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FOOD ESTIMATION FOR THE OPERATED PATIENTS USING LabVIEW

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Abstract: Patients who are under observation for the gastro-intestine problems or the post-surgery recovery need to be observed by the doctor by auscultation. It plays a prominent role in the estimation of food intake. This project offers a way of assessing the bowel sounds of a patient without the doctor interference. It involves a stethoscope diaphragm connected to ECM further joined to the 3.5mm Audio jack, which is driven by the LabVIEW software in PC. The experiment involves digital Butterworth topology in Band pass configuration filters which eliminate the interference of the heart and lungs sounds. It also accepts the recorded .wav file formatted recorded signals of bowel sounds and estimates the food intake of either liquid or solid food to the patients who are being observed.

Keywords: Electret Condenser Mic [ECM], Lumen Tube, Stethoscope diaphragm, 3.5mm Audio Jack, LabVIEW, Auscultation.

1.INTRODUCTION

Initially, doctors used to observe bowel movements of patients with the help of the stethoscope. It provides information about air; liquid sounds present in the gastrointestinal tract. This is further used for either to undergo emergency surgery or post-surgical purposes such as intake of food. Paralysed or people cannot express their state of condition, as either doctor is busy or not, he has to monitor the patient continuously. In this technique, without the presence of the doctor, the bowel movements are captured and monitored anonymously. Quality of service in health care has always been under constant criticism in the modern era, as it is a very touchy subject. Bowel Sounds Monitoring specially-abled people is a concern and most of the people are job holders and have so hectic life. It is difficult to manage to keep a constant watch on operated people as patient admitting numbers are increasing rapidly. LabVIEW provides the means by which it is possible to collect and analyse data remotely. So, this indicates that it is possible to detect and estimate which food to be taken. The basic reason LabVIEW is important for this project is firstly it is automated; the human interaction is reduced to minimum and automation leads to less chance of errors.

2. SIGNIFICANCE OF PROJECT

Bowel sounds detection provides better access of patient abdomen condition to the concerned people and also the physician. It also increases the capacity to treat more patients. It also improves the quality of care since it connects more directly to the patient data. Along with comfort it also gives assurance to the patient that someone is watching out for their health and well-being on a daily basis. This also allows patients to maintain independence, prevent complications and minimize personal costs. One of the key features of this project is early detection and deterioration. Thereby reducing the number of emergency department visits, Postoperative observation period and duration of hospital stays. A real time visualization of the patient bowel sounds and medical parameters can be provided to the doctor

3. PROPOSED METHODOLOGY

It is involved in two bases namely front panel and block diagram the entire programming done in the block diagram panel in the user-friendly display comes under the front panel. This used to play prominent role in both back end front end programming and can be advanced by elaborating with electronics.

