

DESIGN AND DEVELOPMENT OF AN AUTOMATIC WATERING SYSTEM BASED ON BASH SHELL WITH OPENWRT PLATFORM ON CHILI PLANTS

Irham Son'Aniy

Department of Informatics

Universitas Islam Negeri Sunan Kalijaga

Yogyakarta, Indonesia

irhamsony1993@gmail.com

Bambang Sugiantoro

Department of Informatics

Universitas Islam Negeri Sunan Kalijaga

Yogyakarta, Indonesia

Bambang.sugiantoro@uin-suka.ac.id

Abstract—Indonesia is an agrarian country. Because of the wide agriculture area, Indonesia became the exporter country in agriculture sector. Nowadays, the developments in every fields are always increasing. One of those field is technology. Technology should give some contributions which can develop the agriculture field. One of the contribution that can be done is automatic watering system on chili, so it become easier for the farmers to control the chili. The automatic watering system use internet technology to control a device from distance. This chili's automatic watering system based on bash shell with openWRT platform. This system was made to help farmers watering the chili automatically. The methods that used in this system can be based on the soil's moisture, time, or manual. Soil's moisture based method used soil moisture, that tool can measure the ground's moisture and automatically send order to the device. This system can reduce delays of the chili's daily treatment, so the chili's production will be increasing. This system development used SLDC (Systems Development Life Cycle) method. Automatic watering system with openWRT platform can help farmers in watering and controlling chili. The system can perform the function of automatic watering feature and functionality can run well.. (*Abstract*)

Keywords: *Automatic Watering, OpenWRT, Router Wireless.*

I. INTRODUCTION

Indonesia is one of the world's top agricultural countries. Indonesia has great potential in the world of agriculture, considering that one of the biggest contributors to GDP is the agricultural sector, with 14% in 2007. However, the reality is that the agricultural sector is also a sector where there are still many people experiencing poverty in our homeland. About

40% of the poor in Indonesia are dominated by those who work in agriculture, agriculture and fisheries (the results of the 2008 Bank Indonesia middle study). This is really very unfortunate because Indonesia is a country that is given an abundance of natural resources because it lies on the equatorial line that makes this nation have a tropical climate.

For Indonesians who are very minimal in technological development, especially in agriculture, innovation is clearly needed so that this nation can compete in the international arena. The existence of technology that can help human work to become more "efficient and effective" clearly needs to be developed in the agricultural sector. The lack of tools that can be used to help their performance become things that should be underlined. If only there was a tool that could help them to do some of the work. In addition to providing more time for farmers to cultivate other land and clear weeds, farmers will certainly get more and more quality crops.

II. PURPOSE

The purposes of the research are :

1. Design an automatic watering system based on bash shell with the openwrt platform on chili plants.
2. Development an automatic watering system based on bash shell with the openwrt platform on chili plants.

III. METHODOLOGY

A. Preliminary Research

The research sed is the design and analysis of prototyping experiments, namely the design of the system to fulfill the needs of farmers that are carried out repeatedly. Make a prototyping system according to the design created. Evaluate the prototyping by analyzing.

B. Data Collection

To get maximum result we do pre-data collection first, using the interview method. To outline the conditions and the needs of farmers. Furthermore, using the literature method to see the recent research that has been done along with a review of the advantages and disadvantages of each system and research conducted.

1) Interviews

Interviews were conducted to chili planters as actors and system user. Interviews were conducted to obtain accurate data for the development of the system in accordance with what was expected, and at the same time conduct system testing.

2) Study of Literature

Search for information from books, internet, journals and articles about automatic watering systems and the application of technology to farmers. Studying similar works as a reference in building an automatic watering system.

C. System Development Needs

1) The hardware used in this research, among others :

- One mini-Router (Gl.inet)
- One Modem
- One Webcam
- One RTC
- One Arduino
- One Relay
- One Water Pump
- One Soil Moisture Sensors

2) The software used in this research, among others :

- Openwrt as a router firmware.
- WinSCP as a router file access media.
- Putty as a remote SSH and Telnet configuration.
- Sublime Text Editor as a medium for developing system script writing.
- Mozilla firefox as user interface system.

3) The programming languages used in this study include :

- Bash Shell as a main programming on openwrt
- CGI as user access programming.

D. System Development Method

System development method refers to the SDLC method (Development Life Cycle system. SDLC is a phased approach

to analyzing and building system designs using cycles that are specific to user activities (Kendall & Kendall, 2006). System Development Life Cycle (SDLC) is also central the development of an efficient information system SDLC consists of 4 (four) key steps namely, planning and selection, analysis, design, implementation and operation (Valacich, George, & Hoffer, 2012).

In its implementation, the bash shell programming language and SQLite database are used as media for storing data and HTML programming languages related to CGI, CSS, and JavaScript to make the system interface.

IV. RESULT AND DISCUSSION

System functionality testing consist of 3 scenarios based on soil moisture, based on scheduling, manually.

TABLE I. Functionality Testing

Test	Sensor Values	Relay	Image	Log
1	3	Not active	No pictures	Unsaved
2	170	Not active	No pictures	Unsaved
3	170	Not active	No pictures	Unsaved
4	358	Active	Take a picture	Saved
5	401	Active	Take a picture	Saved
6	507	Active	Take a picture	Saved
7	508	Active	Take a picture	Saved
8	564	Active	Take a picture	Saved
9	517	Active	Take a picture	Saved
10	523	Active	Take a picture	Saved

From the test results of scenario 1 above, it can be concluded in general that based on soil moisture can run according to the value of the sensor that has been applied, the author gives dry soil moisture value of less than 200, after checking the value of the sensor sent by Arduino through the serial port can be sent properly to the openwrt mini router.

