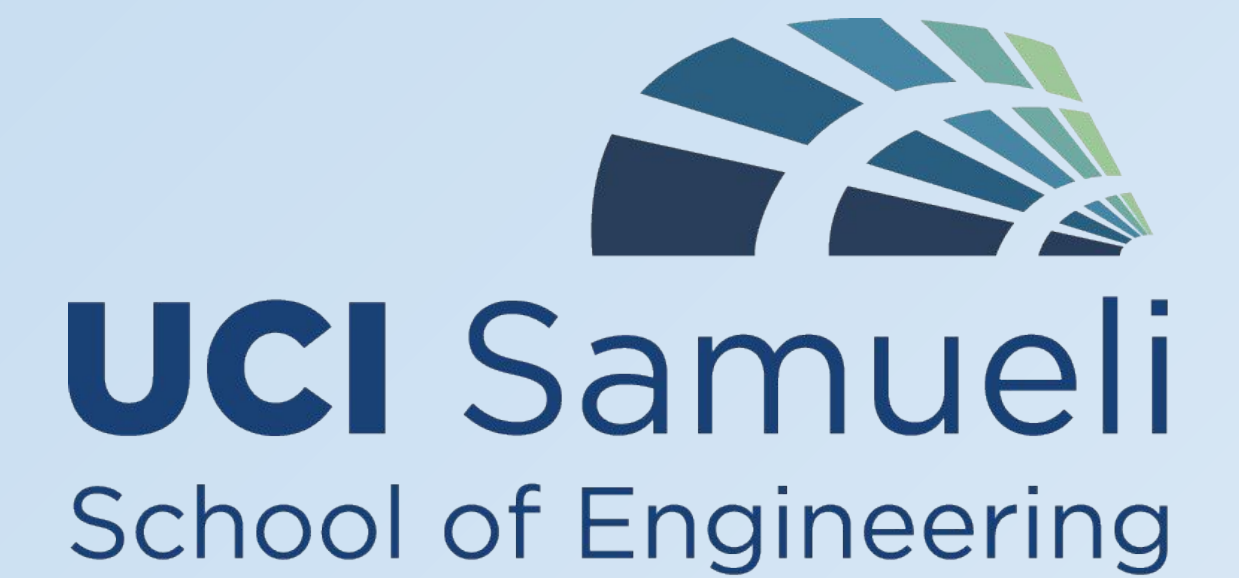




Proprioception Trainer

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Background

Proprioception is an individual's ability to recognize the position and/or movement of their body in space without obtaining visual cues. A stroke can cause damage to finger proprioception, which is a basic motor ability. As a result of the integration of robotics into rehabilitation methods, it has been shown that there have been great benefits in treatment for those with impaired proprioception.² Therefore, we seek to develop a game that trains finger proprioception.

Problem and Solution

Problem: The loss of finger proprioception can occur after stroke. There are a limited amount of devices that help retrain sensing of finger location.

Solution: Develop a game that assists neurological rehabilitation of finger proprioception, specifically the index and middle finger, that strays away from predictable motion yet allows for neurological connections to be made in order to restore basic motor skills

Innovation

- The team focused on designing the programming of the device on raspberry pi.
- Our design omits visual and audio input, resulting in patients strictly relying on their finger proprioception to sense when their index and middle fingers are parallel to each other.
- The music game is designed to motivate the patient to continue playing and it is tailored for individuals of the age 65 and above.