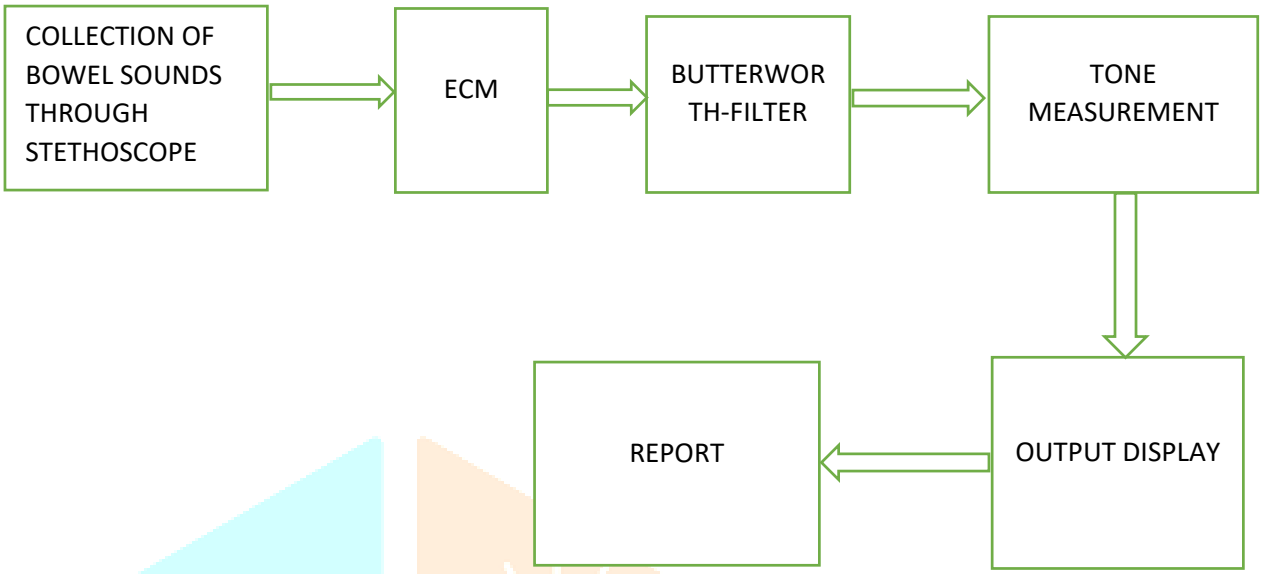


Figure: BLOCK DIAGRAM

ECM:

An ECM is a type of condenser microphone transducer which means its works on electrostatic principles. Condenser mic capsules essentially work as capacitors and require a charge, which is supplied quasi-permanently by electret material (a portmanteau of electric and magnet) in the capsule. An electret microphone is a widely-used electronic communications and audio recording device. It is a type of electrostatic capacitor-based microphone, which eliminates the need for a polarizing power supply by using a permanently charged material. It is commonly made by first melting a suitable dielectric material such as a plastic or wax that contains polar molecules, and then allowing it to re-solidify in a powerful electrostatic field.

Figure. Wire-type ECM

STETHOSCOPE DIAPHRAGM

The diaphragm is best for higher pitched sounds, like breath sounds and normal heart sounds. It has a larger flat side of the chest piece. A stethoscope is a medical instrument used to listen to sounds produced in the body, especially those that emanate from the heart and lungs. Stethoscopes comprise two flexible rubber tubes running from a valve to the earpieces. It consists of two earpieces angled at the same angle as the ear canal, rubber tubing, and a head with either a diaphragm (plastic disc) or a bell (hollow cup). The diaphragm accentuates high-frequency sounds; the bell transmits low-frequency sounds.

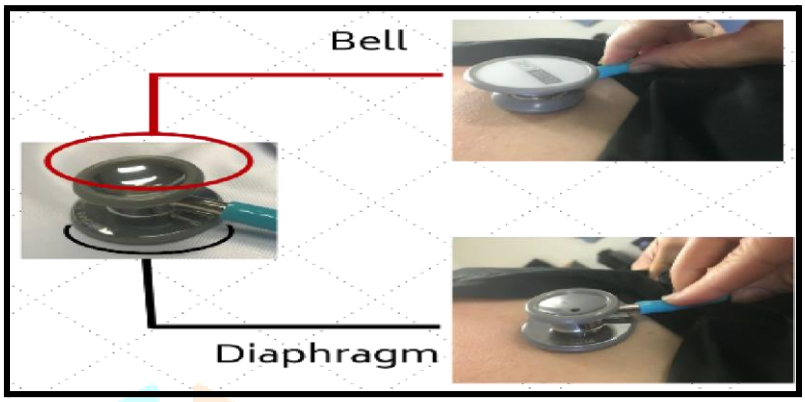


Figure. Typical usage of Stethoscope diaphragm

BUTTERWORTH FILTER

The frequency response of the Butterworth filter is maximally flat (i.e. has no ripples) in the passband and rolls off towards zero in the stopband. When viewed on a logarithmic Bode plot, the response slopes off linearly towards negative infinity.

