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HEARING AID COMBINED WITH VIRTUAL REALITY FUNCTION

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Nowadays, hearing aids are available for every type of hearing impairment or hearing loss. Various manufacturers produce such specialized medical equipment. Hearing care experts can choose the right hearing aid for each person individually, also considering his preference on style, fitting, and functionality [1].

Digital hearing aids are also programmable during the fitting process and have multiple listening profiles that are selectable by the patient. The digitization of sound allows more advanced signal processing, such as noise reduction, filtering, and acoustic feedback (ringing) control. The vast majority of hearing aids sold today are digital because of their increased performance and flexibility over the analog versions. Today's hearing aids, includes volume control, remote control, telecoil, direct audio input, FM reception, Bluetooth capabilities, directional microphone, compression, clipping, frequency shifting, wind-noise management, data logging, self-learning, moisture resistance, and earmold venting [2]. Some of these features require an external area to implement and become more difficult to include as the size of hearing aids shrinks, while other features can be implemented in all digital hearing aids [2].

Progress of microsystem and semiconductor technology [3-6], the development of various biomedical devices [7-8], computerized biotechnical systems [9-13] of various blocks and units have become very current for technical solutions [3-15].

Hearing aids give straightforward enhancement of the sound grabbed by the microphone and reproduced louder by the receiver or loud speaker. The amplification can be shaped marginally to consider distinctive hearing losses in spite of the fact that there is not always much flexibility. Many types of analog hearing aids can be programmed by the user. They have a microchip which enables the device to have settings customized for various listening situations, for example, in a quiet place like in a library, or in a noisy place like in a hotel, or in an expansive region like a soccer field. The analog programmable hearing aids can store different programs for the different situations. Digital hearing aids take the sound waves from the microphone and change them to advanced digital binary code by the utilization of digital signal processing (DSP) strategies [2].

In this research work, we propose to develop the smart hearing aid with the additional function of virtual reality. The idea of an interactive (smart) hearing aid is to add a device to it with developed software for the mobile phone. Such an

organization will help to significantly expand the capabilities of a person, for example, a hearing aid can become a translator in real-time. The developed hearing aid can accompany voice accompaniment from the GPS-navigator of a mobile phone, have additional settings when listening to music or audiobooks.

Fig. 1 demonstrates diagrammatic representation of using the developed interactive hearing aid with additional function virtual reality [15].



Figure 1 – A diagrammatic representation of the smart hearing aid with function virtual reality

Fig. 2 represents developed structure scheme of the smart hearing aid with function of virtual reality. This scheme consists of 6 blocks: sensor (microphone), ADC, microprocessor or microcontroller, battery, module Bluetooth, speaker.

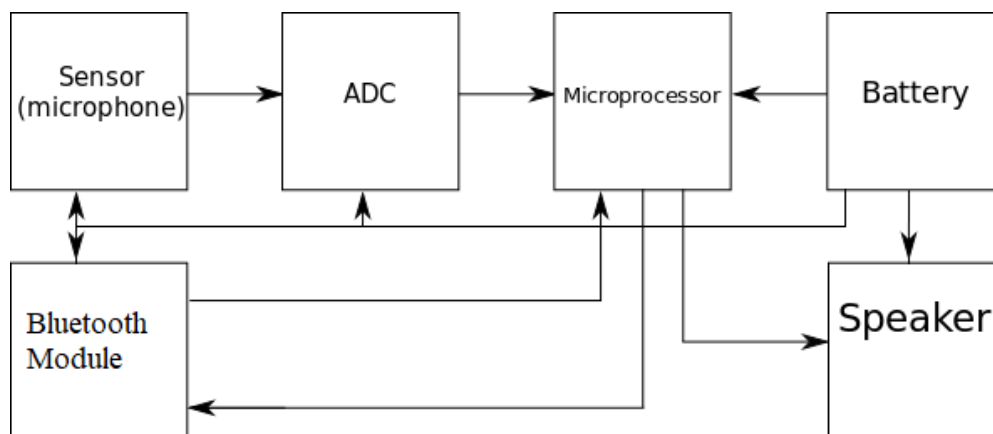


Figure 2 – A structure scheme of developed smart hearing aid

The principle of operation of this device is as follows. The sensor is necessary so that a person can hear the world around and use it like as a regular hearing aid. ADC used for conversing analog to digital signals because the microphone is analog. The microprocessor (microcontroller) controls the operation of the entire device. The Bluetooth module is required to connect a hearing aid to a mobile phone. The battery is rechargeable as in conventional wireless headsets such as Battery 35mAh, 3.7v, 10x10x10 mm. A sound reproducing speaker is needed to generate sounds directly into the damaged ear of a disabled person.

Thus, the structure of a hearing aid with augmented reality is proposed. Such a device should not only improve hearing but also increase the psychological

confidence of a person. The next stage of work is the development of an electrical circuit diagram of the device and the assembly of the prototype.

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