

# SMART GLOVE FOR DEAF PEOPLE

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**Abstract:** A smart glove for deaf people is designed to make them independent to make the call and to listen incoming call on mobile. This smart glove uses bone conduction technology using Bluetooth technology. This smart glove is easy to use and very economical.

**Index Terms - Bone conduction technology, Bluetooth technology, smart glove, smart device for deaf people, smart hearing aid, smart earphone**

## I. INTRODUCTION

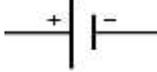
According to the UN agency, over 5% of the world's population (360 million people) has disabling hearing loss in which 32 million are children. Other estimates show that around 6.3% of Indian population suffers from hearing and speech impairment [1]. Hearing loss may occur in one or both ears. In children, hearing problems can affect the ability to learn spoken language and in adults it can cause work related difficulties [2]. In some people, particularly older people, hearing loss can result in loneliness. Hearing loss can be temporary or permanent. Hearing loss may be caused by a number of factors, including: genetics, ageing, exposure to noise, some infections, birth complications, trauma to the ear, and certain medications or toxins. Therefore to help deaf people, we need a device who can overcome their deafness problem. Deaf people can not talk to anyone on mobile during call because of their disability; they can not hear anything. Hence this problem can be overcome by smart glove. Smart glove is based on bone conduction which uses vibration for hear. Using this device, deaf people can easily listen anyone without any help. Smart glove is a wireless Bluetooth device which provide wireless connection between glove and mobile phone. Bluetooth technology permits hands free headset for incoming voice calls and making call.

## II. METHODOLOGY

The smart glove is related to the smart technology. The proposed smart glove is designed for hearing impaired people and its designed is based on Bluetooth & Bone conduction technology. Bluetooth is a wireless technology which is used to transfer data between different electronic devices. The distance of data transmission is small in comparison to other modes of wireless communication. This technology neglect the use of cords, cables, adapters and permits the electronic devices to communicate wirelessly among each other. Bluetooth technology permits hands free headset for incoming voice calls and making call [3]. The aim of this technology is to provide wireless communication between gloves and mobile phone. If Bluetooth is paired to mobile phone, glove is used to make a phone call or answer the phone call. The receiver is placed on the thumb of the glove, the microphone and buttons which control Bluetooth are placed on the glove over the wrist [4].

*Bone conduction technology* - Bone conduction is the conduction of sound to the inner ear through the bones of the skull. Bone conduction transmission can be used with individuals with normal or impaired hearing [5]. We all hear sounds through both our bones (bone-conducted or bone-transmitted) and our eardrums (air-conducted or air-transmitted). The bone conducting transducer is connected to the Bluetooth device at a place of speaker. The bone conducting transducer is a vibration transducer which convert electric signal into vibration signal. Table I shows details of various component including their range and function. The circuit diagram for the proposed smart glove is shown in fig.1.

TABLE I

S. No.	Component	Image	Range	Quantity	Function	Reference No.
1.	Glove		-	1	To protect the hand during operation	-
2.	Antenna		15-20 meter	1	Turns electrical signals into radio waves	6
3.	Micro switch		-	1	To push on and push off the circuit	7
4.	Led		1.2 V	1	For indication	8
5.	AA Battery		1.5V	1	Provide the power to device	-
6.	Bluetooth module		3.7V	1	Connect devices to one another wirelessly	9
7.	Bone Transducer		3.7V	1	Convert sound into bone vibrations	10
8.	Microphone		3.7V	1	Convert sound into electric signal	11

