

The DH³ Automated Tourniquet System

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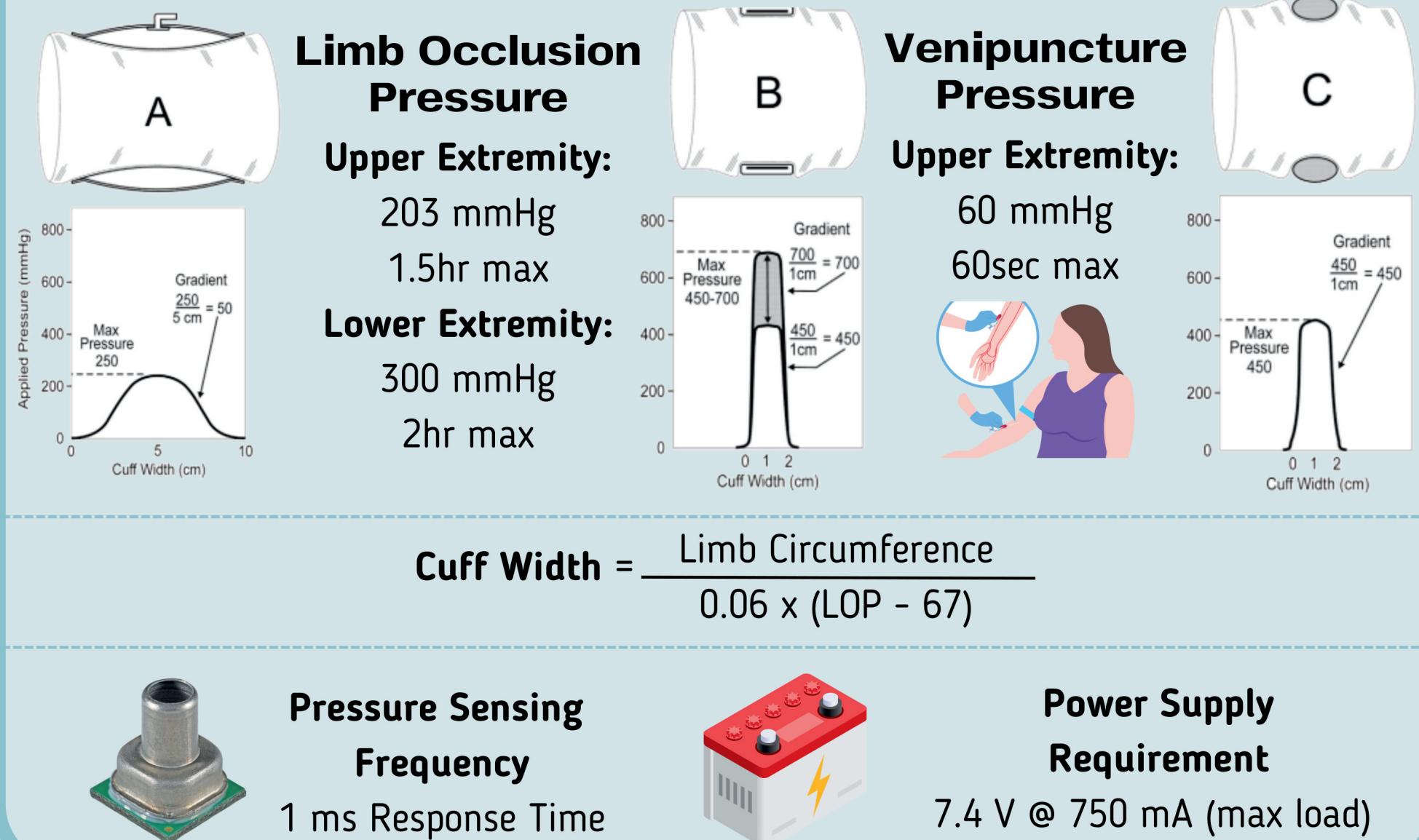
Objective

Develop an **automated tourniquet** that will apply the **ideal pressure** for venipuncture and **improve user understanding** of vein engorgement.

