



Introduction

In the United States, 1 in 345 children has cerebral palsy, a set of neuromuscular disorders effective around birth. Cerebral palsy can reduce the mobility of those that have it. The current treatments consist of medication, therapy, and surgery. Biomotum stands within the therapy category by developing a battery-powered ankle-exoskeleton that increases walking speed by 32%, stride length by 21%, and improves efficiency by 29%.

Biomotum is currently in the prototype and testing stages for their ankle-exoskeletons. First, they place a child on a treadmill with the exoskeleton. Next, the researchers measure how much energy the child uses during testing and track the child's movements. After a session, the patient will access their data through the Biomotum phone application where they can visualize their steps, torque, duration of use, and more within the application.



Problem

Biomotum has no means of displaying the data being collected by the exoskeleton on a desktop computer. The data collected is in a raw heap of numbers which is unreadable to those untrained in MATLAB or Python. Ultimately, the data being collected from the exoskeletons must have the following qualities in order to be properly usable.

- Easily understandable to the average user without requiring any prior knowledge
- Viewable in an appealing format that is clear and concise
- Allow the users to access and analyze the data collected in simple graphs

Solution Overview



Rehab Remote developed a web portal for clinics to analyze the data collected from the exoskeletons. The web portal accesses the data of every exoskeleton via querying the Biomotum Google Drive. The Google Drive is given the information through a Python script which Biomotum stores on their AWS database. Once the clinic has signed up, Biomotum administrators assign the clinics their particular exoskeleton(s) to their clinic account. Once signed in, clinicians can view individual exoskeletons, data for a specific patient, and individual trial sessions of particular patients. With each filter, the graph updates to accommodate the information collected from the Biomotum Google Drive. Once a trial session has been selected, the clinician may then download a CSV file with all the data for the trial. Below are images of the final live product:

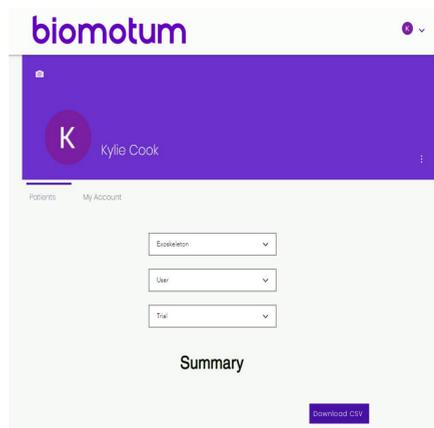


Figure 2: Patient viewer once logged in

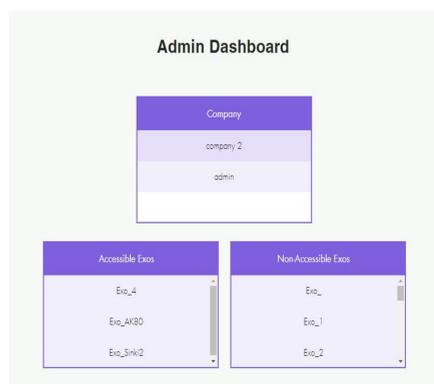


Figure 3: Admin dashboard for granting access to exoskeleton data based on clinic

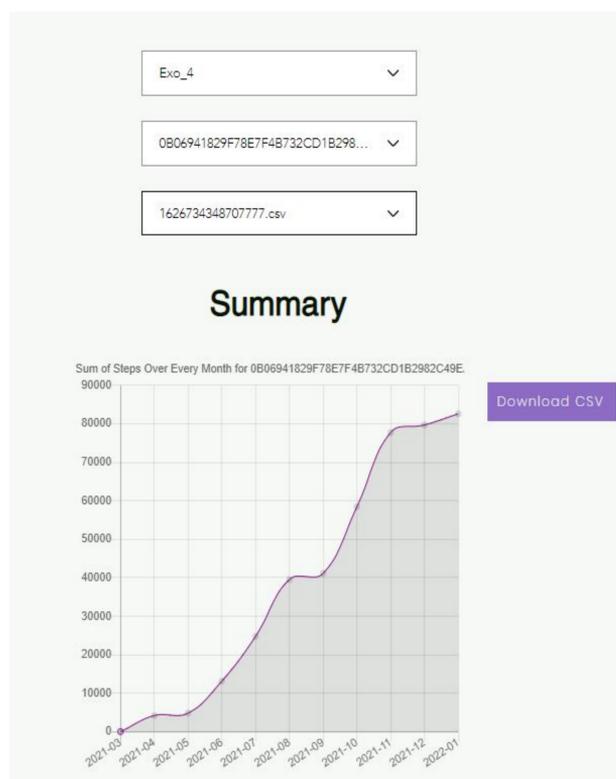
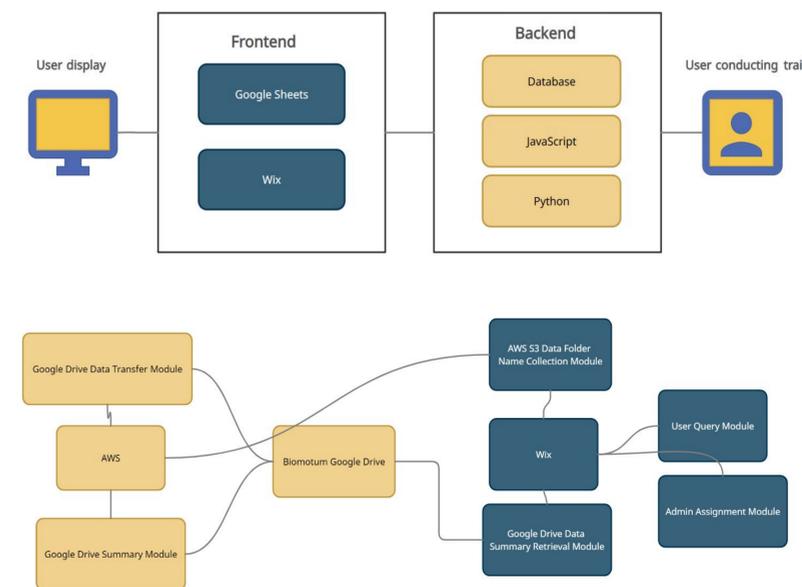


Figure 4: Patient session graphical view

Architecture



Technologies

- Wix
- Python
- JavaScript
- Google Sheets
- AWS



Future Work

As Biomotum begins releasing their exoskeletons for clinical use, some features that will be added include:

- A visualizer with interactive graphs and plots, and summary statistics
- A "smart" tool to score and track a user's rehabilitation progress (steps taken, training time)
- Generate Clinical Trial summary reports