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Design of GSM based Voice Data Processing Using Bone Conduction Principle

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Abstract: (PIC16F877A) PIC Microcontroller based digital electronic system to allow deaf people to hear the sounds via bone conduction by wearing an intra-oral device and a small microphone in the deaf ear to regain lost hearing. This device consists of GSM modem, PIC microcontroller and audio amplifier unit. GSM modem will receive the incoming calls and answer the calls automatically Via AT commands. The incoming voice signal converted in to low frequency vibration signals that is fed through the teeth to the cochlea via bone conduction. The system is implemented by PIC midrange controller based hardware and low cost GSM module, which makes it economic, reliable and efficient. It is the world's first removable and non-surgical hearing solution to use the Well-established principle of bone conduction to imperceptibly transmit sound via the teeth. It is simple, Removable, and very Non-Invasive. This hearing device is designed to use the natural amplification of your ear. Any sound in that that coming from GSM Modem. It uses a digital processor (PIC16F877A) to transmit to the sound to a piezoelectric actuator, which needs very little power to generate the vibrations that travel through bone, which in turn sends those sound vibrations into your cochlea through your teeth. This way, the sound is transported from your impaired ear directly to your hearing ear this hearing device is a flat piece that contains a sealed rechargeable battery, and electronics and wireless capabilities that can pick up sound transmissions from the behind-the-ear microphone.

Keywords: PIC Microcontroller, Piezoelectric Actuator, Ear Microphone.

INTRODUCTION

This paper thesis presents some recent developments on ongoing challenges in implantable bone conduction hearing devices. In view of the large number of problems and challenges in designing implantable electronics for medical devices, this thesis focuses on areas that will advance transcutaneous bone conduction implant devices for hearing impaired patients. It will be described in greater details in the upcoming chapters that the implanted bone conduction transducers need to receive power and data wirelessly through the intact skin.

Furthermore, this transmission should be designed to be very efficient to reach the desired output force levels in the bone and also to consume less power, which is an important factor of cost. Efforts are focused on the design and implementation of an efficient wireless power and data transmission system for the use in bone conduction implants.

If successful, this device can improve the quality of life for patients suffering from different hearing impairments and make it feasible to use this technology all over the world. It is reported in the World Health Organization (WHO) fact sheet that in 2005, about 278 million people had moderate to profound hearing impairment (Deafness and hearing impairment Fact Sheet N 300, April 2010).

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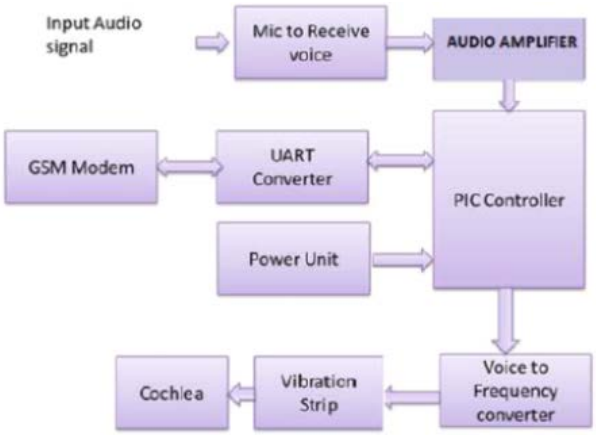
This shows the great importance of improving the design of hearing aid devices to the society. Whereas conventional hearing aids transmit sound to the tympanic membrane via air conduction (AC), bone conduction (BC) devices transmit sound via vibrations through the skull directly to the cochlea. In most hearing-impaired patients with conductive and mixed hearing loss and single sided deafness who cannot sometimes be rehabilitated by air conduction hearing aids, a conventional bone conduction hearing device is an efficient alternative. Major drawbacks with the conventional BC devices reported are the discomfort of the static pressure over the skin, reduced high frequency gain feedback problems.

