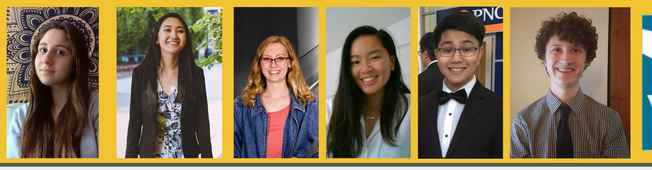
ENME444 Mechanical Engineering Systems Design Spring 2020

Jessica Boesch, Thuyai Ha, Rachel Kelly, Jennie Le, Renmar Sarreal, Jason Vanisko

Techy Treads

Imani's Modified Treadmill



Project Scope

Background: Our team has been tasked with creating a specialized treadmill for our client, Imani Graham. She wants to exercise to maintain her blood pressure levels, however her disabilities prevent her from operating a traditional treadmill. Our product will accommodate her dwarfism and visual impairment, allowing her to exercise as she wants.

Objective: To design a set of guard rails that is at the client's desired height to assist her in getting on and off the treadmill.

System Requirements

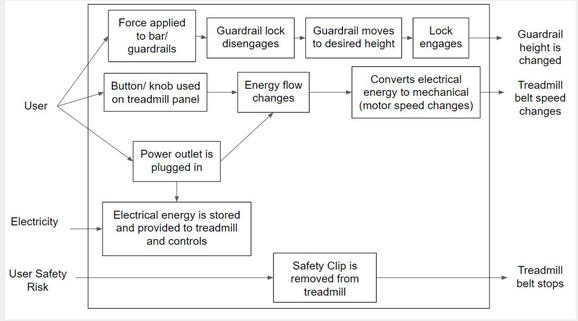


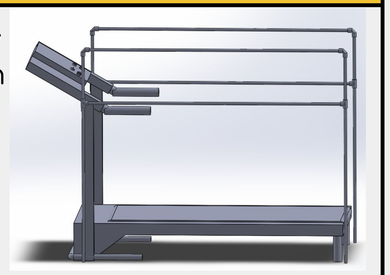
Figure 1: Functional Block Diagram

The system requirements for this project include:

- Must have 2 guardrail heights -- 28" for walking and 37" for running, ¾ in diameter
- Must lower control panel to 28.5"
- ASTM regulations such as kill switch, guardrail grips, chamfered bars, and accessible belt height

Final CAD Model

Figure 2: Final CAD Assembly of the modified treadmill with the lowered control panel and adjusted guardrails.



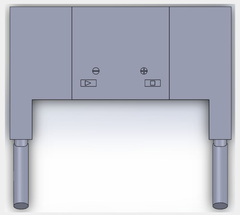


Figure 3: Top view of modified control panel, which was altered to simplify the control console as well as increase the size of the buttons.

Design Evolution

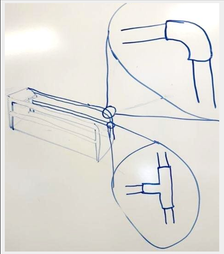


Figure 4: Initial sketch of guardrails

Figure 5: First prototype of guardrails made from PVC pipes and crutches

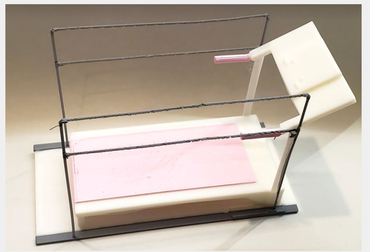


Figure 6: 3D printed 1:10 scale model of the modified treadmill

second prototype is in CAD shown in Figure 2

Finite Element Analysis

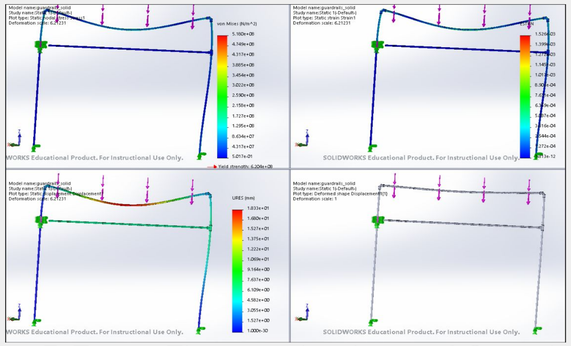


Figure 7: Finite Element Analysis of Guardrails Static analysis shows that the force applied is less than the yield strength of the guardrails.

Future Work

- Fabrication of the guardrails
- Assembly of new guardrails and lowered control panel onto the treadmill
- Potential use of voice response system
- Vibrational analysis of guardrails
- Further testing and optimization

Figure 8: Purchased treadmill

Acknowledgements

We would like to thank Jim Arnett and Angela Tyler for their guidance during the completion of this project, as well as Dr. Chuck LaBerge for his assistance in the electrical components of the treadmill. Lastly, we'd like to thank Dr. Gurganus for her instruction throughout the semester.

ENME444 Mechanical Engineering Systems Design Spring 2020

Jessica Boesch, Thuyai Ha, Rachel Kelly, Jennie Le, Renmar Sarreal, Jason Vanisko

Techy Treads

Imani's Modified Treadmill

UMBC