GEMONG: A blind drinking aid

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Abstract. The purpose of this study was to design the GEMONG (A Blind Drinking Aid) tool. This device provides information in the form of sound to the blind when measuring water into the glass, starting to fill the water up to the size of the glass by making a sound on the loudspeaker programmed through the Arduino microcontroller. This glass is designed portable and can be washed as desired. The material used to make glass comes from stainless steel with PLA as a mechanical manufacture for the system using a 3D printing machine.

1. Introduction
Blind people are those who have no vision at all and those who still have residual vision but cannot use their vision to read 12 normal points of writing under normal light conditions even with the aid of glasses [1]. In daily life, blind people have difficulty in carrying out their activities. They rely on their senses of touch and hearing, or depend on their lives for the people around them to carry out their daily activities.

One of the problems faced by blind people is difficulty in eating or drinking [2]. Especially for drinking purposes, now there are many dispensers that help blind people to distinguish between cold and hot water so they can avoid the danger of hot water coming from the dispenser. However, this dispenser also still has a problem, which is not able to know whether or not the water is full in the glass. So if it is too full then water can certainly be spilled.

With the help of technology, these problems can be overcome so that blind people can take drinking water comfortably. Previously there had been technological innovations for the visually impaired, namely the modification of drinking water dispensers (minerals) that could greatly facilitate its users, especially for blind people [3]. Other examples namely a device for assisting the blind who are guided via RFID [4], and how to gather information, tips and indications on interaction with a touch-screen by blind users [5].

In this study we designed the glass as the latest technological innovation specifically for the blind so that it is easier and able to drink independently. This technology can tell by human voice if the water in the glass is in the maximum limit. The tool is called GEMONG (A Blind Drinking Aid). With this tool, it is hoped that blind people will not worry about spilling if they fill water into a glass. This tool is considered useful and practical use for drinking needs for the blind.

2. Methods
Some components used in the design of GEMONG, including Arduino Nano as a microcontroller, Dfplayer as an audio player module that transmits audio files from SD cards to Arduino Nano, speakers as audible outputs, load cels as sensors to detect the weight and amount of water. The design of the
The implementation of this research refers to the stages of the research and development approach. This approach is used to produce certain products, and test the effectiveness of these products [6]. Figure 1 shows the implementation method.

![Implementation method flowchart](image)

**Figure 1.** Implementation method flowchart.

The first thing to do is identify the problem and then analyse the needs. In designing this tool, several components are needed to make tools such as microcontrollers, sensors, polylactic acid, etc. Next is the search for data sheets for the needs of the appropriate specifications to be used in this tool. Tool design consists of mechanical design and hardware design. Glass is designed to be able to accommodate a set of hardware and glasses that can be stored and removed from a mechanical system. Figure 2 is the mechanical design of GEMONG.

![GEMONG design](image)

**Figure 2.** GEMONG design.
In the process of designing hardware, electrical circuit design is required. The hardware design process includes the breadboard design. This breadboard design will be carried out as a work test of the device or component that has been prepared before installation directly to the tool.

![Figure 3. Hardware schematic.](image)

Use of this program aims to provide programs or commands on the device where the making of this program is done using Arduino software. The device can function if the software and hardware can run properly and synchronously. If there are still errors, it will be checked again in software and hardware to get the desired results and make sure the tools used are functioning.

Next is assembly. Tool assembly is done after the PCB layout and tool component assembly with the aim of completing the manufacture of the tool as planned. Meanwhile, test and evaluate the device by looking at the effectiveness and performance of the use that this tool is functioning properly. Shortcomings that are still found in this system will be an issue for evaluation.

3. Results and discussion
Tests were carried out on GEMONG performance. Testing is done by testing the suitability of performance between design and results. The following is a table of the results of tests conducted. Some
conditions used as experiments include testing the Turn ON button, Start filling water, the water is half a glass, the water is full, Glass is lifted and water is drunk, and Glass saved. In general, the test results show that the performance of the tool can meet the specifications designed.

**Table 1.** Experimental result.

| No | Condition                              | Trial 1 | Trial 2 | Trial 3 | Trial 4 | Trial 5 | Trial 6 | Trial 7 | Trial 8 | Trial 9 | Trial 10 |
|----|----------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|
| 1  | Turn Button ON                         | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓        |
| 2  | Start filling water                    | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓        |
| 3  | The water is half a glass              | ✗       | ✗       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓        |
| 4  | The water is full                      | ✗       | ✗       | ✗       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓        |
| 5  | Glass is lifted and water is drunk     | ✗       | ✗       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓        |
| 6  | Glass saved                            | ✗       | ✗       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓       | ✓        |

4. Conclusion

GEMONG provides information in the form of sound to blind people when measuring water into glass from starting to fill up to the size of the glass there will be sound coming out through the speakers. GEMONG can also be carried everywhere, refilled with a charger, and washed as desired.

References

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