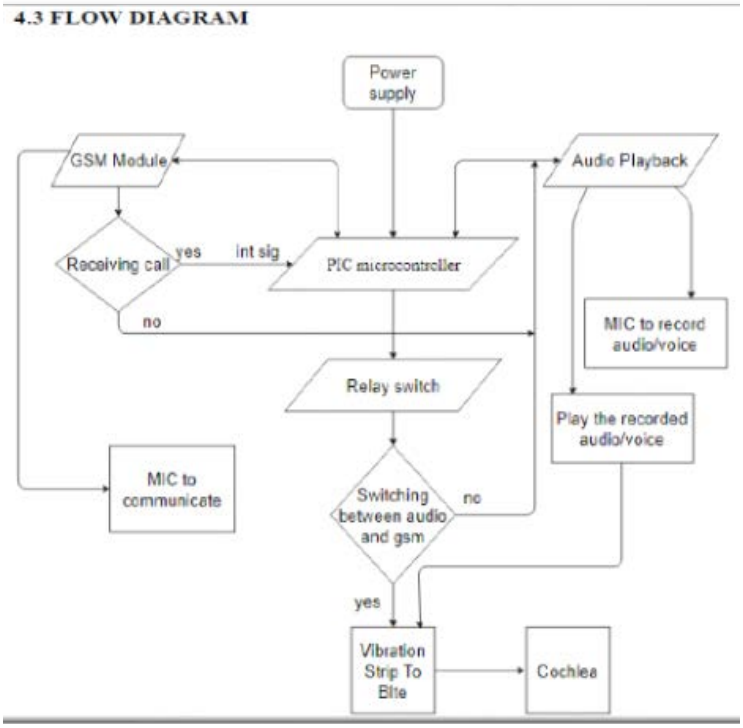
An alternative can be a direct bone conduction device with a permanent skin penetrating titanium screw called the bone anchored hearing aid (BAHA). Even though very successful implantations have been reported with the BAHA, the permanent skin penetrating implant needs life-long commitment of care every day. Loss of implant may happen as a result of trauma and skin infection and redness is also appearing to some patients. A solution to these drawbacks can be a novel bone conduction implant (BCI) device.

The BCI is novel because the skin is kept intact by implanting the transducer within the skull bone near to the cochlea, which also might increase the sensitivity of the bone conducted sound. In the BCI, no screw attachment to the skull bone is used. Instead there is a at direct contact between the transducer housing and the skull bone. Moreover, the BCI has an improved gain headroom than the BAHA that allows for the possibility to increase the real gain of the BCI without getting feedback problems.

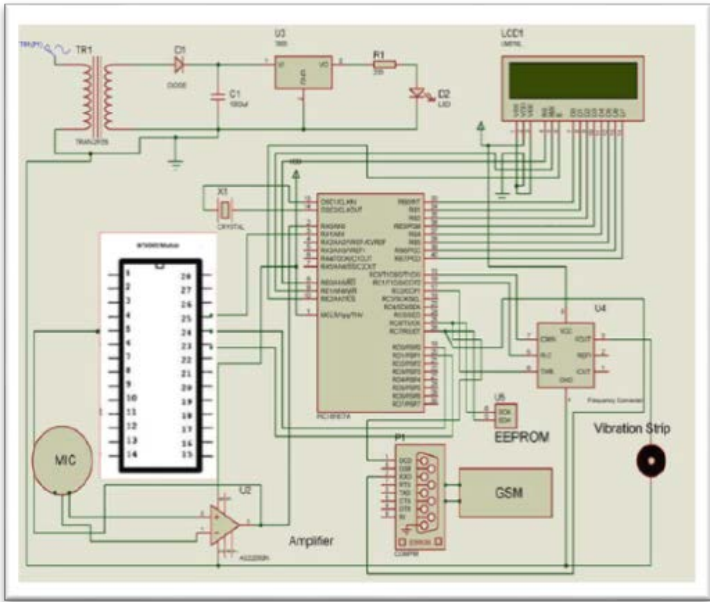
Block Diagram



Flow Diagram



Schematic Diagram



EXISTING SYSTEM

Several hearing devices were found for outer drum problem only. Inner drum problem is usually a permanent condition which impairs one's ability to tell the direction a sound is coming from. It can also be responsible for difficulty understanding speech or conversations on the deaf ear side, particularly in a noisy environment. Some medical treatments have been proposed but that needs surgery. Due to that surgery it may leads to additional problems.

PROPOSED SYSTEM

This hearing device is designed to use the natural amplification of your ear. Any sound in that that coming from GSM Modem. It uses a digital processor (PIC16F877A) to transmit to the sound to a piezoelectric actuator which needs very little power to generate the vibrations that travel through bone, which in turn sends those sound vibrations into your cochlea through your teeth. This way, the sound is transported from your impaired ear directly to your hearing ear. This hearing device will be fitted to the upper left or right teeth in the back of your mouth. This doesn't require any of your teeth to be altered, and the device can be inserted and removed easily. This hearing device is a flat piece (in Real-Time Product) that contains a sealed rechargeable battery, and electronics and wireless capabilities that can pick up sound transmissions from the behind-the-ear-microphone

Wireless Communication

Wireless communication, or sometimes simply wireless, is the transfer of information or power between two or more points that are not connected by an electrical conductor. The most common wireless technologies use radio waves. With radio waves distances can be short, such as a few meters for Bluetooth or as far as millions of kilometers for deep space radio communication. It encompasses various types of fixed, mobile, and portable applications, including two-way radio, cellular telephones, personal digital assistants (PDAs), and wireless networking. Other examples of applications of radio *wireless technology* include GPS units, garage door openers, wireless computer, keyboards and headsets, Headphones, radio receivers, satellite television, broadcast television and cordless telephones. Somewhat less common methods of achieving wireless communications include the use of other electromagnetic wireless technologies, such as light, magnetic, or electric fields or the use of sound

LI-FI Communication

Optical communication is any form of telecommunication that uses light as the transmission medium. Having originated in ancient times in the form of beacon fire and smoke signals that transport a message, optical wireless communication (OWC) has grow to high-capacity complementary technology to radio frequency (RF) communication. OWC system utilize wavelength in the infrared (IR) spectrum for IR communication and the visible ligh spectrum for visible light communication (VLC). Because of the availability of huge license-free spectrum of approximately 670Thz, OWC has the potential to provide wireless links with very high data rates.

