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The Design Of The Dryer Shoes Automatic Based On Moisture Uses The Method PID

Okta Andrica Putra[1],Harkamsyah Andrianof*[2,], Aggy Pramana Gusman[3]
[1,2,3] Sistem Komputer, Universitas Putra Indonesia "YPTK" Padang, Indonesia

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*Correspondence should be addressed to harkamsyah.andrianof@upiyptk.ac.id

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Abstract

This research is in the form of an automatic shoe dryer that can be used when sunlight is not available and users want shoes to dry quickly. This research was conducted to determine the water content before and after drying and to determine the water content lost in canvas-based shoes. The results obtained in the form of a shoe dryer A smartphone is used as the initial controller of the drying process using Bluetooth HC-05. The DHT-22 sensor is used as a temperature and humidity detector in the shoe drying room. And there are several other components as output media, such as a hair dryer that is used to carry out the drying process, a 16X2 LCD that is used to display information on the ongoing process and displays the temperature and humidity of the air around the drying room, a servo motor as a door lock and opener, and a UV lamp. as a germ killer that remains when the shoes have finished drying. The temperature of the shoe dryer is set at 40 oC, with drying times of 45 minutes, 60 minutes, and 90 minutes. The effect of the best time variation is that at 90 minutes, the amount of water content that has been removed is 170 grams. The results showed that the tool could function well and was developed for a larger scale.

Keywords: Dryer, shoe dryer, smartphone, drying time

INTRODUCTION

Shoes are a type of footwear that usually consists of soles, heels, hoods, ropes, and tongues that serve as footwear [1]. In 2009, the rate of shoe consumption in Indonesia increased by 20%. With the increase in shoe consumption rates, the opportunity to improve shoe treatment has a very promising prospect.

In Indonesia today, a large number of individuals wear shoes for support or as footwear. There are two seasons in Indonesia: the dry season and the rainy season. There are occurrences that happen during the rainy season that can only be experienced during that time. For those who are operating outside the home while wearing shoes and riding a motorcycle, this behavior will be a concern. Due to the demands of their jobs, it's probable that they will need to carry on with their tasks even if it starts to rain because they can't prevent it. The shoes must be dried before being worn again if they are moist. But if it's rainy outside, it will be challenging to get the sun to warm up enough to dry those wet shoes[2].

During this time, the shoe treatment in Indonesia if the shoe is wet still uses conventional means that it is sunbathed by utilizing the sun's heat. Because of the unpredictable availability of solar energy, especially during the rainy season, the process of drying with solar energy cannot be controlled. Therefore, another alternative is needed to dry the shoes. [2].

Drying using a mechanical device (an artificial dryer), which uses additional heat,

has several advantages, including the fact that it is not weather dependent and can be done at any time. This mechanical drying requires energy to heat the dryer, offset the heat that comes out of the device, evaporate water, and move the air. [3].

It is for this reason that the author is interested in designing, creating, and conducting research on shoe dryer tools with a fan and heater or heater elements as a heat source. The machine is controlled by the Arduino, which gets input in the form of Bluetooth and temperature and humidity sensors. The output of the Arduino contains ultraviolet light, a heater, and a fan. With the automatic shoe dryer, it is expected to facilitate employees or housewives in the process of drying shoes..

RESEARCH METHODS

A research framework is a structured concept that will be carried out in research. The stages will be done in a structured and elaborate manner, as shown in figure 2.1 below.

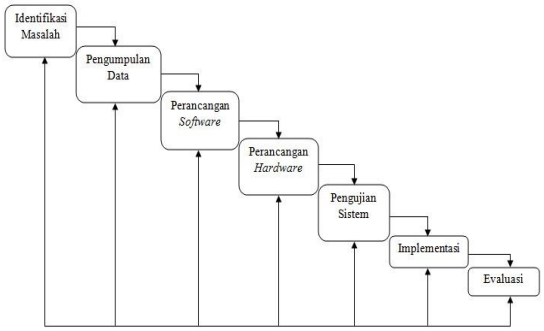

Figure 1: Research Framework

A. Identify Problems

Identification of problems is the initial stage of the design and development of a system, because at this stage the performance of the system will be measured and evaluated. In identifying problems, it must first be aware of and understand the system to be created. To analyze, it is necessary to have data relating to the system to be designed and created.

