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Design of Voice Control Assister for the Hearing Impaired Person

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***Abstract*—In this paper, we proposed a voice control assister for the hearing impaired persons. Normally the hearing impaired person has a problem to control his/her voice properly due to the limited hearing ability. As a result, the hearing impaired person can't communicate easily with others. The proposed voice control assister checks and compares the environment noise around the hearing impaired person and the hearing impaired person's voice amplitude simultaneously. According the hearing impaired person's voice amplitude, the proposed voice control assister gives two kind vibrations to feel low or loud voice. Also the hearing aid is connect with Bluetooth, so it can controlled volume easily.**

Keywords—bluetooth, heraing aids, servomotors, vibration control.

I. INTRODUCTION

Recently, the number of people are gotten a problem on hearing loss and increased more by using earphone, noise pollution, car accidents, and etc [1]. Many people do not concern about these problems. However, a few people know about the difficulties of deaf people clearly. Therefore, the hearing aids are used to improve their hearing by putting inside the ear [2]. Actually, the hearing aids amplified might be produced an unwanted sounds during wearing it and make an unwanted sounds during wearing it and make an uncomfortable to use [3], [4]. This issue can be solved by controlling a volume of hearing aid and makes deaf people possible to listen well. However, it is hard to recognize their volume. Therefore they have some troubles in communications by making loud voice not fit with surrounding. Actually, hearing-impaired people lost their confidence in conversations by repeating such mistakes. As a result they abandon from community [5].

In this paper, we proposed the technique and equipment which can help deaf people to recognize their volume. If the volume of aid does not fit in a situation, the proposed equipment will vibrates in their neck. So this equipment is automatically sets to a standard value according to noises around them. By using this equipment, they can be controlled a voice amplitude according to the situation and it provide a confidence to solve the problems. Also hearing aids which are widely used currently are too small to adjust the volume. To solve this problem, the Bluetooth was used to adjust the volume of the proposed equipment.

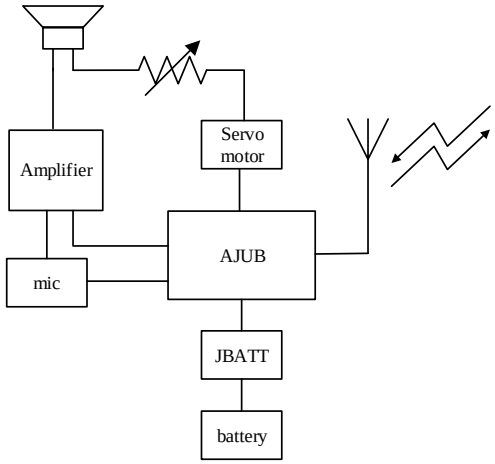

Fig. 1. Block diagram of the proposed earphone aid.

II. TECHNICAL DESCRIPTION

A. *Neckband*

There is a product called 'neckband for anyone' supporting hearing-impaired people. The product informs where the sounds coming from by collecting high-pitch sounds. The product makes you prepared for dangerous situations such as automobile horn and siren while not wearing a hearing aid. However, 'neckband for anyone' is also not a solution for hearing-impaired people whom do not realize the volume of their own voice.

B. *Bluetooth*

Bluetooth becomes the standards of close-distance wireless communication in close distance, developed by wireless

