyth Sugiharto Wijaya.
"System Monitoring And Controlling Water Nutrition aquaponics Using Arduino Uno Web Based Server". Aquaponics is a sustainable farming system combines aquaculture and hydroponics system as an integrated system of cultivation simbiotics. In aquaponics system is an important factor affecting the development of the ecosystem is the degree of acidity (pH), which have a direct impact on the absorption of nutrients in the roots of plants and development of animals that live in the ecosystem , Another factor is the electroconductivity (EC), the ability to conduct electrical ions in the solution to the plant roots. The degree of acidity (pH) of water is normal for an aquaponics ecosystem ranged on the value of 6-7, for EC ranged in value of 0.8-1.2 ms / cm. The research produced a device capable of monitoring in the form of a web server as well as doing automation in the control of pH and EC levels. Based on test results obtained by the results of the sensor system PH Meter Kit Analog and Analog Electrical Conductivity Meter capable of monitoring water tank according to the standard measurement tool used is PH meter and EC Solution. The system is also able to control the changes that occur in accordance with the standard tank water PH and EC.

3. Analysis of Results and Discussion

3.1 Testing pH sensor

Testing pH electrode sensor is done by using several samples of different solutions. Before the measurement of the pH sensor output voltage as a reference for measurement of pH by using a pH

meter PH-207. The results of testing the pH electrode sensors are shown in Table 1. This test aims to test the sensors as well as to obtain a solution of acid and alkaline solution to be used.

Table 1. pH Electrode Sensor Testing

Larutan	pH	Vout (mV)
Air+HCl	2.4	120
Air+CH_3OOH	3.81	82
Buffer pH 4	4	75
Air+CH_3OOH	4.60	60
Air+CH_3OOH	5.57	30
Air+CH_3OOH	6.31	6.45
Buffer pH 7	7	-19
Air+ NH_3	7.30	-31
Air+ NH_3H	8.47	-78
Air+NaOH	9.51	-95

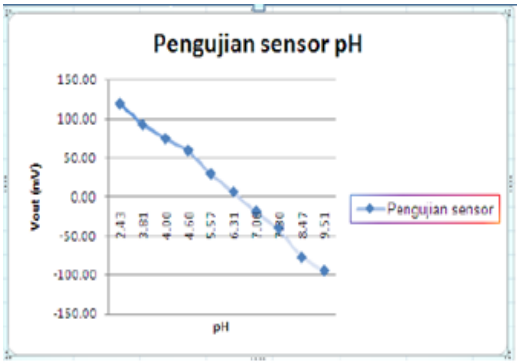


Figure 1. Grafik pH Electrode Sensor Testing

From the figure above shows that the measurement of sensor voltage linear with respect to the levels of pH. Where to pH below 7 has a positive voltage, for pH 7 (neutral) output is close to 0 volts and to a pH greater than 7 has an output voltage that is negative.

3.2 Testing Temperature sensor DS18B20

Table 2 Temperature Sensor DS18B20 Test Results

NO	Suhu (°C)	VoutDS18B20
1	27,9	29,5
2	28,5	304
3	29,6	309
4	30,7	321,5
5	31,8	330
6	32,9	341
7	34,5	361
8	35,6	372
9	36,7	383
10	37,8	391
11	39,5	403,7

