DESIGN AND IMPLEMENTATION OF OBJECT SENSORS ON ASSISTIVE DEVICES FOR THE VISUALLY IMPAIRED

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Abstract
Blind is a general term used for the condition of someone who experiences problems or obstacles in their vision. Assistive tools for the blind using stainless steel sticks or using paralon sticks that are designed to be sticks, which are white with a sensor in the middle (Dedy irawanRio & Wulansari, 2021). As a result of the loss or reduction in the function of their sense of sight, blind people try to maximize the function of their other senses such as touch, smell, hearing, and so on, sometimes they also find it difficult to find their way from one place to another using the traditional cane (Muhammad, 2018). The cane functions as a guide and to make daily activities easier and also as a cane as a substitute for eyes for the blind (Dedy irawanRio & Wulansari, 2021). But the stick also still has weaknesses inside. Traditional sticks also make it difficult to recognize an object in front of us. what the blind often use is to use estimates when entering a rising road. To make this tool, software and hardware are needed. Where to control the hardware, a microcontroller is needed, namely an electronic component that can work according to a program that is loaded into its memory, like a very simple computer (Tarigan et al., 2020). Microcontrollers are very suitable for use with specific purposes because their large ROM and RAM ratio means that the control program is stored in ROM which is relatively larger in size, while RAM is used as a temporary storage area, including the registers used in the microcontroller in question. Based on this and developing previous research, the author conducted research with the title "Design and Implementation of Object Sensors in Assistive Devices for the Blind." In this research the author proposes a tool or system that is capable of detecting obstacles in assistive devices for the blind, which is very important for notifying them of their existence. objects or obstacles for blind people when walking

1. Introduction

The rapid development and advancement of digital technology has caused very significant changes to human life today. Technological developments have helped in the completion of work. In any field, including the manufacture of environmental recognition aids for blind people. As it should be, traditional aids or ordinary sticks are still considered very unhelpful in handling the introduction of the environment of blind people (Harianto et al., 2021). Blind is a general term used for the condition of a person who experiences impairment or obstruction in his vision. Aids for the blind by using stainless steel sticks or using paralon sticks designed to be sticks, which are white with sensors in the middle (Wulansari, 2021). Due to the loss or reduction of the function of their sense of sight, blind people try to maximize the function of other senses such as touch, smell, hearing, and so on, sometimes they also find it difficult to find their way from one place to another using the traditional stick (Muhamad, 2018).

Canes function as walking directions and to facilitate daily activities and also canes as a substitute for eyes for blind people (irawanRio, 2021). But the stick also still has weaknesses inside. Traditional sticks where it is also difficult to recognize an object in front of us. What blind people often use is to use approximation when entering naek roads. To make these tools, you need software and hardware. Where to control the hardware requires a microcontroller, which is an electronic component that can work according to the program filled into its memory like a very simple computer (Tarigan et al., 2020). Microcontrollers are very suitable for use with specific purposes because their large ratio of ROM and RAM means that control programs are stored in relatively larger ROM, while RAM is used as temporary storage, including registers used on the microcontroller in question. In a study conducted by (Supriyadi, 2019) where the results of the research are Blind Sticks Using Ultra Sonic Sensor Technology to Help Blind Alertness and Mobility. The tool uses an ultra sonic sensor type PING parallax, the objects detected are hollow, sponge, and solid, while in reality on the street there are rarely hollow and sponge-shaped objects so that if hit it does not endanger the blind because the texture is not hard. The alarm is in the form of a vibrating motor to give a vibrating effect on the rod of the stick. The disadvantage of the stick is that the stick rod is not flexible where the stick cannot be adjusted in height and low and the stick designed is too heavy.

