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Speaker Amplitude Mic with Bluetooth Module

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***Abstract*— A microphone is used in almost every platform of life whether it's an education platform or entertainment platform. The system proposed in this paper is an advanced solution for the traditional microphones which is used in major parts of the world which lacks in connectivity and portability. The technology we have used is the latest Bluetooth technology which will enable the microphone to connect itself to the nearby devices within a range which has the Bluetooth feature in it. The Speaker amplifier mic with Bluetooth module is the new advancement in which both the amplifier and the speaker will be present in an individual device, enabling the portability and enhancing sound clarity with a higher pitch and volume over a particular area. The results were pretty successful as the model was able to produce sound which was quite clear up to the required range and it was also able pair without any problem with the Bluetooth devices.**

Keywords — microphone, Bluetooth, portability sound clarity

I. INTRODUCTION

A **microphone** is a transducer that changes sound into electrical signal .Different entities of microphones are in use which have the different methods to convert the air pressure variations of a sound wave to electrical signal. Microphones are used in many fields such as telephones, hearing aids, public events, etc. Microphones typically needs to be connected with the preamplifiers before the signal can be transmitted. Here, the prototype has two inbuilt speakers which eliminates the burden of porting the speakers. The IEEE paper on Acoustic Echo Cancellation using sub adaptive filter states that AEC cannot control the step-size parameter appropriately if the double talk and the echo path change simultaneously occur, which is possible in this project. The IEEE paper on speaker recognition, which deals with Digital Signal Processing fails to explain the effectiveness of these methods which is examined from the viewpoint of robustness against utterance variation such as differences in content, temporal variation, and changes in utterance speed, achieved in this project. Then the major problem to be solved was the connectivity of the microphone. Hence to solve this problem a Bluetooth module is used which can make the microphone to connect to all the Bluetooth devices nearby irrespective of any Bluetooth version it supports. Various Bluetooth modules were considered and after examining with a few of them RN 52 Bluetooth module was implemented. The proposed model is powered with a rechargeable 2600mah Li-ion battery. This eliminates the problem of charging the battery frequently. Charging is done through standard USB port. It has a normal USB cable which is used in charging most of the mobile phones and is easily available in market nowadays. This feature eliminates the use of an adapter thus making it portable and also helps in its cost reduction. With the proposed model one can easily use it in classrooms, mini halls, etc. This model also provides a clear, non-screeching sound and a flawless connectivity with mobiles, laptops, etc. The main purpose of this model is to help the professors to produce a clear loud voice without giving any extra effort to his/her throat.

II. MICROPHONE

The electronic device short named as mic which is basically used to convert the sound energy to electrical energy which gets transmitted in the form of waves i.e. signals. The device is mainly used to increase the sound i.e. to amplify the input sound energy. The output obtained is applicable in field of technology such as recording of sound and its engineering, communication systems such as phones and mobiles, hearing aids. The working basically lies on the coiling of the copper wire, which assists the diaphragm in the form a vibration acting as a capacitor and hence the piezo electric material works. Johann Philipp Reis, the German inventor designed the early sound transmitter. The electrical outbound obtained at its output defines the sensitivity of the sound.

$$Sensitivity_{dBV} = 20\ x\ \log_{10}\left(\frac{Sensitivity_{\frac{mV}{Pa}}}{Output_{REF}}\right)$$

The frequency response of the mic depends on the flat response within the pass band.

III.SPEAKER

The speaker which is an electronic device shares the same working principle as that of the mic, differing by operating in reverse action, to produce sound from an electrical signal. The working of the speaker is effective when an AC source sound is applied to its coil, another coil of wire suspended in a circular gap between the poles of a permanent magnet, the coil is forced to move rapidly back and forth obeying Faraday's Law of Induction, which causes a diaphragm attached to the coil to move back and forth, pushing on the air to create sound waves and hence making it audible. There are several alternative technologies that can be used to convert an electrical signal into sound. The speaker uses a lightweight diaphragm, or the cone, connected to the structure, with the help of a tangible suspension, that assists a sound to move axially through the cylindrical magnetic gap produced. When an electrical signal is applied to the coil, a field of resonance is created by the electric current in the coil, making it a temporary electromagnet. The adjournment or the suspension system assists the coil placed in the center of the gap providing a restoring force that returns the conical shaped structure to a neutral position after vibration. The adjournment is usually made of a drenched fabric disk, covered with a hard resin.

IV.LM 386 AUDIO AMPLIFIER

It is a low voltage operating amplifier. It is built around popular amplifier LM386 comprising of resistors, speakers, capacitors etc. A powerful battery is used to power this project in order to operate for a long period of time.