In identifying problems with an automatic shoe dryer system based on moisture using this PID method, we sought some problems that will likely be faced during the study so that the formula for these problems can be obtained.

B. Data Collection

Data is an important part of research for the sake of research. Data collection can be done by conducting studies and testing existing concepts and related research. In collecting data, the testing of components used in automatic shoe dryer systems is designed based on existing concepts. In this case, testing of the PID method will be used.

C. Software Design

Software design is the stage that is done for the design and creation of software in the form of programs that will later be applied to the system.

At this stage, the steps, or algorithms, will work on the system. To facilitate software design, context diagrams, DFDs, and flowcharts are used to make the system clear and according to the purpose for which it was created. Then the software is created based on the design by creating programs per module used, until the program is created in its entirety according to the way the system has been planned using the C programming language with the Arduino IDE software on the Mega2560.

D. Hardware Design

Hardware design is the stage for the physical design of the system and is implemented into the physical form of the system in real terms. In this stage, the software is finished and has worked well, then it is implemented into the form of hardware with software already in it.

Hardware design is done with the help of special software for three-dimensional design, namely Google Sketchup. Google Sketchup is a software developed by Google, Inc. for graphic design, especially three-dimensional modeling. Design results will be attached in the next chapter.

After all the physical designing of the tools is completed, the physical manufacture of the tools is done according to the design that has been made. Based on the designs that have been made, the physical tools are built according to the needs and consider the dimensions of the tools and components used, namely the bluetooth module, DHT22 sensor,

LCD, UV light, fan, servo motor, and heater hair dryer.

E. System Testing

At this stage, the system has been created. Then the system is tested and analyzed to determine whether it is running as it should in accordance with the design before it is implemented. This test is done on the software, hardware, and system parts as a whole.

In software testing, it is done on programs that have been created based on the design of the previous software, i.e., programs created using the programming language C. While in hardware testing, testing is done to the physical performance of the tool that has been designed to determine whether the physical tools that have been created can be implemented later, including testing the components of the system in them.

In overall system testing, the system is run with the current state of hardware and software combined so that complex systems are formed. Testing is done by running the system while considering the design of the previous system as a reference, where the system is tested as a device that can be controlled with a smartphone and automatically dries shoes.

F. Implementation

The implementation stage is the stage in which the system has been created and is ready to be operated. At this stage, the system must be completed. Initial tool implementation must be in accordance with the purpose of the research; then, the system will be implemented at the right target. Based on this study, automatic shoe dryer tools based on moisture using PID methods that have been created and tested will be implemented to help the community dry shoes when the weather is cloudy or rainy. At this stage, the PID control system will be implemented to control the temperature in the dryer room of the shoe, so that as long as the tool is implemented, it can dry the shoe so that it can be done evaluating the performance of the tool based on the need.

G. Evaluation

Evaluation is a much-needed stage for the system that has been created according to the needs of the user. The main objective of the evaluation stage is to look at the conformity between the performance of the tool and the needs, so that it can solve the problem.

At this stage, the system that has been implemented is viewed thoroughly, from the components used to the tool's performance. If the implementation of the tool has obstacles or inconsistencies in the performance of the tool with the design of the previous system, which is how to make the tool capable of drying the shoes properly according to the needs, then improvements are needed to the tool based on the results of the evaluation as much as possible.

