

## AN APPLICATION OF ELECTRONIC AMPLIFIER STETHOSCOPE

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**Abstract-** Electronic stethoscopes are one of the important medical devices which affects the self-diagnostic or remote diagnostic in medical area. Rather the general stethoscopes, electronic ones increases the sound amplitude and quality. By filtering ambient noise, they can be used for advance analysis of heart or lung related diseases.

**Keywords:** Microphone, electronic stethoscope, amplifier

### I INTRODUCTION

The use of electronic instruments in medical needs has been drastically increasing recently. These applications can be within a broad scope of fields from very complicated artificial machines to small electronic medical devices. Especially in small ones, there are lots of instruments today.

One of the most famous and widely used devices is electronic blood measuring devices. It is one of the first example of these kind of devices. Some of other popular ones are electronic temperature measuring, blood sugar measuring, physicall threatment equipments and so on. These equipments are commonly

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used by individual patients or households easily. In other words, they are used by non-professionals because it is easy to use and understand the results.



Figure 1 Stethoscope

Comparing to them, there is another important devices, electronic stethoscope. Stethoscopes, unlike the others, are not used commonly by non-professionals apart from measuring blood pressure. More commonly, doctors are using them for diagnostic or checking their patients. They use this equipment for listening especially the heart and lung sounds, or in other words body sounds.

Electronic stethoscopes are one of the example of these small hand-held devices. In the industry, there are applications of electronic stethoscopes. Some of them are academic projects and some of them are mass-production industry-aimed products.

Body sounds gives lots of information about human health. There are still opportunities in these fields for further improvements. First of all, there is still a room for easy, ergonomic and cheap electronic devices for varying fields of medicine. Secondly, with new technologies of wireless connections, internet communication, there are some new fields of development.

The aim of this project is to investigate electronic stethoscope, how to produce them cheaply, and finally explore the wider applications of these devices as self-diagnostic for both professionals and non-professionals.

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## II ELECTRONIC AMPLIFIER STETHOSCOPE

The word stethoscope is derived from the two Greek words, stethos (chest) and scopos (examination). Apart from listening to the heart and chest sounds, it is also used to hear bowel sounds and blood flow noises in arteries and veins [1].

Stethoscopes are compact mechanical equipments. There is a diaphragm or plastic disc just in front of the stethoscope. This membrane vibrates and it creates a pressure waves inside the stethoscope. Through a plastic tube this sound waves reach to human ear. It is a good isolated system. There is another plastic plug for connecting to the ear directly to sound nerves [2].

Heartbeats or pulse is an important sound. But it is very low amplitude. By a good isolated system, we can hear them with a normal stethoscope. There is not an amplification of these sounds, just isolation.

The aim of this project is to make an electronic stethoscope in order to increase the sound level. By this way, a good quality and powerful sound of body can be achieved.

We used a simple 8-watt microphone. Microphones as a transducer changes the analog sound wave (pressure) into electronic signals as voltage. For getting the heartbeat or pulse, we put the microphone directly inside the vibrating diaphragm.

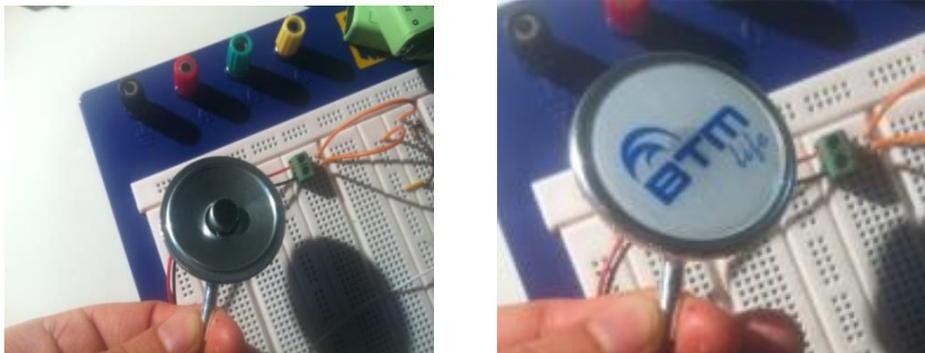


Figure 2 Microphone in stethoscope

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The voltage that microphone produce is very low between 15-25 mVpp. It is very difficult to hear this sound through a speaker. We have to amplify this voltage since speaker needs 2 V to hear sound loudly.

In order to hear the sound from the speaker, we need 100 voltage gain. For this necessity, in order to amplify this low voltage, we used operational amplifiers (op amps). We have use LM324 integrated circuit [3]

For the 100 vorage gain, we use one 1k ohm and one 100k ohm resistors. We supply the IC with independent 9V batteries. There is also a potansiometer. By this way,one can increase and decrease the volume of speaker by limiting the voltage with changing the resistor by turning the potansiometer.

By connecting any kind of headphone jack we will hear the sound of heart and lung of a human. In the commercial products, there is no headphone, just the ordinary stethoscope ear-plug.



Figure 3 Commercial Electronic  
Stethoscope [4]



Figure 4 Headphone

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## III APPLICATIONS

After we have accomplished the amplification of the body sounds with electronic stethoscope, it can be further developed by signal processing. Doctors listen body sound in order to check whether there is a health problem or not. By saving the body sounds, one can compare them with the pre-defined sound of diseases. So it can make an automatic device telling whether there is a possibility of illness or not [5].

One of the most important advantage of electronic stethoscopes is that it can be used over cloths. In normal stethoscopes, doctors put the diaphragm directly to the naked chest or heart of a human body. But in some conservative cultures and regions, just for this reason, some women do not prefer to go to doctor. But with this electronic stethoscopes as they amplify the sound waves, there is no need to take off cloths.

Even with remote monitoring systems, one can send their parameters to a system located in an hospital. After some control algorithms of error or false warnings, one can be invited to hospital to be checked by a professional health care staff. By this way, with a very limited amount of investment, a public health care system can be developed.

## IV CONCLUSION

Electronic stethoscope or more generally diagnostic devices are becoming very important in self-diagnostic or remote diagnostic. Especially with the increase of smart phones, electronic stethoscopes can be implemented with these phones with a little hardware and software applications. As they have all internet access and microprocessors inside, they can be a very good choice for the development of electronic stethoscopes.

## REFERENCES

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