Diagnostic EEG for viral-induced epilepsy

Client: Dr. Brandon Coventry

Advisor: Prof. Amit Nimunkar

Team: Richard Yang (Team Leader)
Ellie Dingel (Communicator)
Mark Rice (BSAC)
Elliott Harris (BWIG & BPAG)

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Problem statement

Epilepsy is recognized as a potential consequence of infection by endemic viral pathogens prevalent in developing regions. Unfortunately, the diagnostic capability to localize seizure foci is severely restricted in low-resource medical environments where access to electroencephalography (EEG) is limited. Despite this well-documented risk, many medical facilities in low-resource settings lack the necessary diagnostic tools, such as EEG, to effectively localize seizure foci. The inability to pinpoint these foci impedes timely and precise treatment, exacerbating the burden of epilepsy in these communities. This project aims to address this critical gap by developing an affordable, open-source EEG system tailored for rapid deployment in rural and under-resourced hospitals. By enhancing the localization and treatment of epilepsy, this initiative seeks to significantly improve clinical outcomes in regions with limited healthcare infrastructure.

Brief status update

The team met to split up goals for the spring semester and continued work on the embedded system and tested the circuitry. The priority for this semester is to 1. Develop the embedde system and 2. Design V2 of the PCB

Difficulties / advice requests

Mark had issues this week getting the pico to run anything, will try on another pico to see what the issue may be.

Current design

Currently, the team is working on creating a 3D printed headcap model along with a single channel circuit which includes a multiplexer.

Materials and expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
									$0.00	
									$0.00	
Category 2										
									$0.00	
									$0.00	
								TOTAL:	**$0.00**	

Major team goals for the next week

1. Have embedded system ready for circuit testing

Next week's individual goals

- Richard
    - Further quantification of PCB performance
    - Debug Driven right leg
    - Maybe help with embedded system
- Ellie Dingel
    - Held to further solder the PCB
    - Aid in debugging the driven right leg
    - Contact location for mentor program
- Mark Rice
    - Get embedded system updated and ready for testing.
- Elliott Harris
    - 3D print new ear clip and test the attachment of the electrodes to the ear clip
    - Receive skullcaps and start to create the electrode web onto the cap

Previous week's goals and accomplishments

- Team Accomplishments
- Richard Yang
    - Fully debugged one channel in the parallel configuration
- Ellie Dingel
    - Debugged one channel in parallel configuration
    - Aided in population of another channel
- Mark Rice

    - Soldered multiplexer onto surface mount adapter, troubleshooted pico not running programs
- Elliott Harris
    - Ordered the skull cap of interest to start working on first cloth prototype
    - Modified the ear clip drawing for second prototype

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Ellie Dingel	9/8	Researched Seizure physiology and the Bionode Sensor	2.5	6.25h	54.75h
	9/8	Corresponded for Client Meeting	.25		
	9/10	Researched Circuit Design	1.5		
	9/10	Held a client meeting	0.5		
	9/12	Put together progress report to send to client	0.5		
	9/13	Advisor Meeting & Team Meeting	1		
	9/15	Conducted Literature Review to examine EEG guidelines	1.5	5.5	
	9/16	Conducted Literature Review for creation of PDS and worked to fill out PDS	3		
	9/19	Conducted Literature Review	1		
	9/20	Worked with team to draft design matrix, held Advisor Meeting	2.5		
	9/22	Watched videos on how to operate altium and downloaded the software	2.5	10	
	9/23	Further investigated EEG schematics as planned EEG design	1		
	9/24	Begin to draw EEG circuit, investigate circuit components	1.5		
	9/25	Attended the TECH welcome event and finished design matrix	1		
	9/26	Worked on Creating EEG circuit	4		

	10/2	Worked on EEG circuit and preliminary slides	2.5	7.5	
	10/3	Preliminary slides and presentation	2		
	10/4	Tema Meeting Preliminary Presentation	3		
	10/8	Preliminary Report	2	4.5	
	10/9	Preliminary Report & Altium	2		
	10/10	Worked on Altium	.5		
	10/11	Team Meeting	1	9.5	
	10/11	Breadboarded Circuit	3		
	10/13	Worked on creating schematic in altium and lt spice	2		
	10/14	Adjusted design schematics	.75		
	10/15	Research papers to confirm design	.5		
	10/16	Meeting and work on LT spice	1.5		
	10/17	Work on LT spice	.75		
	10/18	Meeting & Individual work	3.5	11.5	
	10/19	Worked on Altium Schematic	3		
	10/21	Worked on Altium Schematic	1.5		
	10/22	Worked on Altium Schematic	1.5		
	10/23	Meeting to talk Schematic	.5		
	10/14	Meeting, worked on PCB	1.5		
Mark Rice	9/7	Researched Raspberry Pi Models & EEG	3	6.25	38.75
	9/10	Researched EEG & Viral Induced Epilepsy & Had Client Meeting	2		
	9/12	Filled out progress report	0.25		
	9/13	Advisor meeting	1		
	9/18	Literature review: open source EEG hardware systems	2	7.5	
	9/17	Worked on PDS & documenting in labarchives	3		
	9/20	Advisor & team meeting	2.5		

	9/23	Design matrix & drawings	2	7	
	9/26	Plotting head mesh in matlab & contacting for access to software in head cap paper	2		
	9/26	TECH kickoff	1		
	9./27	Advisor & team meeting	2		
	10/2	Prelim Slides	2	9	
	10/3	Prelim practice	2		
	10/3	Troubleshooting Blender Addons	2		
	10/4	Prelim presentation & team meeting	3		
	10/6-9	Writing & Editing Prelim Presentation	3	8	
	10/9	Head Anthropometry Research & calculations	2		
	10/10	Tried to get neurocaptian blender plugin to work (no luck)	2		
	10/11	Team & Advisor Meeting	1		
	10/16	Met with makerspace	1	1.5	
	10/17	Followed up with makerspace & with Ashley about blender issues	0.5		
	10/18	Team & advisor meetings			
Elliott Harris	9/10	Attended client meeting	0.5	4 h	29 h
	9/12	Researched competing designs and background information	2		
	9/18	Worked on PDS	1		
	9/19	Worked on PDS	1		
	9/19	Completed Research on topics above	2		
	9/23	Worked on the design matrix	1		
	9/25	Researched placement of electrodes in EEG cap	1		

	9/26	Started to draft a design	1.5		
	10/7	Worked on preliminary report	2		
	10/8	Worked on report	1.5		
	10/10	Researched and sliced STL file	1.5		
	10/17	Edited and created new STL files for printing	3		
	10/23	Met with Mark to discuss plans	1.5		
	10/24	Started to research GUI	2		
	10/31	Worked on ear clip and electrode design	1.5		
	11/1	Attended show and tell	2		
	11/6	Worked on ear clip	2		
	11/7	Worked on electrode solution	2		
Richard Yang	9/7	Researched EEG circuit design	1	4	10.5
	9/10	Attended client meeting	0.5		
	9/12	Researched EEG circuit design	1		
	9/15	Worked on PDS	1		
	9/19	Worked on PDS	3		
	9/23	find components on digikey	2		
	9/26	worked on altium	2		