PIN NO.1 and 8: These pins are the gain controlling pins. It can be increased up to 200 times by using a capacitor placed between PIN 1 and 8. We have used 10uF capacitor to get the highest gain i.e. 200. Gain can be varied to any value ranging between 20 – 200 by using the proper configuration of the capacitor.

PIN NO. 2 and 3: These pins are the input PINs for sound signals. Pin number 2 is the -ve input terminal, connected to the ground. Pin 3 is the +ve input terminal, in which the audio signals are fed in order to be amplified. Potentiometer acts as the volume control knob. Also a capacitor has to be implemented along with the potentiometer, to eradicate the DC component produced at the input signal and hence only allow the audio (i.e. AC component) to be fed into the IC LM386

PIN NO. 4 and 6: These pins are the power supply Pins of the IC. Pin 6 for is +Vcc and Pin 4 is Ground. The circuit can also be powered with suitable voltage.

PIN 5: This pin serves as the output PIN, from which we get the amplified sound signal. The output signal has both AC and DC component. The DC component is unwanted and hence can't be fed to the speaker. So, in order to remove this DC component, a capacitor of 220uF has to be implemented. This capacitor has the same function as capacitor at the input side. Along with this capacitor of 220uF, a filter circuit of capacitor of .05uF and resistor of 10ohms has been used at the output pin 5. This filter is acknowledged as the Zobel Network. This electronic filter is used to eradicate the sudden unwanted high frequency oscillations and noise.

PIN NO. 7: This pin is known as the bypass terminal. It can be left open or can be grounded using a capacitor to obtain stability.

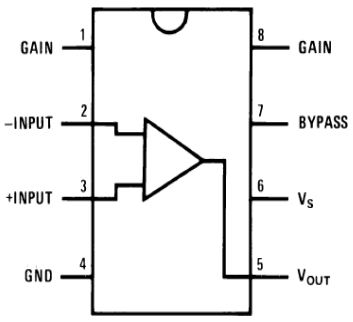

Figure 1: LM386 PIN DIAG

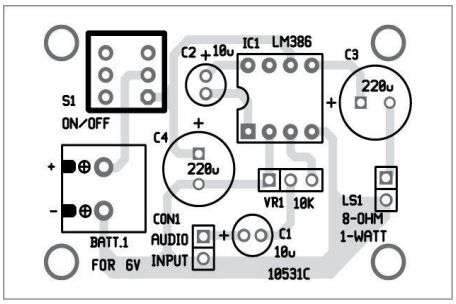

Figure 2: PCB LAYOUT

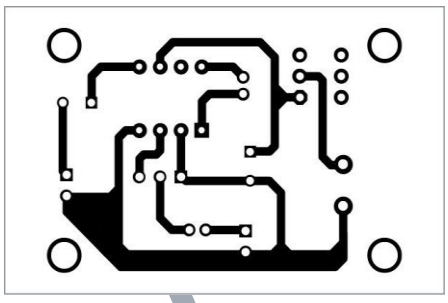

Figure 3: PCB LAYOUT

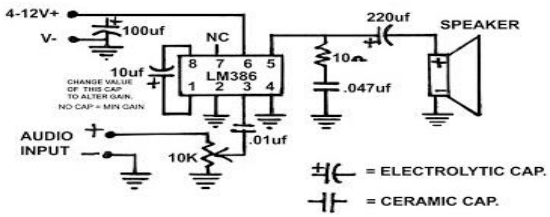

Figure 4 LM 386 AUDIO AMPLIFIER

V. RN52 BLUETOOTH MODULE

The RN52 Bluetooth audio module provides a fully integrated solution for delivering high quality stereo SOUND in a small form factor. It combines a Class 2 Bluetooth radio with an embedded Digital Signal processor, controlled and is configured. It integrates RF, a baseband controller, and Digital Signal processor, making it a complete Bluetooth audio wireless link. The module also supports Digital Input/Output, Stereo speaker output, Stereo microphone input, up to 11 General Purpose Input/Output's, and 2 LED status outputs.

Figure 5:RN52 BLUETOOTH MODULE

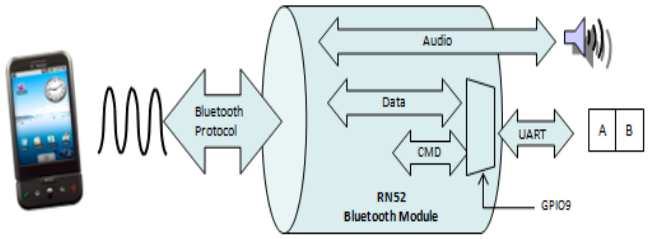

Figure 6: FLOW CHART OF BLUETOOTH WORKING.