Based on observations that have been made on one of the blind people who were in Rajabasa stated that Mr. Sobirin often had difficulty in walking long distances such as hitting cars or other objects. Mr. Sobirin hopes that there is a stick that can give warnings to its users. Based on this and developing previous research, the author conducted a study entitled "Design and Implementation of Sensor Objects on Aids for Blind People" in this study the author proposed a device or system capable of detecting obstructions on blind stick aids which is very important to notify objects or obstructions in blind people when walking. This is so that the blind cane used by people can function optimally. This tool uses the ATmega328 as a controller to sound the buzzer if the barrier is near the stick. The distance between the stick and the barrier is detected by the HC-SR04 sensor. There are 4 sensors used, namely front, right, left and bottom sensors. Microcontrollers are made in a minimum system and then connected to sensors and buzzers. Testing of the tool is carried out by measuring the distance of the barrier to the sensor as soon as the buzzer sounds.

2. RESEARCH METHOD

In this study, the author uses an experimental method, which means that this method requires research or implementation directly to partners or research places where this research is divided into several stages or parts, the first is literature study, design and manufacture of software and hardware, testing, data collection and analysis of results. Literature studies are carried out by collecting information from journal articles, books and interviews directly to research places related to this research. By using experimental methods, the author created a system or tool that is able to monitor food supplies, monitor drinking supplies, provide automatic drinking and security at the door of the room for the bird. In figure 1 below is a picture of the experimental method that the author uses.

Fig 1. Research Methods

To be able to understand each step in figure 1 above, it is explained as follows:

a. Literature Study
The initial stage of research that the author did was a literature study, namely reading journals related to research, reading books, conducting interviews to find out more about existing research. And compare previous research with the author's research.

b. Hadware *and* Software *Planning*
The second stage of this research is the design of *hardware* and *software* where the author collects materials and tools to be used in research. After the tools and materials are collected, the author designs the tool from flowcharts, tool schematics, tool designs, after the software design is complete, the author pours it in the form of hadware in the form of an automatic aviary.

c. Hadware and Software Testing
The third stage in this study is to conduct testing where the author conducts system testing in the form of coding testing and telegrams after that, the author then conducts hadware testing in the form of aviary testing to the partner concerned who is in Kalianda.

d. Data retrieval
The fourth stage is data collection where the author takes this data in two ways, namely by taking data through Arduino idea coding displayed on the serial monitor to see the value of each sensor. The next data collection is by testing directly to the partner concerned where each sensor is tested seven times to determine the accuracy of the sensor value with the value on the serial monitor.

e. Analysis of Results
The last stage of this research is the analysis of the results where the results of this test are that when testing automatic feed and drinking inventory devices , ultrasonic sensors and water level sensors cannot detect anything because the microcontroller used is damaged. The height of the bird drinking water supply container made by the author is 10 cm and uses a 4 cm sensor.

a)Research framework

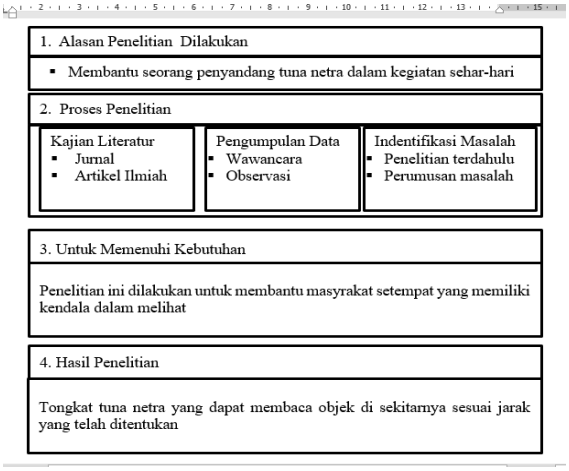

Fig 2. Research Framework

b) System Plan

In making system design tools are needed, because system design is one of the basics before being implemented into the form of tools. System design is a very absolute thing that is usually done by a *programmer* or an *engineer* because it determines the success or failure of the tool to be made. If all stages are carried out properly and meet the specified standards, starting from making diagrams, flows to the components of the tool to be used, the results must be in accordance with the initial description of making the tool. When there are stages that are missed, the results obtained will not be optimal or satisfactory with what is expected. In this study using a soil moisture detection sensor in the form of *a soil moisture* sensor. In this tool, the author will give a little idea of what steps the author takes before implementing in the form of a tool that will be ready to use.