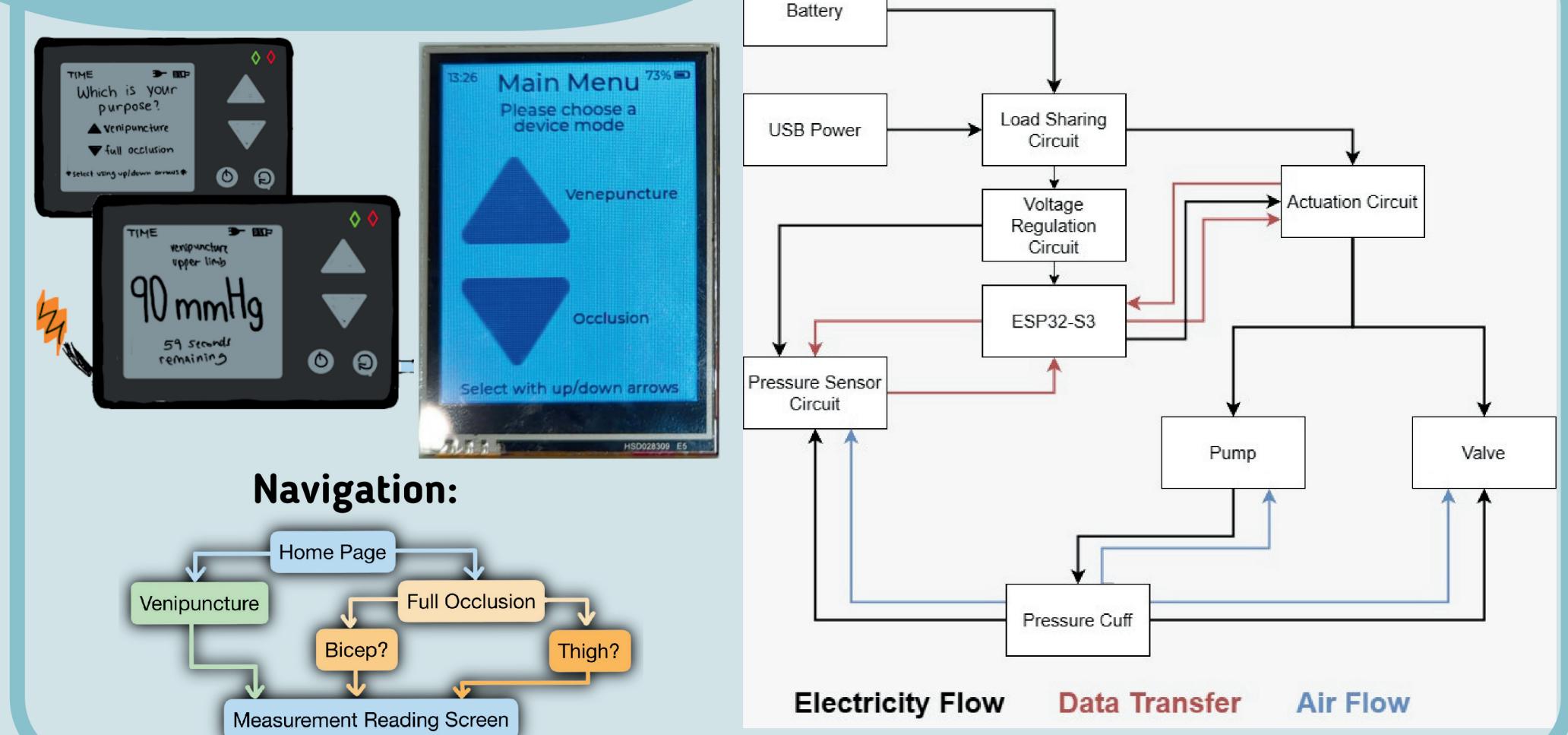
Motivation

- Prevent arterial damage & ensure consistent pressure application
- Minimize variability & reduce risk of incorrect tightening
- Decrease strain on the user and lower chance of nerve & arterial damage