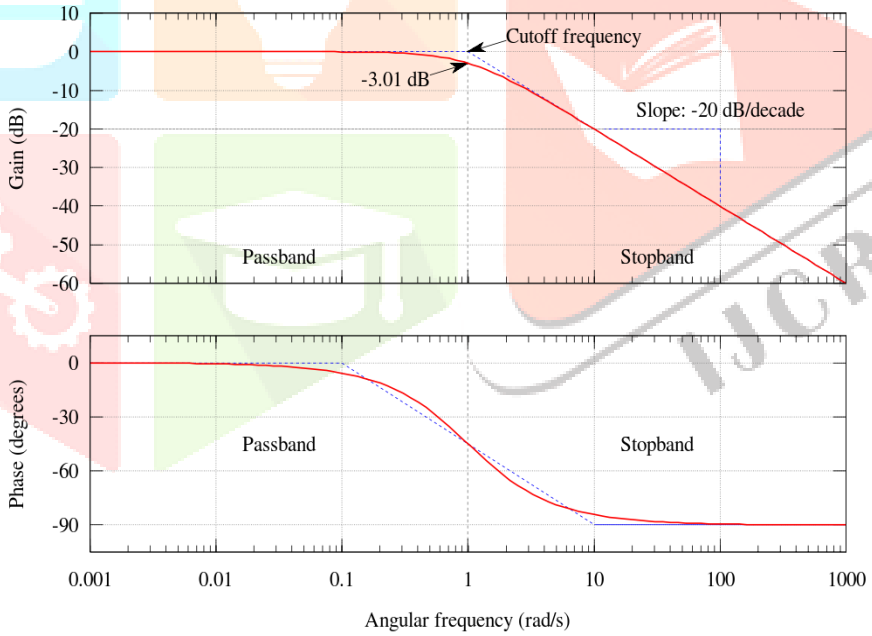


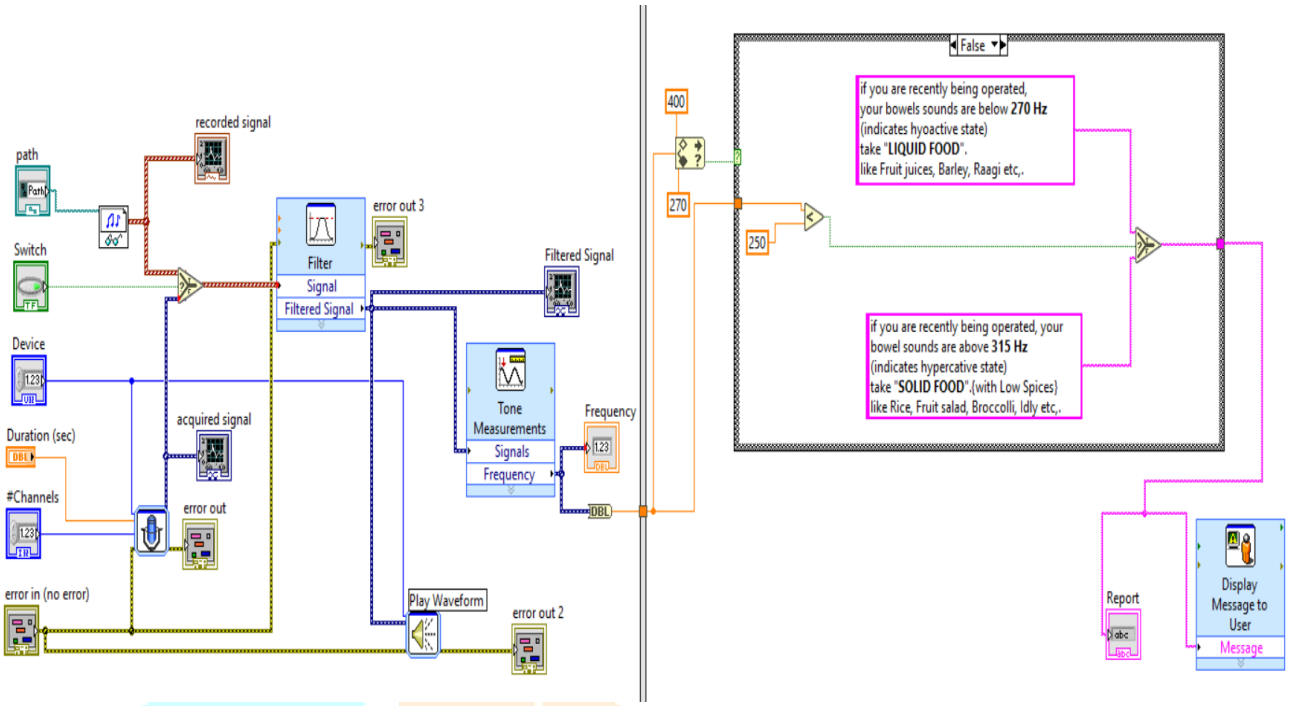
Figure. Frequency response of Butterworth filter

Introduction to Virtual Instruments:

LabVIEW is a graphical programming language that uses icons instead of lines of text to create applications. In contrast to text-based programming languages, where instructions determine program execution, LabVIEW uses dataflow programming, where the flow of data determines execution.

In LabVIEW, you build a user interface with a set of tools and objects. The user interface is known as the front panel. You then add code using graphical representations of functions to control the front panel objects. The block diagram contains this code. In some ways, the block diagram resembles a flowchart.

FLOW CHART



SIMULATION RESULTS

Initially for every standard abdomen procedure, the bowel sounds must take 24 - 48 hours to get back to normal condition for the processing of food and other metabolisms. For every surgery after 24 hours doctors must auscultate the operated patient for bowel recovery. So, given threshold values for the examination of bowel sounds.