c)Blok Diagram

Block diagrams are the most important thing in tool design, in this chapter will discuss a little overview of how the system works from the tools to be created and used. The block diagram in this study is:

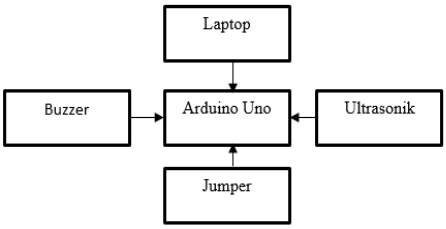

Fig 3. Block diagram Circuit

d)Tool Schematic Network

The schematic network of tools is designed using Fritzing software in the form of an overview to be further implemented in real form. Below is an example of the schematic network of the entire device to be used. As for the network is:

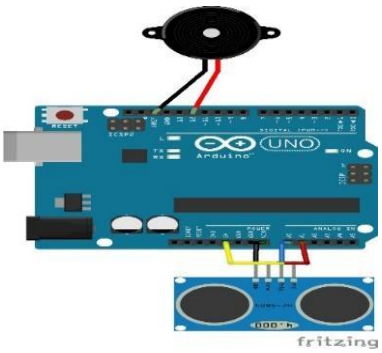

Fig 4. Tool Schematic Suite

e) Desain Alat

Desain alat dibuat untuk mendapat gambaran 3D dari alat yang akan dirancang dengan tujuan sebagai panduan dalam pembuatan alat. Desain alat ini dibuat dengan *software* SketchUp dalam bentuk 3D modeling dengan rancangan sedemikian rupa untuk mendapat gambaran nyata. Dibaw ini adalah contoh desain alat yang akan penulis gunakan dalam penelitian.

Fig 5. Design Tool

3. Result and Discussion

In this chapter the author will explain the results of testing tools that have been designed along with discussions to find out the results of the tool design and implementation carried out whether it is in accordance with the data needed, The first step taken is to test several components, so that if something goes wrong it will be easier to find out. Figure 6 is a drawing of the physical form of the tool that has been created.

Figure 6 Physical Form of Tool

In figure 4.1 is a blind kicking stick that will be used by researchers in this study. Where the wand has been given sensors - sensors needed in research

A.Testing

Tool testing is a stage carried out directly by the author on blind people, this testing aims to determine the success rate of the tool / system can work as expected or not.

Table 1. Black Box Testing Table

No	Skenario	Hasil Yang Diharapakan	Hasil yang diharapkan
1	Power supply plugged into power source	The device turned on successfully, the arduino lamp flashes	
2	Ultrasonic Sensor Turns On	The sensor successfully detected the object in front	
3	Buzzer Sensor Turns On	Sensor succeeds Gives user reasoning	
4	Ultasonic Detecting Distance ≥ 1-2 m	The sensor successfully reads the object in front	
5	The sensor detects a distance of ≥ 2 cm	Buzer Will turn off/ not sound	

B.How the Tool Works

The way the tool works starts with an ultrasonic sensor that detects objects or not in front of the sensor when it successfully detects, the buzzer sensor will sound to signal if in front of the sensor there is an object or object if not, then the buzzer will be off or not sound. This system or tool is designed using ultrasonic sensors as object monitoring sensors, buzzer sensors as alarm sensors if there are objects or objects. This system is also made of paralon so it is safe for use by blind users. Where from the test results above show that this system or tool is able to monitor objects or not and provide notifications of buzzer sensors that sound. Where each sensor is tested ten times or ten days.

4. Conclusion

4.1 Conclusion

After various tests and analyzes on automatic propable tools or systems for blind people, both hardware and software. Then the following conclusions can be drawn:

a. Tools or systems are able to monitor objects or objects around.
b. Based on the results of the tests conducted, this system is able to alarm the user if there is an object blocking in front of him.

4.2 Suggestion

This research has many shortcomings and many things that must be studied, then developed, suggestions that the author can give for further research, as follows:

1. In future research, it should be developed again and more specifications in the system or tool.
2. In future research, you should add more features on the stick so that it is even more efficient

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