MOBILE TECHNOLOGY FOR HEARING IMPAIRED

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Abstract - *The proposed system makes an approach of an alternate way of communication through mobile for the people with hearing disabilities. The system mainly focuses in the subject that the deaf people to communicate via mobile phone without any chance of disturbances. Usually people in cases of hard hearing, will use aid devices for hearing purposes. But while communicating through cellular phones will result in degradation in hearing aid performance and sometimes results in worst cases due to interference of radiation. The biomedical engineering is going to help here to understand the human auditory peripheral system where the project is going to make use of the cochlear nerve. The cochlear nerve is a nerve that connects teeth nerve or carnial nerve and inner ear drum. So without the help of outer ear drum vibration, inner ear drum will function independently when cochlear nerve is vibrated or stimulated. The artificial stimulation of cochlear nerve is done through external application of vibration through transducers with better accuracy to achieve high dynamic range in terms of decibels. So this project suggests an alternate way which totally provides a better utilization of mobile technology.*

Keywords — hearing disability, cochlear nerve stimulation, mobile communication, error free communication.

1. INTRODUCTION

Telecommunication is a powerful tool for effective information sharing for us today. And that too, mobile technology plays a very important role. Especially, for the people with disabilities (especially deaf people), information provided through their own telecommunication device is extremely important and necessary. In many ways, mobile technology such as email, text and instant messages has proved to be quite empowering to the deaf and hard of hearing community. In this paper, we propose a voice call mobile technology for the deaf people. [1] The gamma-tone filter well expresses the performance of human auditory peripheral mechanism and has a potential of improving advanced speech communications systems, especially hearing assisting devices and noise robust speech recognition systems. The proposed system implements the GSM modem through which the deaf people can hear the voice from GSM speaker.

2. COCHLEAR NERVE STIMULATION

[2] Cochlear nerve stimulation process is one of the existing systems that help the deaf people to hear artificially. This cochlear nerve is a nerve that carries auditory sensory information from the inner ear directly to the brain. Also this nerve is connected to the teeth nerve. The stimulation of this nerve can be done using Bone Anchored Hearing Aid surgical technique (BAHA). BAHA uses sound processor and titanium screw to vibrate the nerve. Another way of stimulation is done by cochlear implants which bypasses the normal hearing process. Also this includes surgical option and provides discomfort. [3] These procedures need strict maintenance and frequent screening. Our objective is, without using any of this technique we are going to stimulate that nerve externally with the help of filtering and amplification process.

3. SYSTEM PROPOSAL

The proposed system explains about the deaf people using mobile phones. We are enabling GSM kit with mic and filtering for the deaf people to hear and response. Our proposed system includes the benefit of calling through GSM which helps that people to listen the accurate voice which we are implementing with the pre-processor. Making use of the gain-balancing techniques, the computation accuracy at gamma-tone filter is improved, leading to a high dynamic range. The output from the gsm module is first sent through the filter followed by power amplifier and potentiometer to increase and control gain. The output signal from the power amplifier is further filtered to eliminate noise signal and then sent through the line audio amplifier to power the transducer in-order to control the velocity and the inertia of the transducer. The transducer will convert the finally filtered electrical signals into vibrations which was the final output. [4] When the vibrations are being sensed by deaf people, the cochlear nerve gets stimulated to send signals from inner ear to brain.

4. BLOCK DESCRIPTION

The detailed behaviour of the system was explained in this chapter with segregated levels. The required power needed for the system performance is drawn from the power supply. The various power specifications that required for different circuit performance was segregated from the single power supply using rectifiers and voltage regulators. Here, the GSM module and LCD display was interfaced using microcontroller. The output from the GSM module was filtered, amplified and converted into vibrations.

4.1 Power Supply

The entire system is powered by the alternating current supply by means of step-down transformer. The rectifiers and voltage regulators are further used to meet the specific component power requirements present in the circuit. Also alternating current was converted into direct current and vice versa then and there in order to ensure the proper functioning of the system.

4.2 GSM Module

GSM (Global System for Mobile communications: originally from ***Group Special Mobile***) is the most popular standard for mobile phones in the world. Its promoter, the GSM Association, estimates that 80% of the global mobile market uses the standard. GSM is used by over 3 billion people across more than 212 countries and territories. GSM differs from its predecessors in that both signaling and speech channels are digital, and thus is considered a *second generation* (2G) mobile phone system. This has also meant that data communication was easy to build into the system. GSM EDGE is a 3G version of the protocol. There are many specifications available according to their needs. We are using here to just transmit and receive information.

4.3 LCD

The LCD was used here for the purpose of identification of call details such as caller ID, status of GSM module and other useful information. When the call was made to GSM, LCD should respond simultaneously for the further actions with the help of microcontroller. So synchronization of devices must be provided with the help of delay. This was achieved by writing a program for LCD to make it functioning according to the high speed device.