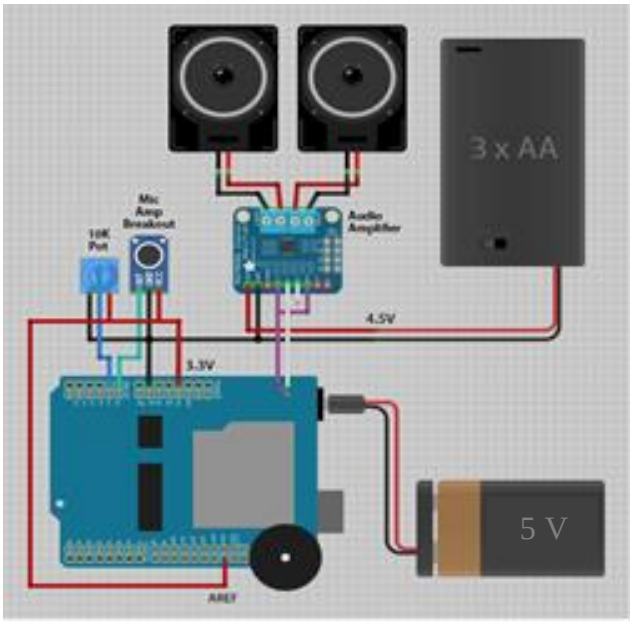

Fig. 2. Schematic diagram of proposed earphone aid.

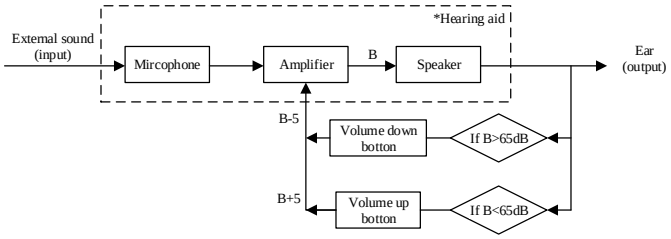

Fig. 3. Algorithm of proposed earphone aid.

technologies with low price and low power consumption. It is basically for the wireless communication within 10 m and the range can be expanded up to 100 m. In addition, Bluetooth is composed of two devices, Master and slaves. Master can be connected to maximum seven slaves, in Bluetooth system. It is

C. Proposed earphone aid

Fig. 1 shows the control algorithm of proposed earphone aid. The earphone aid was operated by a small battery that build inside it. The hearing aids consists of a microphone, audio amplifier with digital to analog converter, speaker, high pass filter, and a rechargeable battery. JBATT is used to control the battery charger and also supply Arduino simultaneously. As shown in the Fig.1, the microphone is used to detect the sound from someone who speak to the hearing-impaired people (user). Then the sound was amplified an audio signal and converts to a corresponding sound by loudspeaker. Actually, the proposed earphone aid is communicated (transmit and receive) with the proposed neckband through a build-in Bluetooth. In case of the signal of sound is low or loudly, user can control volume by themselves with the button at the

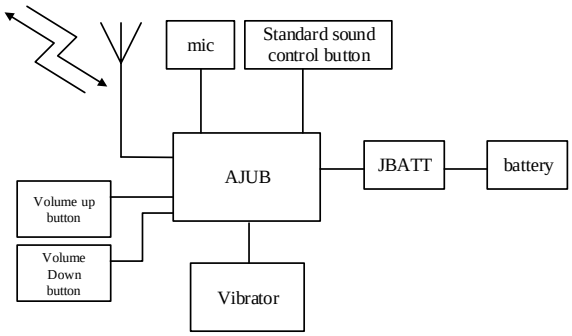

Fig. 4. Block diagram of the proposed (a) earphone aid and (b) neckband with Arduino controller.

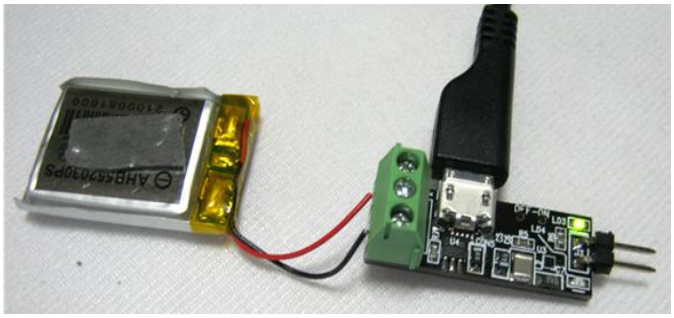

Fig. 5. Photograph of JATT and rechargeable battery.

neckband. The servo motor is used to control the resistance volume of the speaker [6], [7]. Fig. 2 shows the real schematic diagram of the earphone aid. Conceptually, the real size the earphone aid can be fixed with the human ear and can be adjusted by rubber caps. Fig. 3 shows main the algorithm of proposed earphone aid.