VI.LI-ION BATTERY

A **lithium-ion battery** or **Li-ion battery** (abbreviated as **LIB**) is a type of rechargeable battery in which lithium ions move from the negative electrode to the positive electrode during discharge and back when charging. Li-ion batteries use an intercalated lithium compound as one electrode material, compared to the metallic lithium used in a non-rechargeable lithium battery. The electrolyte, which allows for ionic movement, and the two electrodes are the constituent components of a lithium-ion battery cell. Lithium-ion batteries can pose unique safety hazards since they contain a flammable electrolyte and may be kept pressurized. An expert notes "If a battery cell is charged too quickly, it can cause a short circuit, leading to explosions and fires". Because of these risks, testing standards are more stringent than those for acid-electrolyte batteries, requiring both a broader range of test conditions and additional battery-specific tests

Figure 7: LI-ION BATTERY

VII. RESULTS/DISCUSSIONS

In this paper, a practical microphone and speaker module is designed and verified for different acoustical effects through experiments. In addition we showed Bluetooth connectivity of the module with different operating system. This new advancement enables the amplifier and the speaker to be established in a single device. This portability enhances sound clarity with a higher pitch and volume over a particular area.

The LM386 amplifier is used to amplify the ordinary microphone. The maxicom 5watt speakers are used for adequate loud acoustics. The super B 2600 Li-ion battery provides excellent battery backup.Our low noise microphone amplifier will fit well in the niche market for true analog designed microphone amplifiers, providing the basic needs of a microphone amplifier while introducing as little noise as possible at a reasonable cost.

The cost design will include the following features:

There are three main technical objectives that must be overcome in order to achieve our design features.

The first and most important objective is to produce low overall noise for the microphone amplifier. Low overall noise will be at the core of the design of each of the sub-systems of the microphone amplifier. There are two totally different aspects of this concept in order to achieve the overall goal of low noise. The first aspect is to minimize the Equivalent Input Noise (E.I.N). This is the fundamental or "true" noise of the electronic design based around the internal noise generators, both voltage and current, in all active and non-ideal passive components. Optimizing circuit bias points and source resistances, as well as the use of negative feedback, can aid in meeting low noise goals. The second aspect is to minimize the coupling of external noise sources to the internal amplification circuitry; this includes the use of specialized shielding, grounding, PCB design techniques and balanced differential signaling.

The second objective is too ensure feedback stabilized circuitry. Negative feedback at DC will force optimum bias points for transistors and related components. Negative feedback applied at AC will make the circuit gain and bandwidth less sensitive to changes in temperature, transistor variations, and signal levels.

The third objective is to establish low distortion from the circuitry. While distortion is sometimes considered a musically pleasing effect, for our design we will primarily try to minimize non-linearity with the hope that the quality of the transformers will be the limiting factor. Transistor linearity will benefit from localized feedback (degeneration) as well as the use of overall, global, negative feedback.

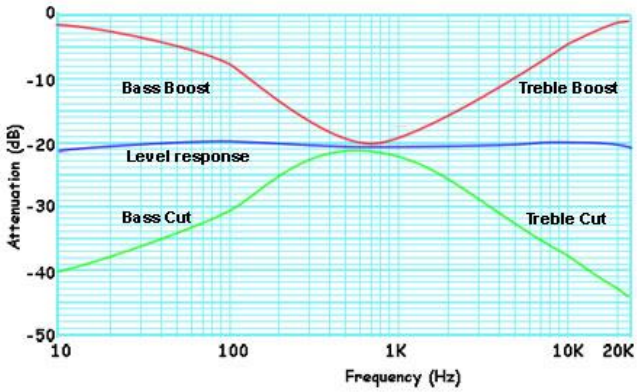

Figure 8: BASS GRAPH

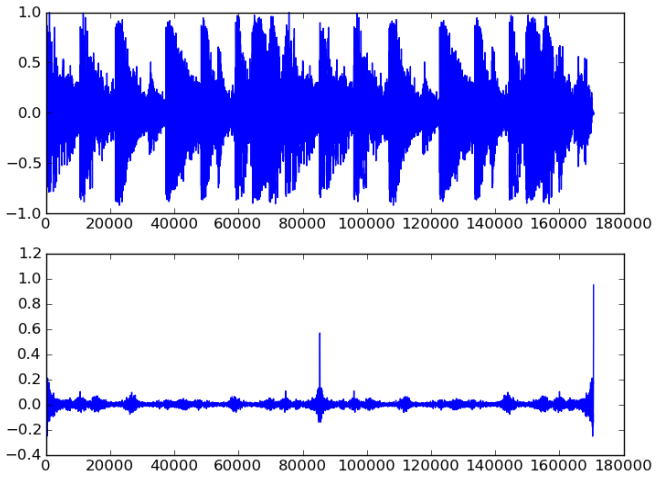

Figure 9: ECHO GRAPH

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