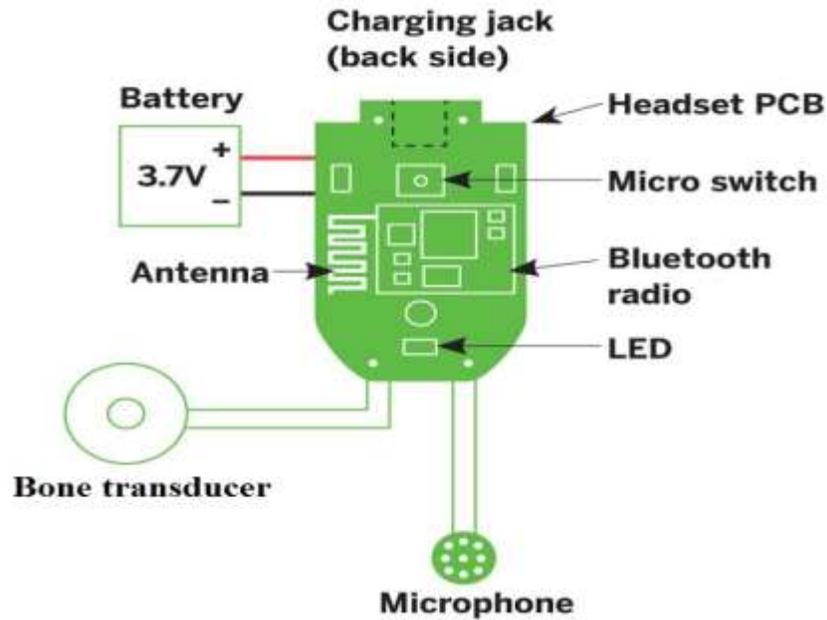
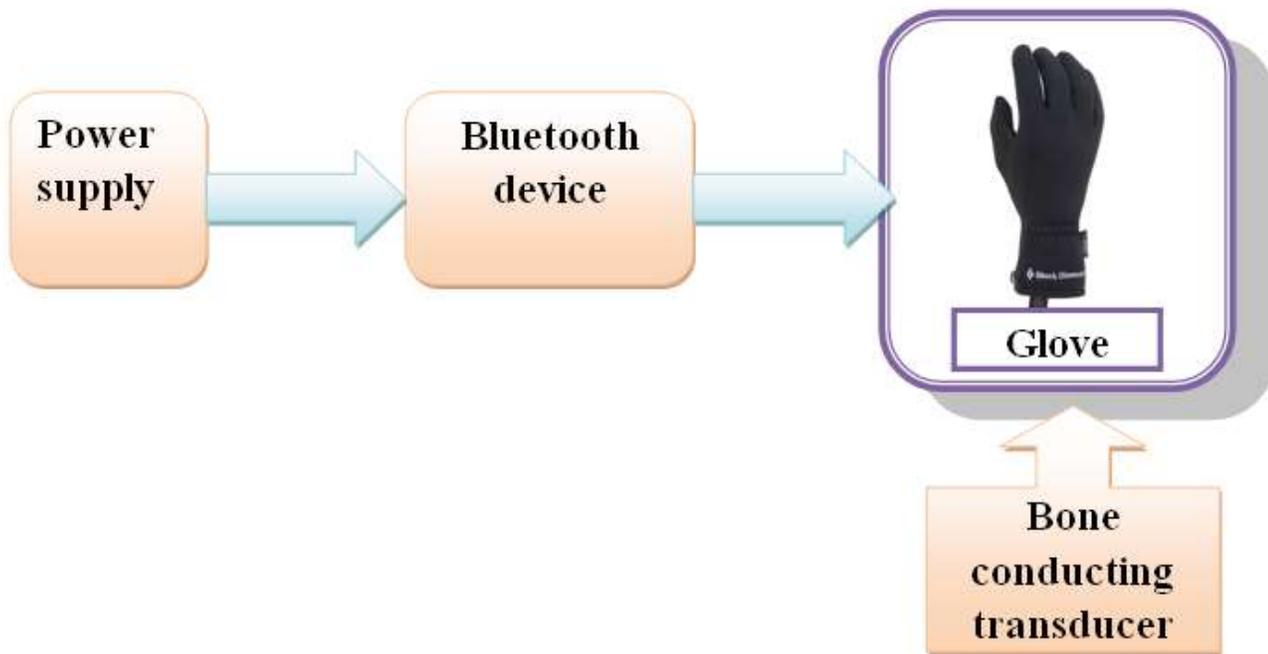


Fig.1.Circuit of Bluetooth device [12]

Smart glove working principle can be explained using block diagram as shown below.



