Interactive Electrocardiography Display

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Abstract

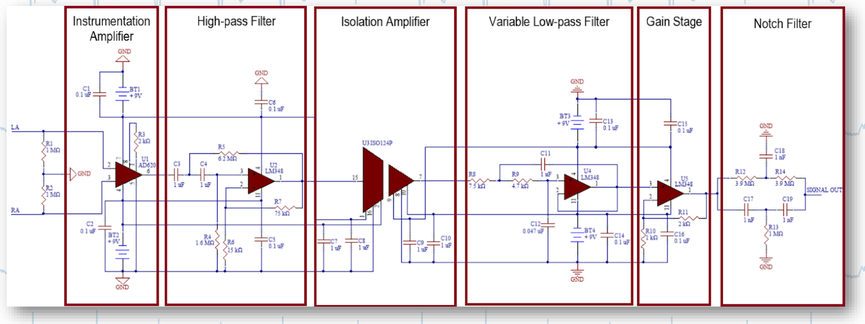
The target of our Major Qualifying Project was to produce an educational demonstration meant to aid Worcester Polytechnic Institute's (WPI) Department of Electrical and Computer Engineering (ECE) in exhibiting the opportunities available to those interested in pursuing a career in ECE. To accomplish this goal we created an interactive project for WPI's Touch Tomorrow event in the Spring of 2020 and into the future. We utilized Elenco Electronics Snap-Circuit pieces to produce a two-electrode ECG circuit allowing users to visualize the electrical activity of their heart after building the ECG circuit themselves. In addition to the interactive project, we proposed how future MQP teams could utilize our project to produce an interactive display for the lobby of Atwater Kent, the location of WPI's ECE department.

Background

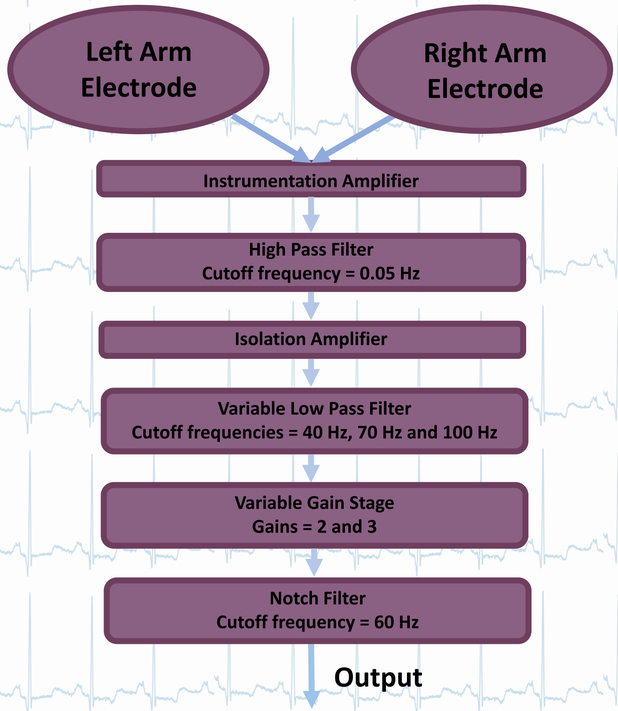
The human heart contracts regularly and continuously, pumping blood to the body and the lungs. The pumping of the heart is caused by electricity that repeatedly flows through the heart in a cycle. The electrical activity of the heart can be recorded through an ECG. An ECG measures how electrical impulses move through the heart as the muscle contracts and relaxes through electrodes that are placed on the limbs and chest of the human body. The standard clinical ECG utilizes ten electrodes and twelve leads.

Project Goal

To produce an educational demonstration to aid WPI's ECE Department in exhibiting the opportunities available to those interested in pursuing a career in ECE.



Circuit Layout



Results

	Instrumentation Amplifier	High Pass Filter	Overall Gain
Theoretical	25.7 V/V	20 V/V	1028 V/V – Gain of 2 1542 V/V Gain of 3
Measured	30.2 V/V	20.8 V/V	
Vin	20 mV pk-pk	.1 V pk-pk	
Vout	1.030 V pk-pk	2.08 V pk-pk	
Error	17.5%	4%	6.6%

- Common Mode Rejection Ratio
- Input Offset Voltage
- Input Bias Current
- Step Responses of filters
- Gain Testing

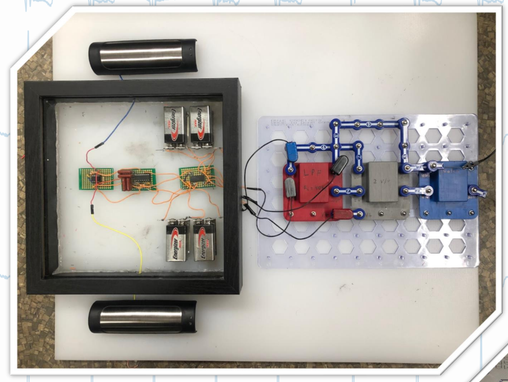
Discussion

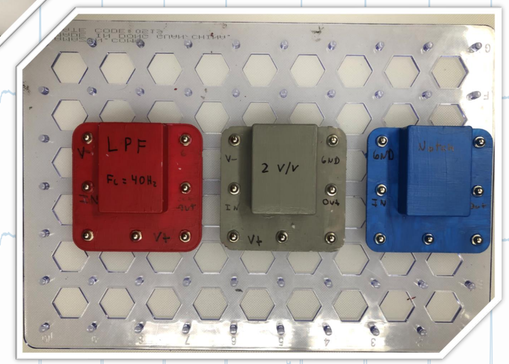
Constraints

- Time
- Cost
- Size

Objectives

- User-friendliness
- Sustainability
- Reliability
- Safety





Acknowledgements

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Citations

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