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# Monitoring Automation System Design Hydroponics Based on Chatbot

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## ABSTRACT
*The development of information technology has had a tremendous impact on human life. The impact is felt in almost all aspects of life, including agriculture. Farming with hydroponic systems has been widely developed, including the role of information technology to improve the quality and efficiency of crop management. A smart hydroponic system was designed to be able to detect and perform actions automatically. Various sensors are installed for multiple needs, such as checking nutrient levels and adding them when nutrients are running out, controlling water ph levels, controlling water temperature, controlling water levels, etc. To optimize this smart hydroponic system, facilities are needed for monitoring data on the system. This research makes monitoring of a hydroponic automation system based on a telegram chatbot. The chatbot can be obtained from the TDS sensor, Ph sensor, water level sensor, and temperature sensor. According to the incoming request, data from each sensor is sent via IoT with the ESP8266 MCU node and Firebased database to the chatbot. This study uses the waterfall software development method. The results showed that monitoring data on the hydroponic automation system could run well with an average time needed to access 1.44 seconds.*

***Keywords**: Monitoring; Hydroponic Automation; Chatbot; Google Apps; Firebase.*

## INTRODUCTION
The application of an automation system to hydroponic plants can help the energy and costs of plant maintenance. The automation system can work independently in fertilizing plants, controlling pH levels, water levels, controlling temperatures, and knowing harvest estimates. Even though everything can run independently, monitoring plant data is still needed to see the status of each sensor if there is a failure in the automation system. The system proposed in this work monitors water quality based on wireless sensor networks and the Internet of Things (IoT) (Encinas et al., 2017).

IoT traps integrated with firebase are used to read plant conditions in crop management and prepare the needs of each trap for use by users in trap management. A sound monitoring system can be done without being bound by time and place, anytime, anywhere. Chatbot technology is currently widely used in sending messages and data. This study aims to monitor plant data on a smart hydroponic system through a chatbot with the telegram application. Through this chatbot, information related to the status of hydroponic plants can be monitored easily via a smartphone or desktop telegram (Maulayya et al., 2019).

Telegram bot is a program that behaves like a regular chat partner with additional functionality. It performs predefined tasks independently and without user involvement. The term bot comes from the term robot (Hariono & Widya, 2019). Like the anonymous chat telegram bot, which is very popular this year. The telegram creation process is done through FatherBot (Sujono & Herlambang, 2021). In the research, the name of the bot created is Smart_hidro_Bot. The bot will later be managed through google apps with data sources from firebase that have been synchronized with nodeMCU-ESP32 via the internet of things (IoT) (Kurniawan & Lestari, 2020).

Internet of things in current technological developments can be interpreted as communication between one trap to another using the internet (Denanta et al., 2020). IoT is a concept where internet connectivity can rotate information with objects around it (Wulandari et al., 2020). Many predict that the internet of things (IoT) is "the next big thing" in the world of internet technology. The tool used to

transmit information via IoT in this research. This Hydroponic Plant Monitoring System was made by supporting ESP8266 internet access (Doni & Rahman, 2020).

It serves to group data and makes it easier to identify data. The database will display data according to instructions from the user about information quickly with the help of database management systems (DBMS) software. Firebase is a service from Google to make it easier for application developers and develop their applications. Firebase Baa (Backend as a Service) is a solution offered by Google to speed up developer work. Data from various sensors can be stored easily through this online database (Novelan & Amin, 2020).

Cultivation using water without using soil by emphasizing the nutritional needs of plants, hydroponic water needs are less than the water requirements for cultivation with soil planting media. Hydroponics is one of the agricultural methods that are often applied by modern farmers today. This method has many advantages, one of which can be planted in a limited place and only requires growth media using water and nutrients (Syahrir et al., 2020).

The TDS sensor is a sensor to measure the number of dissolved substances in a liquid inorganic ion, compounds and colloids in water calculated in 1 ppm (parts per million) (Kuala et al., 2019). The pH sensor is used to measure the hydroponic nutrient solution that is acidic or alkaline. In general, the hydroponic method is carried out using water media, where the water conditions that need to be considered are water supply, oxygen, nutrients and acidity (pH) (Sotyohadi et al., 2020). The temperature sensor is used to measure the water temperature in plants. At the same time, the temperature controller is a sensor that works to cool the water temperature if it is too high. The water level sensor is used to check the volume of water in the nutrient tank. This sensor determines whether the volume of water will be increased or maybe excess. (Megawati et al., 2020)

## METHOD

This research method uses a software development method with the waterfall method with several stages, as shown in Figure 1.