Smart glove allows its users to make a phone call without holding the phone to their ear. Instead, they can answer a call through their fingertips. A user would need to first connect their smart gloves via Bluetooth to their mobile device. The Bluetooth handset is built into the left glove and the power button to activate it. The gloves are compatible with any mobile phone that has Bluetooth. A bone conducting transducer is placed into the index finger at proximal phalanx [13], a microphone built into the Bluetooth module and a simple set of controls on the back of the hand for pairing and other functions. In glove, Bluetooth are fitted into the box. The main

purpose of Bluetooth is to provide facility to user to make call and receive incoming call without any disturbance [3]. Bluetooth also has a rechargeable battery which has a talk time of 4 hours. For Bluetooth device 3.7 V and 400mA is required. Bluetooth used in the glove is shown in fig.2.



Fig.2. Bluetooth device

Normal sound waves are actually tiny vibrations in the air. The vibrations travel through the air to our eardrums. The eardrums in turn vibrate, decoding these sound waves into a different type of vibrations that are received by the Cochlea, also known as the inner ear. The Cochlea is connected to our auditory nerve, which transmits the sounds to our brain. Bone Conduction bypasses the eardrums. In bone conduction listening, the bone conduction devices (such as headphones) perform the role of your eardrums. These devices decode sound waves and convert them into vibrations that can be received directly by the Cochlea so the eardrum is never involved. The sound reach the ears as vibrations through the bones (or skull) and skin. The whole process is shown in fig.3. Most cases of hearing loss are due to damages to the eardrums. Since bone conduction does not use the eardrums, people with hearing difficulties would be able to hear clearly again with bone conduction, provided that their cochlea is in healthy and normal condition [2]. The bond conducting transducer fitted in the glove is shown in fig.4.

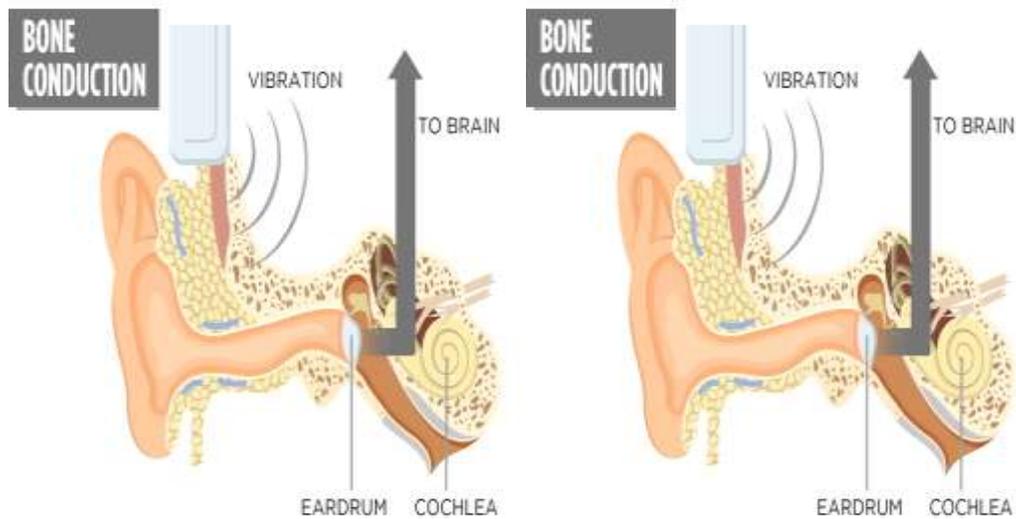


Fig.3. Bone conduction technology in ear [2]



Fig. 4. Bone conduction transducer with glove

### III. CONCLUSION

A smart glove is designed for people who have lost the hearing power due to the damage of eardrums but they want to listen the call on phone independently. This glove uses bone conduction technology along with Bluetooth technology. Since, bone conduction does not use eardrums, people with hearing difficulties would be able to hear the call clearly with bone conduction provided that their cochlea is healthy. Bluetooth transfers the call to the vibrator attached in the glove and help the user to listen the call on phone when the user touch the finger to the ear. This proposed project can also be used to listen songs by the user using Bluetooth technology. In future, further improvement can be done in the project like using proximity sensor for blind people and implement of touch less interface using gesture control based system.

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