TABLE II. System Testing Functionality Result

No.	Statement	Y	N
1	The login process is running	10	0
2	The logout process is running	10	0
3	Watering schedule input process runs	10	0
4	Watering schedule delete process runs	10	0

5	Watering process based on <i>time</i> running	10	0
6	Watering process based on soil moisture running	10	0
7	The watering process manually runs	10	0
8	Automatic watering systems can be accessed by local network (LAN and Wifi)	10	0
9	Automatic watering systems can be accessed by public network (Internet)	10	0
10	The results of capturing images by the webcam can be accessed via web	10	0
Total		100	0
Percentage		100%	0%

TABLE III. Interface Testing Result

No.	Statement	SA	A	N	DA	TDA
1	The system has an easy navigation	0	6	3	1	0
2	User friendly	0	4	6	0	0
3	Good performance	2	2	6	0	0
4	Easy on controlling system	0	6	4	0	0
5	Images can be seen clearly	0	0	5	5	0
Total		2	18	24	6	0
Percentage		4%	36%	48%	12%	0%

The results of testing the automatic watering system based on system functionality concluded that most respondents said the system's functionality was running well. From the test data it is known that 100% states that the functionality is running well, and no one stated otherwise.

The results of the system interface testing obtained the conclusion that most respondents agree with the system that has been made. Test data shows that 4% strongly agree, 36% agree, 48% are neutral, and 12% disagree. Based on the two tests above, it can be concluded that this automatic watering system can running well.

CONCLUSION

After doing research in the previous chapter, it can be concluded that:

1. The system built has been able to run a sprinkler according to the specified soil moisture, based on a predetermined time and manually.
2. The system built has been able to provide information about the value of soil moisture.
3. The system built has been able to provide information on the state of the land with the last picture of watering.
4. The system can be accessed locally via a WIFI connection and widely via the internet. The system design can be implemented into the application but has not been able to be implemented in the real world because the design of this system only discusses the functions of automatic watering supporting features, not to design the needs of chili farmers on agricultural land.

ACKNOWLEDGMENT

As a respect and profound gratitude to Father, Mother and all members of the extended family of writers, who have provided encouragement, support and prayer. Mr. M. Didik R. Wahyudi S.T., M.T., as an academic supervisor who has guided the Writer and his students well. All Bapak / Ibu Informatics Department lecturers who have provided their knowledge and cooperation during the lecture period. Friends of arms who always give enthusiasm and prayer during completing this research.

REFERENCES

- [1] Andi.2008.*Administrasi Jaringan Menggunakan Linux Ubuntu 7*. Wahana Komputer Yogyakarta
- [2] Cooper, Mendel.2011. *Advanced Bash-Scripting Guide*. Linux Documentation Library.
- [3] Junaidi (2015) *Desain Penyiram Taman Otomatis Tenaga Surya Mengacu Pada Kelembaban Tanah*.Surakarta : Universitas Muhammadiyah Surakarta.
- [4] Malvino, Albert Paul Ph.D, (1981) *Prinsip-prinsip Elektronika*, Erlangga, Jakarta, Agustus.
- [5] Nuryadi, Agus (2015) *Prototipe Penyiraman Tanaman Otomatis Tanaman Cabai Berbasis Mikro-kontroller ATmega16*. Yogyakarta : UIN Sunan Kalijaga.
- [6] Onno W Purbo, Protus Tanuhandaru dkk. *Jaringan Wireless di Dunia Berkembang. Panduan Praktis Perencanaan dan Pembangunan Infrastruktur Komunikasi yang Rendah*. Yogyakarta : Andi. 2011.
- [7] Pressman, Roger. *Software Engineering: A Practitioner's Approach*. McGraw-Hill, New York. 2005.
- [8] Romi, Agustian. *Perancangan Sistem Keamanan Rumah menggunakan Perangkat Nirkabel berbasis Openwrt*. Surabaya : Universitas Wijaya Kusuma. 2011.
- [9] Silwanus Wakur, Jansen (2015) *Alat Penyiram Tanaman Otomatis Menggunakan Arduino Uno*.Manado : Politeknik Manado.
- [10] Suci Perdani, Lucyana (2014) *Perancangan Prototipe Penyiram Tanaman (Watering Plant) Otomatis Pada Tanaman Mawar*

Menggunakan Metode Fuzzy Logic Berbasis Mikrokontroler. Padang : Universitas Andalas.

- [11] Wiki. *About OpenWRT*. <https://wiki.openwrt.org/about/start> (accessed Maret 23, 2017)
- [12] Wiki *gl.inet* *OpenWRT*, https://wiki.openwrt.org/toh/gl-inet/gl-inet_64xx(accessed Maret 23, 2017)
- [13] Wagito. *Jaringan Komputer, Teori dan Implementasi Berbasis Linux*. Yogyakarta : Gaya Media. 2007.
- [14] Yuliardi, Rofiq. *BASH Scripting Untuk Administrasi Sistem Linux*. Jakarta: Elex Media Komputindo. 2002.