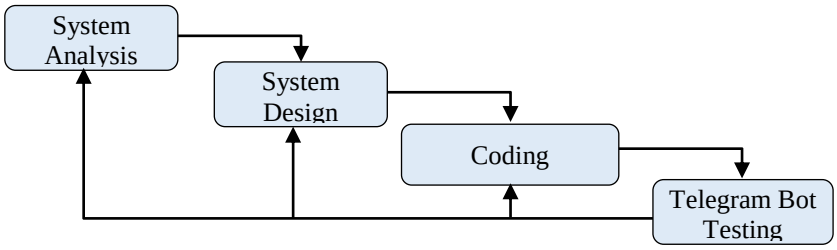


**Figure 1.** Stages in The Waterfall Method

The method in this study starts from the System Analysis stage. This stage aims to analyze the system requirements; in this case, the research is to conduct literature studies, interviews, and observations of the hydroponic automation system that already exists. The next stage is System Design, which is the stage by making a database design on firebase, designing a menu/request chatbot. The method of this system is made in the form of a diagram which can be seen in Figure 2.

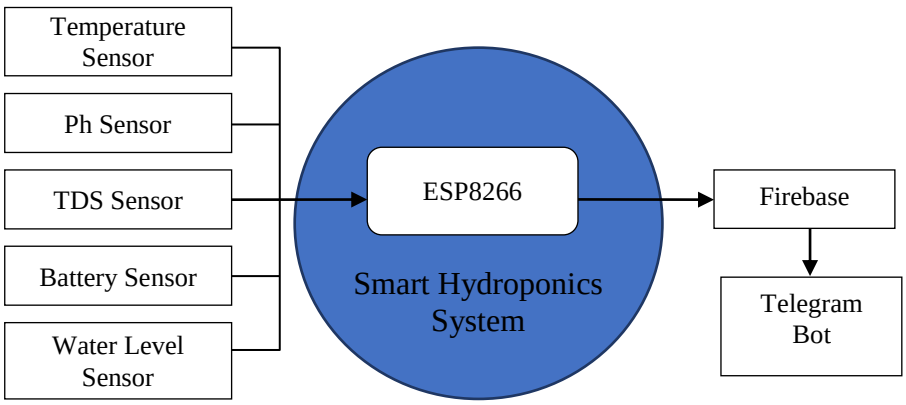


**Figure 2.** Chatbot-Based Hydroponic Automation System Monitoring Design

The next stage is coding. At this stage, the Arduino Uno and ESP 8266 coding is carried out using the Google Apps script and using Google Drive to save the script. Making this script begins with making code.gs to enter the Telegram chatbot token. Next, do the setting process.gs. Process gs is a process to run sensors connected in firebase and then sent via telegram bot.

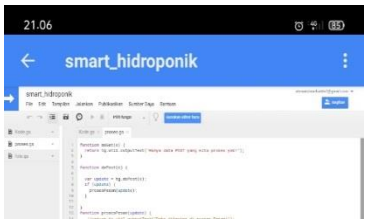


**Figure 3.** Code.gs Interface Display

The last stage is Telegram Bot Testing. At this stage, testing of the telegram bot program is carried out to ensure the system is running correctly according to the request on the chatbot.

## RESULT AND DISCUSSION

The telegram bot that has been created in the research is smart_hidro which can be searched through the Telegram application. To use this chatbot, the first step is to enter the smart_hidro chatbot. This menu or command is used to determine whether the bot is working or not. This menu will automatically open when the user first logs in to the Telegram Bot. The command from this menu is /start, then send. After entering the command, you will get a ready reply.

