

BME 402: Biomedical Engineering Design
A Finger Plethysmograph to Measure Blood Resistivity

Clients:

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February 15th to February 5th

Problem Statement:

Our goal is to design a finger plethysmograph to measure blood resistivity. Impedance plethysmography may be used to measure arterial volume change that occurs with propagation of the blood pressure pulse in a limb segment. For this measurement, we assume a constant value of blood resistivity. However, blood resistivity may change under both physiological and pathological conditions. Use of an impedance plethysmograph on a finger immersed in a salt-filled beaker may yield a simple method for determining blood resistivity. This may develop into a method that diabetics can use to measure glucose level noninvasively.

Last Week's Goals:

- Finish circuit testing
- Finalize several new finger holder designs and begin building and testing.

Summary of Accomplishments:

- The team met and constructed an op-amp constant current generator and a resistive model of the finger to test the circuit.
- The circuit could detect a $1/1000^{\text{th}}$ change in resistance and amplify it.
- We also determined the source of a large signal artifact due to the ripple voltage of the half-wave rectifier. The capacitor value was changed from $.1\mu\text{F}$ to $10\mu\text{F}$ and this reduced to ripple so that it was no longer a problem.
- Started to finalize new ideas for the improved finger holder

This Week's Goals:

- Start and complete the mid-semester presentation.
- Gather supplies to begin constructing several new finger holders to test how well they detect the finger resistivity.

Difficulties:

No difficulties thus far

Activities:

Tim Balgemann: Advisor Meetings: 1 hr
Research 1 hrs
Client Meeting: 2 hrs
Total: 7.5 hrs

Lucas Vitzthum: Advisor Meetings: 1 hr
Research 1 hrs
Client Meeting: 2 hrs
Total: 7.5 hrs

Nick Harrison: Advisor Meetings: 1 hr
Research 1 hrs
Client Meeting: 2 hrs
Total: 7.5 hrs

Tyler Lark: Advisor Meetings: 1 hrs
Research 1 hrs
Client Meeting: 2 hrs
Total: 7.5 hrs

Timeline:

ID	Task Name	Start	Finish	Duration	Jan 2009		Feb 2009				Mar 2009				Apr 2009				May 2009				
					18/1	25/1	1/2	8/2	15/2	22/2	1/3	8/3	15/3	22/3	29/3	5/4	12/4	19/4	26/4	3/5	10/5	17/5	
1	Finalize Circuit Design and Brainstorm New Finger Holder Design	1/26/2009	2/20/2009	4w																			
2	Review Literature on Blood Resistivity	1/26/2009	2/9/2009	2w 1d																			
3	Finalize Finger Holder Design	2/9/2009	2/27/2009	3w																			
4	Begin Planning of Experimentation	2/25/2009	3/2/2009	4d																			
5	Carry Out Experiments	3/3/2009	4/3/2009	4w 4d																			
6	Redesign Finger Holder as Necessary	3/3/2009	4/3/2009	4w 4d																			
7	Mid-Semester Report	3/6/2009	3/6/2009	0w																			
8	Collect and Compile Experimental Data	3/19/2009	4/20/2009	4w 3d																			
9	Report Writing	4/20/2009	5/6/2009	2w 3d																			
10	Design and Create	4/23/2009	5/1/2009	1w 2d																			
11	Poster Presentation	5/1/2009	5/1/2009	0w																			