Current Device

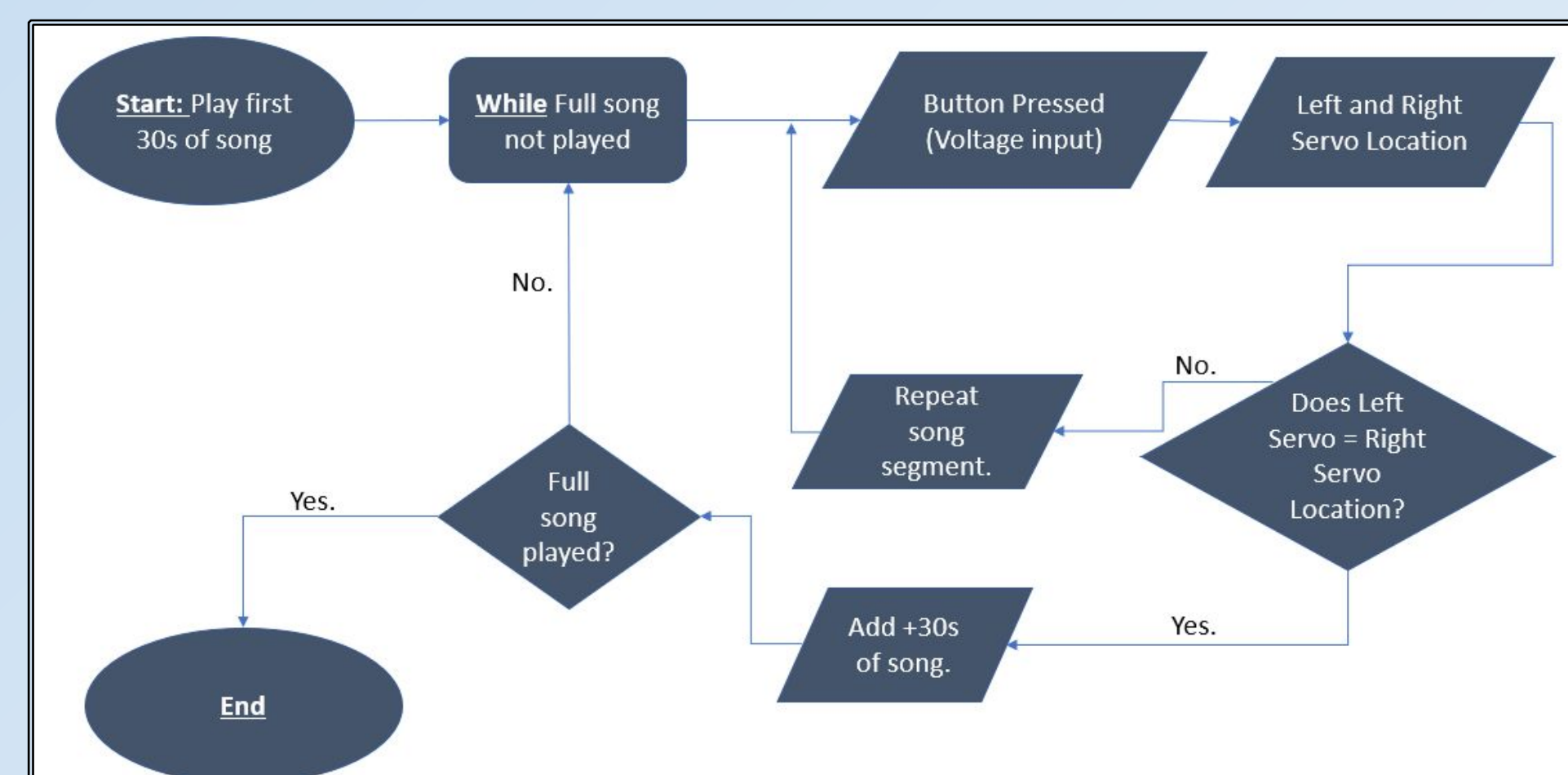


Goals and Objectives

Implement code for a device that allows post-stroke patients to train finger proprioception.

1. Design a program to control and obtain servo motor position.
2. Program a game that motivates a user to detect the crossing of the index and middle finger.

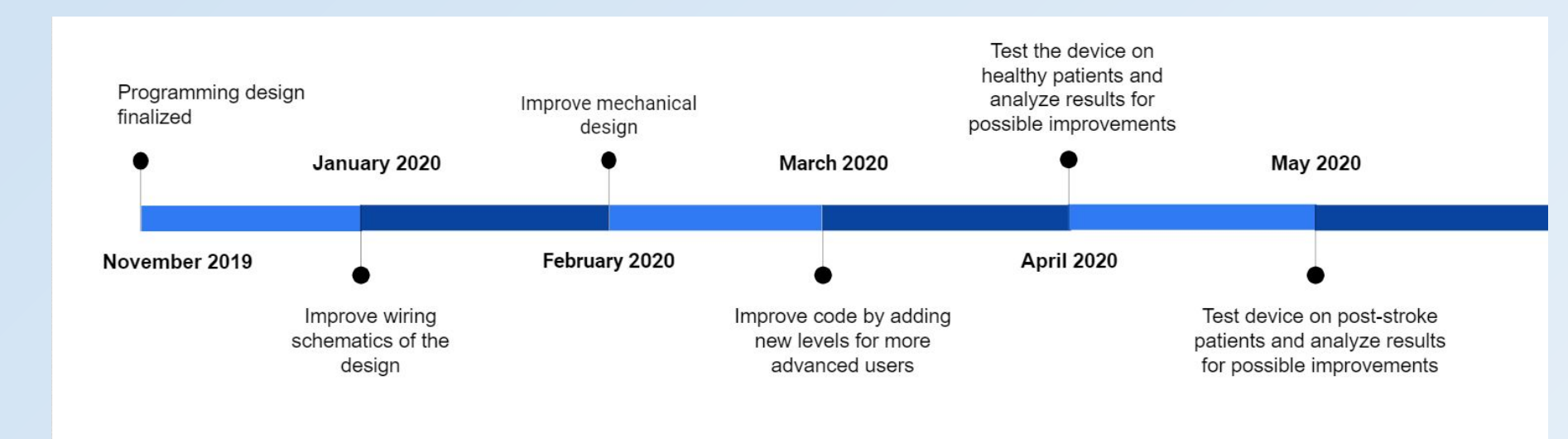
Game Design



Device Requirements

- Range of motion: $67^\circ < \theta < 112^\circ$
- Genre of Music: Classic Rock¹
- Speed: 0.44 rad/s
- No visual or audio input

Timeline



Next Steps

- Improve the programming, design, and circuit to account for varied levels of motor skill rehabilitation
- This includes, but is not limited to:
 - improving feedback accuracy from button
 - implement different speeds
 - randomized motion of fingers
 - improved circuitry and wiring schematics
 - improve mechanical design using CAD

References

1. "Favorite Music Genres among Consumers by Age Group in the U.S. 2018." *Statista*, July 2018, <https://www.statista.com/statistics/253915/favorite-music-genres-in-the-us/>.
2. Rowe, J.B., PhD, Chan, V., MS, Ingemanson, M.L., PhD, Cramer, S.C., MD, Wolbrecht, E.T., PhD, Reinkensmeyer, D.J., PhD. Robotic Assistance for Training Finger Movement Using a Hebbian Model: A Randomized Controlled Trial. *Neurorehabil Neural Repair* **31**(8), 769-780 (2017). PMID: 28803535