LCD Display

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sand witched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. One each polarizers are pasted outside the two glass panels. These polarizers would rotate the light rays passing through them to a definite angle, in a particular direction When the LCD is in the off state, light rays are rotated by the two polarizers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarizers, which would result in activating / highlighting the desired characters. The LCD's are lightweight with only a few millimeters thickness. Since the LCD's consume less power, they are compatible with low power electronic circuits, and can be powered for long durations. The LCD's don't generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCD's have long life and a wide operating temperature range. Changing the display size or the layout size is relatively simple which makes the LCD's more customer friendly. The LCDs used exclusively in watches, calculators and measuring instruments are the simple seven-segment displays, having a limited amount of numeric data. The recent advances in technology have resulted in better legibility, more information displaying capability and a wider temperature range. These have resulted in the LCDs being extensively used in telecommunications and entertainment electronics. The LCDs have even started replacing the cathode ray tubes (CRTs) used for the display of text and graphics, and also in small TV applications.

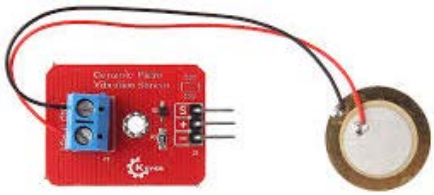
Ultrasonic Sensors

Ultrasonic sensors (also known as **transceivers** when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. This technology can be used for measuring: wind speed and direction (anemometer), U fullness of a tank and speed through air or water. For measuring speed or direction a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water. To measure the amount of liquid in a tank, the sensor measures the distance to the surface of the fluid.

Further applications include: humidifiers, sonar, medical ultrasonography, burglar alarms and non-destructive testing. Systems typically use a transducer which generates sound waves in the ultrasonic range, above 20,000 hertz, by turning electrical energy into sound, then upon receiving the echo turn the sound waves into electrical energy which can be measured and displayed. The technology is limited by the shapes of surfaces and the density or consistency of the material. For example foam on the surface of a fluid in a tank could distort a reading.

Vibration Sensors

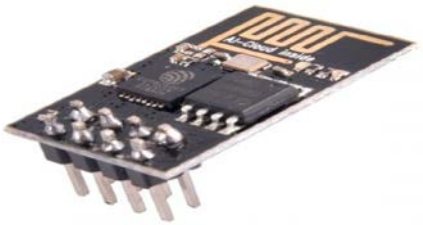
Vibration sensors are sensors for measuring, displaying, and analyzing linear velocity, displacement and proximity, or acceleration. Vibration — however subtle and unnoticed by human senses — is a telltale sign of machine condition. Abnormal vibration indicative of problems with an industrial machine can be detected early and repaired before the event of machine failure; because such a failure is potentially costly in terms of time, cost, and productivity, vibration measurement allows industrial plants to increase efficiency and save money.



Schematic Diagram

ESP8266

The **ESP8266** is a low-cost Wi-Fi microchip with full TCP/IPstack and microcontroller capability .The chip first came to the attention of western makers in August 2014 with the **ESP-01** module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software. The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi. [4]The successor to these microcontroller chips is the ESP32, released in 2016.



CONCLUSION

The improvement in the field of wireless communication gives us flexibility to make our life easier and secure. Here the proposed system replaces the need of Wi-Fi and lights can be used as a source to transmit information. Transmitting information through Li-Fi makes it faster and easier The concept of Li-Fi will make the communication faster and more effective in future in various spheres across the world. It will be more efficient as it can travel through areas where human intervention is not possible. It attracts a great deal of interest in business in the communication sectors and will soon be able to utilize this technology at greater speeds in every field of communication and will thus enable ease of access of data instantly. This ultimately reduces the time consumption and the work outcome is effectively increased. Thus this technology will be a greener, safer and cleaner way of communication. But nowadays the Internet of things are also major part in the world so we Use the Wi-Fi the time consumption and the work outcome is effectively increased. Thus this technology will be a greener, safer and cleaner way of communication. But nowadays the Internet of things are also major part in the world so we Use the Wi-Fi only for uploading data's to the Internet Server to Maintain the DATA in different times for a future reference.

FUTURE WORK

Vehicle to vehicle communication can be done using LI-FI technology. It can reduce the cause of accident and cause of death. It collect the data from other car which is used for future reference.

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