Dynamic Balance Device, BME 200/300

Client: Mr. Daniel Kutschera

Advisor: Dr. James Trevathan

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Problem Statement

Many elderly people–especially those who have suffered from strokes–sustain lasting mobility problems as they attempt to recover and return to "everyday" life. Currently, the solutions for physicians to use in addressing this issue are either too expensive to easily acquire, or are inadequate and are too hard to use while giving sufficient attention and support to the patient. The goal of this project is to provide a solution that remedies the issues with current designs at an affordable cost.

Brief Status Update

This week, the team developed and 3D printed designs of the handle portion of the device. Additionally, the team developed a circuit and programmed a microcontroller for the display screen. The circuit allows the display screen to be turned on and off with a button and change colors with a button. The team will present these components of the device to our peers during our show and tell, where we will receive feedback and advice to improve our prototype.

Summary of Weekly Team Member Design Accomplishments

- Team:
  - Prepared for show and tell by printing various handle designs for our peers to test.
  - Continued to develop the circuitry for the display screen.
- Gabriela:
  - Finalized the CAD models of the handles and took them to 3D print at the Makerspace with Jack

- ○ Did more research on the sound feature of the display and also the screen
- ● Gracie:
  - ○ Researched capacitive pressure sensors to incorporate into the circuitry.
  - ○ Began designing a display box to hold the display screen.
  - ○ Continued to research microcontrollers that are more compact than the arduinoUNO.
- ● Jack:
  - ○ Emailed client with group questions and set up a zoom meeting to discuss further plans for the completed project
  - ○ Went to the makerspace with Gabi and 3D printed the handles for show and tell
- ● Kyle:
  - ○ Looked into sound devices that are Arduino compatible
  - ○ Ordered an Arduino buzzer to experiment with
  - ○ Started researching capacitive pressure sensors

Weekly/Ongoing Difficulties

The biggest challenge we encountered this week was trying to decide how we were going to produce a handle for this device. While we looked online for some simple ones, we decided that with the battery pack and wiring that we'll need, it may be easier to fabricate one ourselves, and we have started looking into prototyping that, along with the electronics.

Upcoming Team and Individual Goals

- ● Team:
  - ○ Present our prototype to our peers during show and tell.
  - ○ Use what we learn from our peers to improve our design.
  - ○ Meet with our client to show him our prototype and clarify some design specifications.
- ● Gabriela:
  - ○ Gather feedback from the show and tell and make any necessary changes
  - ○ Analyze what went wrong when 3D-printing the handle and modify the CAD models based on necessary changes
  - ○ Work on assembling an overall prototype
  - ○ Meet with the client to clarify questions and get feedback
- ● Gracie:
  - ○ Incorporate a pressure sensor and speaker into the circuitry of the device.
  - ○ Begin printing prototypes of the display screen box.

- Finalize and order materials for the electronic components of the device.
  - Jack:
    - Research clear touchscreen for the LED screen
    - Re 3D print the handles to the correct scale and fix the threads on the bigger handle
    - Incorporate peer feedback into the handles
  - Kyle:
    - Start working with Arduino capabilities
    - Keep looking at touchscreen ideas
    - Implement advice received from Show and Tell

Project Timeline

Project Goal	Deadline	Team Assigned	Progress	Completed
Preliminary Presentations	Oct 4	All	Completed	Yes
Preliminary Deliverables	Oct 9	All	Completed	Yes
Show and Tell	Nov 1	All	–	No

Poster Presentations	Dec 6	All	–	No
Final Deliverables	Dec 11	All	–	No

Expenses

Item	Description	Manufacturer	Part Number	Date	QTY	Cost Each	Total	Link
Component 1								
LED Matrix	An LED matrix that should be easy to wire and Arduino, the main component of display panel.	Loamlin	WS2812B	10/17/2024	1	$12.51	$12.51	link
Component 2								
Carbon Fiber Shaft	Piping that we're using for the length of the rod itself, carbon fiber casing, should be lightweight yet very durable	Carbon Kevlar Supply	843728109361	10/17/2024	1	$47.46	1	link
Component 3								
Arduino Buzzer	Buzzer that we should be able to hook up to a capacitive sensor to create an audible feedback for the patient	Arduino Store	C000143 107020000	10/31/2024	1	4.14$	$4.14	link
TOTAL:							**$59.97**	