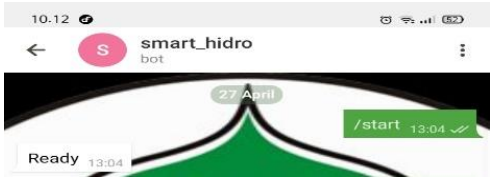


**Figure 4.** Display The Start Menu

This menu is used to display all information on each sensor. To use this menu can be typed with the command /sensor on the telegram. The results of this command will be replied with TDS data information in ppm units, Ph data in Ph units, water temperature data in Celsius units, water level data in per cent units, alkaline status is the pump status for alkaline substances (on/off), acid status is the pump status for acidic substances (on/off), the water pump status is the pump status to increase the volume of water (on/off), the nutritional status is the pump status for adding nutrients with on/off conditions, Peltier status (on/off), battery level to determine the percentage of battery contents, panel voltage data in volts, battery voltage data in volts, current data used in amperes, plant names, planting date, harvest date, current date, and estimated harvest.


**Figure 5.** Sensor Menu Display

TDS Menu This menu is used to determine how much TDS is on the hydroponic system and /tds to check the TDS value. After sending the command, you will get a reply in a TDS value in ppm units.

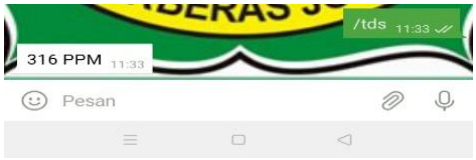


**Figure 5.** TDS Menu Display

The Ph menu is used to obtain information on the level of acidity or wetness in a nutrient solution. This menu is related to acid pump status data and base pump status data. If the pH value is too small, the base pump will turn on and off at ideal pH conditions. Meanwhile, if the pH value is too high, the acid pump will turn on and off at the perfect pH level for hydroponics.

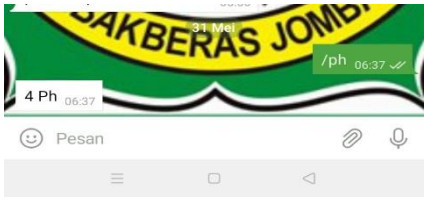


**Figure 6.** Ph Menu Display

Water Level is to find out how much water volume in the nutrient reservoir. The data displayed is the percentage of water in the pool. This water level information is related to the condition of the water pump. If the water level is low (<50%), the water pump will turn on to add water to the nutrient reservoir, and the pump will turn off automatically after the water level is 100%. This menu can be accessed by typing the command /lair on the telegram bot.

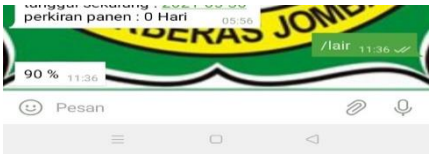


**Figure 7.** Display The Water Level Menu

The temperature menu is used to obtain information on the water temperature in the Nutri reservoir. Temperature data is displayed in Celsius units. The temperature menu has a relationship with the Peltier status. If the temperature is too hot from the provisions, then the Peltier status becomes active (on). Peltier function to help cool the water. The Peltier status will turn off (off) when the water temperature is considered cold.

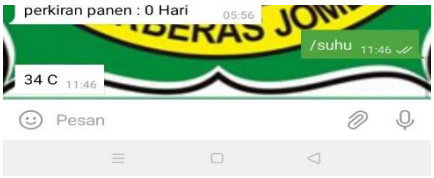


**Figure 8.** Display Temperature Menu

This test is carried out to determine the time required by the telegram bot to process the requested information. The data tested include the sensor menu, TDS menu, Ph menu, water level menu and temperature menu.

**Table 1.** Telegram bot test results

| Test | Sensor Menu (second) | TDS Menu (second) | Ph Menu (second) | Water Level Menu (second) | Temperature Menu (second) |
|---|---|---|---|---|---|
| 1 | 2 | 1.5 | 1 | 1.5 | 1.5 |
| 2 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| 3 | 2 | 1 | 1 | 1 | 1.5 |
| 4 | 2 | 2 | 1 | 1 | 1 |
| 5 | 2 | 2 | 1 | 1.5 | 1 |
| Average | 1.9 | 1.6 | 1.1 | 1.3 | 1.3 |

The test results show that the average time required to process each menu is relatively not much different. The least average time on the Ph menu is 1.1 seconds, followed by the water level menu of 1.3 seconds, the temperature menu is 1.3 seconds, the TDS menu is 1.6 seconds, and the longest average time is the sensor menu of 1.9 seconds. . On the sensor menu it takes the most time because the most information sent is all sensor data. From the test data, it can also be concluded that the average time required to obtain information from the telegram bot from all available menus is fast, which is 1.44 seconds.