Parameter	**Normal**	**Hypoactive**	**Hyperactive**
Frequency Range	316	>400	<200
Sounds range	10-15±	1-2	15-30
Duration	3-5 min	3-5 min	1-2 min

Table. Threshold values table

Using the LabVIEW, the audio signals in the form of .WAV file format for the processing of above conditions and the audio signals can be recorded by using external ECM attached with stethoscope diaphragm connected using 3.5 mm Audio jack 3 ringed configuration.

The recorded signal is processed under digital Butterworth fifth order bandpass filter with band between 250 to 400 Hz for detection of bowel sounds. The live feed of the front panel can be transmitted through the web using a web publishing tool by generating a browsable link with 1 second delay in transmitting almost negligibly.The filtered signal can result in some food estimations for the patient as liquid or solid food for post operated patients.

The results for the recorded signal using ECM with Stethoscope as shown below

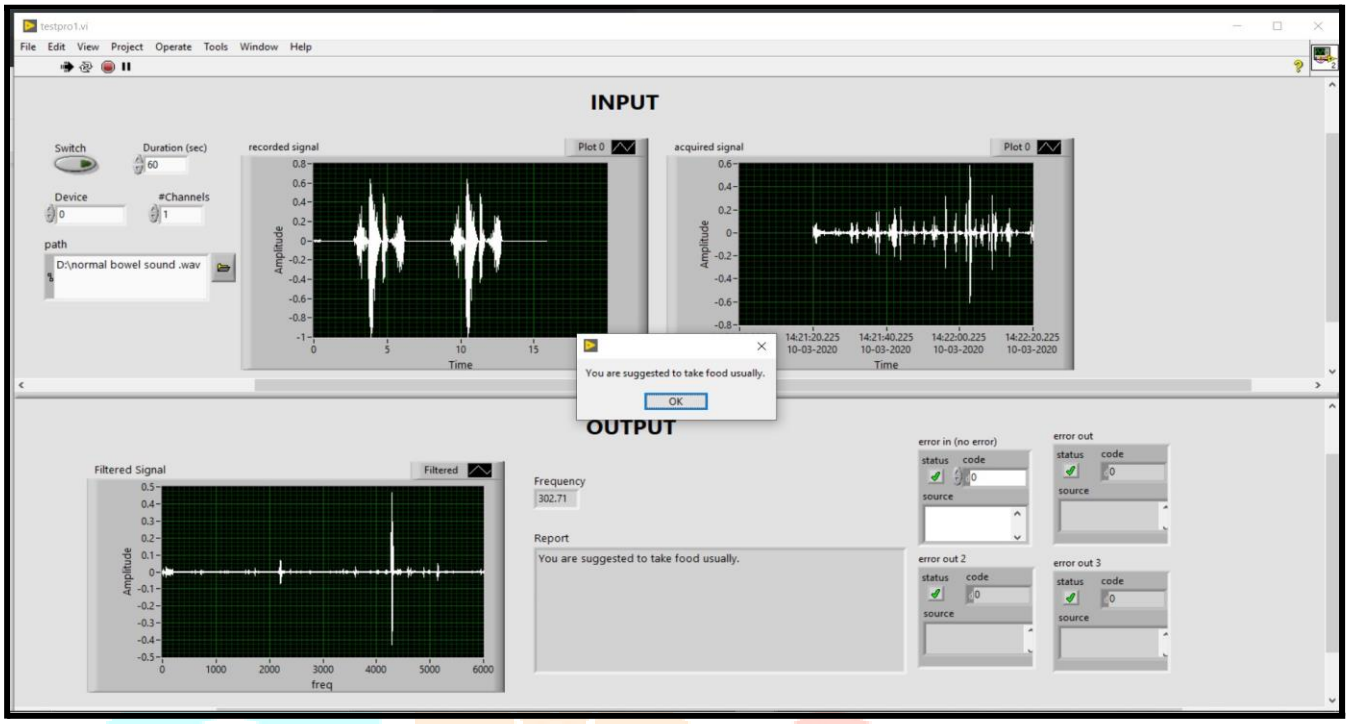


Figure. Front panel (report)

The above figure shows the recorded signal with using the stethoscope and pop-up message as the regular food can be taken. And, the frequency is shown as 302.71Hz.

Any internet connected device can access the data of the front panel and is monitored throughout the diagnosis with 1 second delay at most.

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