RESULTS AND DISCUSSION

Overall, the network has worked well, namely the minimum system: DHT22 sensor, servo, Bluetooth, LCD, and Arduino Mega 2560. The stages in overall circuit testing are as follows:

1. Connect the adapter on the tool to the AC current. After that, open the app for the shoe dryer that has been installed on the Android smartphone.

Figure 2: Living Tools

Figure 3: Application Display Tool Shoe Dryer

2. Connect Bluetooth on your smartphone with a shoe dryer that has been installed. By pressing the Bluetooth button and

selecting the Bluetooth dryer tool that has been named before.

Figure 4: Bluetooth Relationship Display

3. Press the door open button to open the servo-driven door stake.

Figure 5: Servo goes down and opens a peg door.

4. Enter the shoes to be dried and place them on the stands already provided.

Figure 6: Shoe Placing Process

5. Re-close the door and press the "Heater ON" button to activate the heater and hair dryer, and the shoe drying process starts.

Figure 7: Drying process is ongoing

6. Once the temperature reaches 40^0C, the heater will die and the fan will live to lower the temperature in the drying room of the shoe.
7. Once the temperature drops to 34^0 C, the heater will come back to life and the fan will die.

Figure 8: Living fan and dead heater

8. It will continue to repeat until the shoes can be declared dry.
9. After the shoe feels dry, press the UV ON button on the application to kill the remains of bacteria left on the shoe.
10. Press the OFF UV button to turn off the UV light.

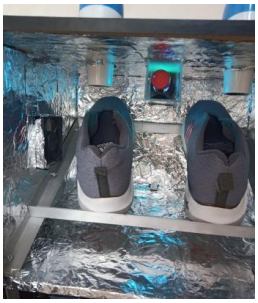

Figure 9: live UV lamp

11. To turn off the power cable, unplug the tool from the resource, then press Out on the application to close the application.

Fabric Basic Shoe Testing Results

The following is data obtained from the shoe drying testing process.

Test	Time	Temperature Drying (ºC)	Mass Shoe Wet (gram)	Mass Shoe After drained (grams)	Mass Shoe After drained (grams)
1	45	40	710	625	85
2	45	40	720	630	90
3	45	40	720	630	90
	Rate		716,6	628,3	88,3
1	60	40	720	585	135
2	60	40	720	580	140
3	60	40	725	590	135
	Rate		721,6	585	136,6
1	90	40	725	560	165
2	90	40	725	565	160
3	90	40	720	550	170
	Rate		723,3	558,3	165

Table 1. Testing Results for Fabric Base Shoes

Testing Results of Shoe Dryer Tools Using Kuesisoner

This test is done by providing a questionnaire to some audience members to determine whether the tool is running well or not.

NO	Questionnaire Question List	Score	Point
1	The drying room temperature reading is then displayed on the LCD	33	94,2
2	The drying room humidity reading is then displayed on the LCD	32	91,4
3	The shoe dryer can be connected to applications that have been installed on an Android phone	35	100
4	The servo motor can unlatch the door when the button	33	94,2
5	"Open Door" is pressed	33	94,2
6	The servo motor can close the door peg when the button	35	100
7	"Close Door" is pressed	35	100
8	The heating element of the Hair dryer turns on when the "Heater ON" button is pressed	35	100
9	The heating element of the Hair dryer turns off when the "Heater Off" button is pressed	35	100
Overall Tool Work Value Results		97,1	

Table 2. Testing Results Using Questionnaires

From the table above, the score was obtained from some questions about the passage of sensors and components that exist on the dryer shoe. The score shows the satisfaction of the audience with this shoe dryer.

CONCLUSION

Based on the manufacture of this automatic shoe dryer, it can be concluded as follows:

1. Automatic shoe dryer tools have been successfully made and have worked well.

2. Changes in temperature and humidity can be detected using the DHT-22 sensor.

3. The temperature stability for the drying process is approximately 400 °C.

4. The app designed using MIT App Inventor can run well.

5. The average time required for drying shoes is approximately 45 to 90 minutes.

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