4.4 Cross compiler

The AT89S52 act as a cross compiler to interface LCD and GSM modem. In other words, it provides synchronization between low and high speed devices with the help of UART. It is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable flash memory. The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the Industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. It is a powerful microcontroller which provides a highly flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features such as 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

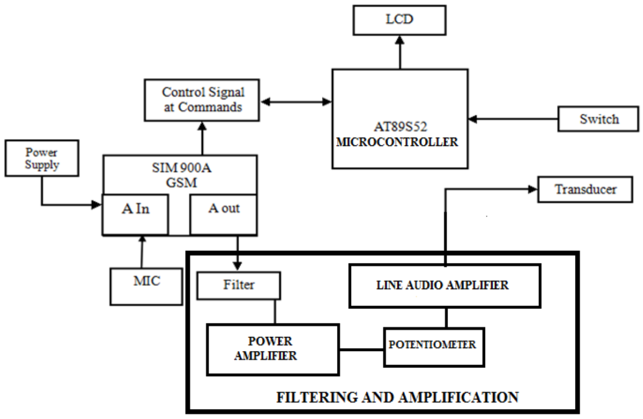

Fig-1: Block Diagram

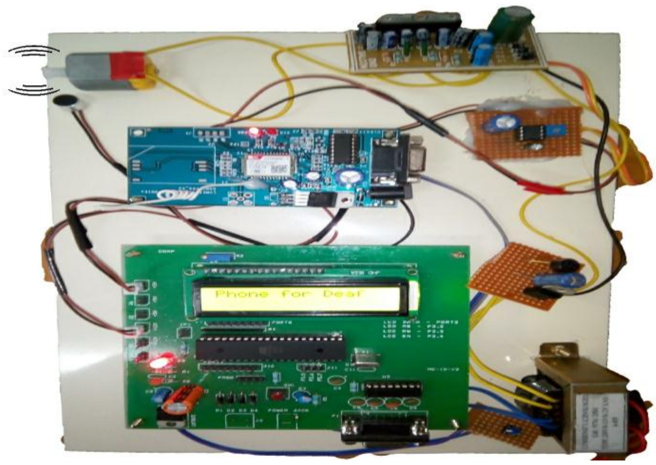

Fig-2: Pictograph of proposed system

4.5 Filtering and Amplification

Filters are essential building blocks in many systems, particularly in communication and instrumentation systems. A filter passes one band of frequencies while rejecting another. Filters are typically implemented in one of three technologies such as passive RLC filters, active RC filters and switched capacitor filters. Crystal and SAW filters are normally used at very high frequencies. Passive filters work well at high frequencies, however, at low frequencies the required inductors are larger, bulky and non-ideal. Furthermore, inductors are difficult to fabricate in monolithic from and are incompatible with many modern assembly systems. Active RC filters utilize op-amps together with resistors and capacitors and are fabricated using discrete, thick film and thin-film technologies. The performance of these filters is limited by the performance of the op-amps (e.g., frequency response, bandwidth, noise, offsets, etc.). Switched-capacitor filters are monolithic filters which typically offer the best performance in the term of cost. Filters are mostly implemented by capacitors and resistors. After filtering, amplification plays a vital role. Amplifier circuits form the basis of most electronic systems, many of which need to produce high power to drive some output device. Audio amplifier output power may be anything from less than 1 Watt to several hundred Watts. Radio frequency amplifiers used in transmitters can be required to produce thousands of kilowatts of output power, and DC amplifiers used in electronic control systems may also need high power outputs to drive motors or actuators of many different types. This module describes some commonly encountered classes of power output circuits and techniques used to improve performance.

4.6 Transducer Output

A transducer is normally designed to sense a specific signal or to respond only to that particular parameter. i.e it converts electrical signal into mechanical energy. A complete knowledge of the electrical and mechanical characteristics of the transducer is of great importance while choosing a transducer for a particular application. Often, it is deemed essential to get details of these characteristics during the selection of instrumentation for the experiment concerned. This is the final output end of the system where deaf people will sense the sound frequency in terms of vibration by biting the transducer with teeth.

5. NEED FOR SYSTEM

[5] The whole setup of the project elaborately explains how far the human auditory peripheral system working was understood and how we are going to implement our project to make utilization of biological concepts. For hearing impaired, some surgical options and hearing aids are required for assistance. Here, those cons are totally avoided. [6] We know that mobile phones will radiate RF energy. This radiation may affect those hearing assistance and causes severe damage and degradation to it. Hence, this project provides healthier technique which is mandatory for telecommunication of deaf person. The main advantage is error and noise free communication. It is almost free from ambiguous noise. This can reduce some social discrimination and can induce some self confidence in hard hearing community.

6. CONCLUSION

Today's blooming technologies provide a quality product with multiple resources to the consumers. But it fails to focuses on a particular community people whether they completely utilize the product without any flaw. [7]Tremendous development in the communication field also tries to provide high end technology for the users. But for the people with disabilities, need assistive technology for the adaption. The assistive technology in mobile phone should be provided for hearing impaired. This is the main theme of the project. In future, with the help of research and development, this project can be integrated in single chipset to reach higher masses.

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