D. Proposed Neckband

Fig. 4 shows the block diagram of proposed neckband. It consist of rechargeable battery, vibration motor, vibration sensor, power switch, microphone, arduino controler, and Bluetooth. A mini Arduino JARDUINO-UNO-BT (AJUB) was used to control a vibration motor and sound amplitude of the earphone aid of neckband. The microphone of the neckband was used to detect the sound of user when they want to communicate with someone. However, the noise around the user can be caused incorrect result. Therefore, the standard sound amplitude was coding to compare with the noise around user. Moreover, the standard sound amplitudes are able to control according to the environment around the user. In case of the sound amplitude of the user is too low compare the standard amplitude, the motor will be vibrated two times. The vibration is the sign to let the user know the sound is too low. If the sound of the user is too high compare to the standard amplitude, the motor will be vibrated continuously. Thus, the user can be controlled the standard amplitude according to

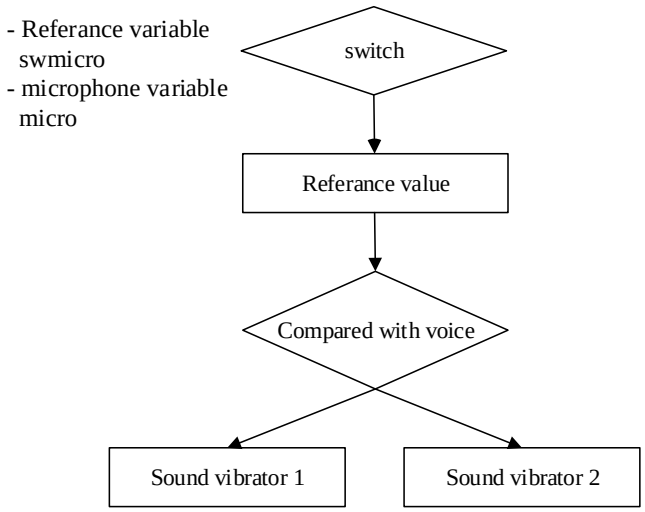

Fig. 6. Algorithm of proposed neckband operation.

environment around them. In order to communicate between AJUB and Bluetooth, it is necessary to use the emulator of 'Hercules SETUP utility' that supports serial communication. Also, the AJUB was coded to control the vibration of motor when the microphone receives the sound amplitude too low or high compare to a standard amplitude. Fig. 6 shows the photograph of print circuit board (PCB) of JATT and rechargeable battery. The battery of lithium polymer battery is used with output voltage of 3.7 V. Fig. 5 shows the control algorithm of the vibration motor. Fig. 7 shows the photograph of real application of proposed neckband.

III. Conclusion

In this paper, the earphone aid and neckband were proposed in order to help hearing-impaired person. The proposed voice control system can be checked and compares the environment noise around the hearing impaired person and the hearing impaired person's voice amplitude simultaneously. The earphone aid is able to control the volume using Bluetooth devices.

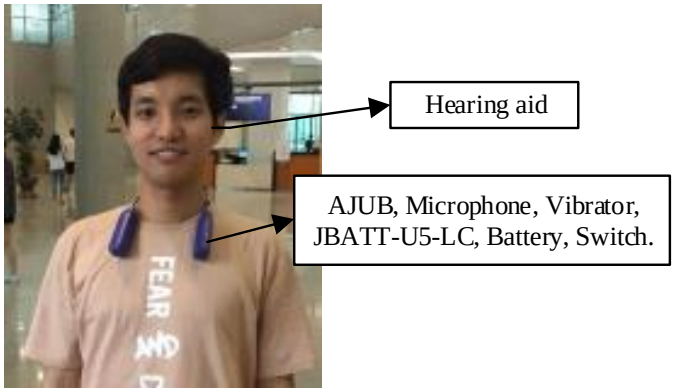

Fig. 7. The photograph of the proposed neckband.

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