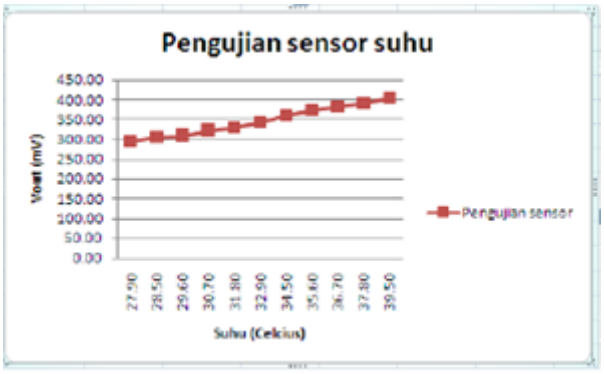


Figure 2. FigureTesting the temperature sensor DS18B20

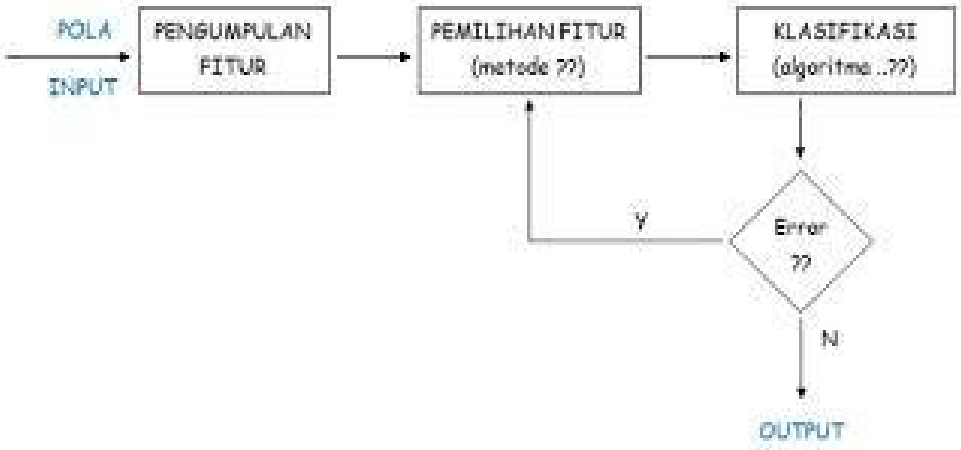
3.3 Sensor Testing TDS / EC of

The analog voltage output of the circuit sensor signal conditioner at TDS have been made comparable conductivity or inversely proportional to the resistance value. Because the conductivity value is proportional to the total dissolved solids (TDS) expressed in ppm, the sensor output voltage is also proportional to the value of TDS. After conditioning the signal, will be conducted TDS sensor calibration process. How calibration data retrieval is done by dipping the probe dimension 2x0,5 cm² as sensor electrodes in direct contact with the medium solution is measured by the distance between the electrodes of 1 cm. TDS sensor designed to enter into a measuring cup that has measured the value of TDS by using standard measurement tools namely TDS meter. From the recording has been done, sensor calibration data obtained in Table 3.

Table 3. TDS Sensor Calibration Data

Sample	Keluaran Sensor (mV)	Kalibrator Cond (µS/cm)	Kalibrator TDS (*ppm*)
1	151,37	73,3	36,5
2	1557,62	576	288
3	2387,7	782	391
4	3388,67	989	495
5	4091,68	1116	557
6	4638,67	1194	598

3.4 Classification of Patterns

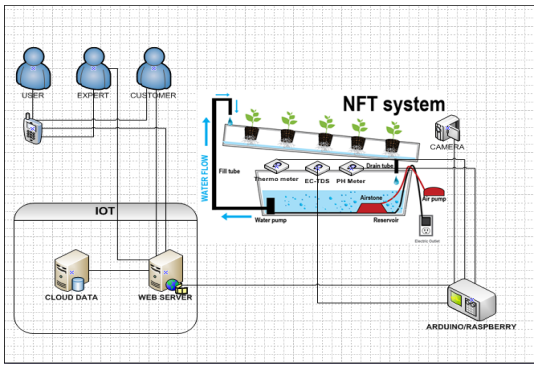


1. Collection featured here to collect vegetable crops that will feature in the input.
2. Feature selection here to choose vegetable crops will be classified.
3. Classification is to classify the types of vegetables where data on vegetable crops will be processed and will release output as the name of the plant, the leaf color, etc.

3.5 Internet of Things

Internet of Thing is a concept that aims to extend the benefits of Internet connectivity continues constantly. As for connected as data sharing capabilities, *remote*control, and includes also the objects in the real world.Basically, *the Internet of Things* refers to the object that can be uniquely identified as a virtual representation of the structure ofbased internet. Term *the Internet of Things*originally suggested by Kevin Ashton in 1999. How the *Internet of Things* is by exploiting a programming where each argument each argument command it generates an interaction between fellow machines are connected automatically without human intervention and within whatever. Internet that be a liaison between the interaction of the machine, while the man only as a regulator and supervisor in charge of operation of the device directly.The biggest challenge in setting up *the Internet of Things* is to draw up their own communication network, in which the network is complex, and requires a strict security system.

3.6 Working Smart Verture Running System



Picture above is a picture of the concept of IOT-based technology to be applied in the*Smart*verture.Here explanation of each of the existing system:

a. From all three of these sensors have their respective roles in which the temperature sensor function to know the state of the temperature there, the sensors EC / TDS serves to measure ppm in nutrient solution hydroponic which shows the concentration of a nutrient solution and pH meter sensor is used to measure the pH of a liquid as it affects the availability and absorption required for plant growth.
b. The camera serves to recognize objects existing plants as well as plant growth control etc.
c. Of 3rd sensor and the camera respectively existing transmit data to the Arduino or Raspberry then processed data is then sent to a *webserver* where the data later stored to cloud data.
d. Then there is the role of User, *Expert*,and *Customer* in which they can control, view, or watching from a distance via *a website*or smartphone.

3.7Vertical Agriculture Smart Architectural

WhereinThe concept here is a picture of based IOT technology to be applied in hydroponics. Here clarificatin of each of the existing system:

a. User book hydroponic device for those who do not yet have.
b. Then the user downloads the application contained hydroponic PlayStore.
c. If you already have a hydroponic device can perform simulations, run the application that was downloaded and then play it like a game hydroponic gardening, then the machine automatically follows the dictates through the application.

Users can access the website of hydroponics has been provided on the website the user can post a status about the development of the plant, can upload photos, can control development, etc.

4. Conclusions and Recommendations

4.1 Conclusions

Based on the results of the analysis and discussion undertaken on authomatically system controlling and monitoring the vertical smart agriculture with the concept of the Internet of things is expected to be able to control and monitoring can be performed automatically and in real time.

4.2 Recommendations

Suggestionafter this paper has obtained some of the things that can be a suggestion to do the design further, that in order to do improvement and development capability on the tool, so that the more intelligent by combining the other components. The goal is to maximize the system in order to minimize error is often the case when being used on the instrument and the system works, and can facilitate and create convenience for the user.

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