## CONCLUSION

Based on the results of the implementation of tests carried out using the internet of things with google apps, you can find out the maximum results and know the harvest automatically. You can monitor the hydroponic system remotely without having to see it directly. The results of the telegram bot testing went well; the time needed to obtain information was fast, namely 1.44 seconds on average. With the telegram bot, it is easier for humans to monitor the growth of hydroponic plants automatically.

The smart hydroponic system design results found some problems in taking photos that still could not be displayed because messages from firebase to telegram could not be converted into images, so the display on a telegram was in the form of string data images sent.

## REFERENCES

Denanta, P., Perteka, B., Piarsa, I. N., & Wibawa, K. S. (2020). Sistem Kontrol dan Monitoring Tanaman Hidroponik Aeroponik Berbasis Internet of Things. *Merpati*, *8*(3), 197–210.

Doni, R., & Rahman, M. (2020). Sistem Monitoring Tanaman Hidroponik Berbasis Iot (Internet of Thing) Menggunakan Nodemcu ESP8266. *J-SAKTI (Jurnal Sains Komputer dan Informatika)*, *4*(2), 516–522.

Hariono, Th., & Widya, M. A. A. (2019). Implementasi Telegram Bot Api Untuk Informasi Kehadiran Siswa di Sekolah. *E-Prosiding SNasTekS, September*, 173–186.

Kuala, S. I., Siregar, Y. H., & Susanti, N. D. (2019). Sistem Kendali Jumlah Zat Padat Terlarut (TDS) pada Larutan Nutrisi Menggunakan CCT53200E. *Jurnal Riset Teknologi Industri*, *13*(1), 22. https://doi.org/10.26578/jrti.v13i1.4256

Kurniawan, A., & Lestari, H. A. (2020). Sistem Kontrol Nutrisi Floating Hydroponic System Kangkung (Ipomea reptans) Menggunakan Internet of Things Berbasis Telegram. *Jornal Teknik Pertanian Lampung*, *9*(4), 326–335.

Maulayya, F. R., Hariono, T., & Arifin, M. Z. (2019). Rancang Bangun "Telegram Bot Api" Untuk Layanan Sistem Informasi Akademik Di Unwaha Menggunakan Metode Long Polling. *Saintekbu*, *11*(1), 68–77. https://doi.org/10.32764/saintekbu.v11i1.360

Megawati, D., Masykuroh, K., & Kurnianto, D. (2020). Rancang Bangun Sistem Monitoring PH dan Suhu Air pada Akuaponik Berbasis Internet of Thing (IoT). *TELKA - Telekomunikasi Elektronika Komputasi dan Kontrol*, *6*(2), 124–137. https://doi.org/10.15575/telka.v6n2.124-137

Novelan, M. S., & Amin, M. (2020). Monitoring System for Temperature and Humidity Measurements with DHT11 Sensor Using NodeMCU. *International Journal of Innovative Science and Research Technology*, *5*(10), 123–128.

Sotyohadi, Dewa, S. W., & Somawirata, K. I. (2020). Perancangan Pengatur Kandungan TDS dan PH pada Larutan Nutrisi Hidroponik Menggunakan Metode Fuzzy Logic. *ALINIER: Journal of Artificial Intelligence & Applications*, *1*(1), 34–43. https://doi.org/10.36040/alinier.v1i1.2520

Sujono, S., & Herlambang, W. A. (2021). Rancang Bangun Pendeteksi Pengaman Pintu Dan Jendela Berbasis Internet Of Things (IoT). *Exact Papers in Compilation (EPiC)*, *3*(2), 307-314.

Syahrir, Syarif, iIyas M., Bastian, A., & Mahjud, I. (2020). Rancang Bangun Monitoring Nutrisi Tanaman Hidroponik Berbasis Internet of Things ( IOT ). *Seminar Nasional Penelitian & Pegandian Kepada Masyarakat 2020*, 62–67.

Wulandari, P. A., Rahima, P., & Hadi, S. (2020). Rancang Bangun Sistem Penyiraman Otomatis Berbasis Internet of Things Pada Tanaman Hias Sirih Gading. *Jurnal Bumigora Information Technology (BITe)*, *2*(2), 77–85. https://doi.org/10.30812/bite.v2i2.886.