Relevant Specifications

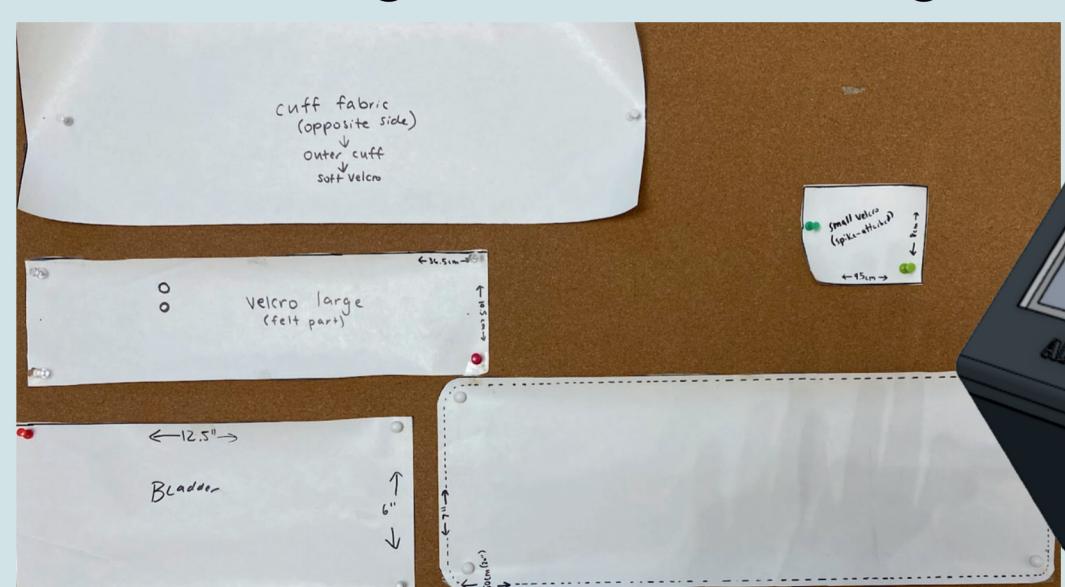


System Design



Device Design

Device Sewing Pattern & Drawings

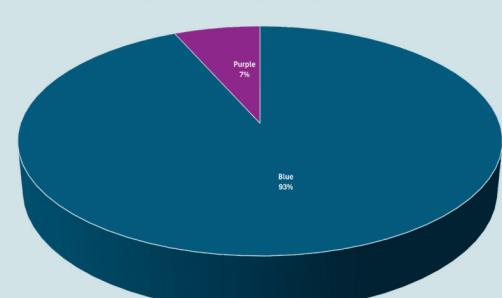


Fabricated Cuff & User Controlled Device

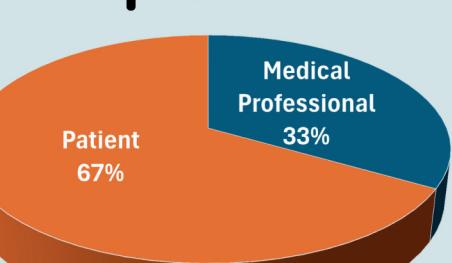


User Testing

Cuff Color Preference:



Professional Expertise:



End User Testing:

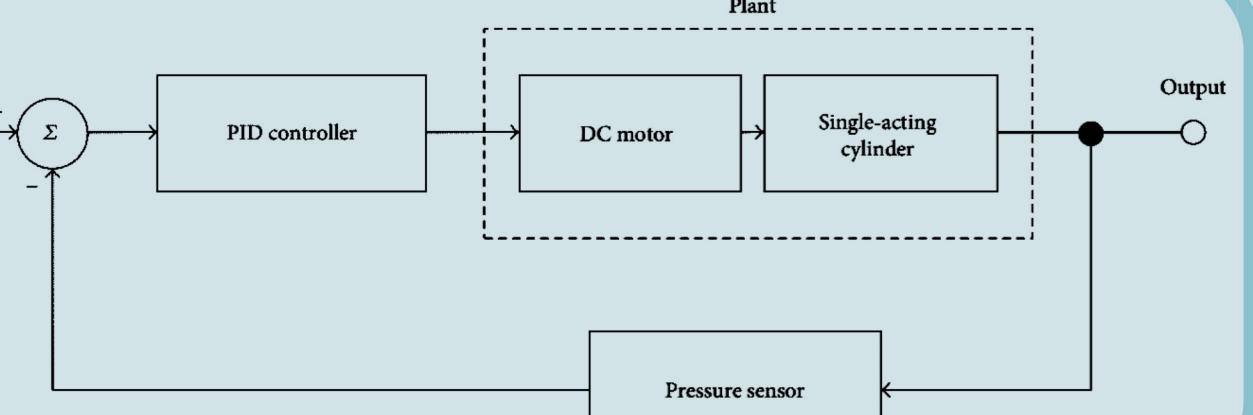


SUS Score: 95%

PID Design

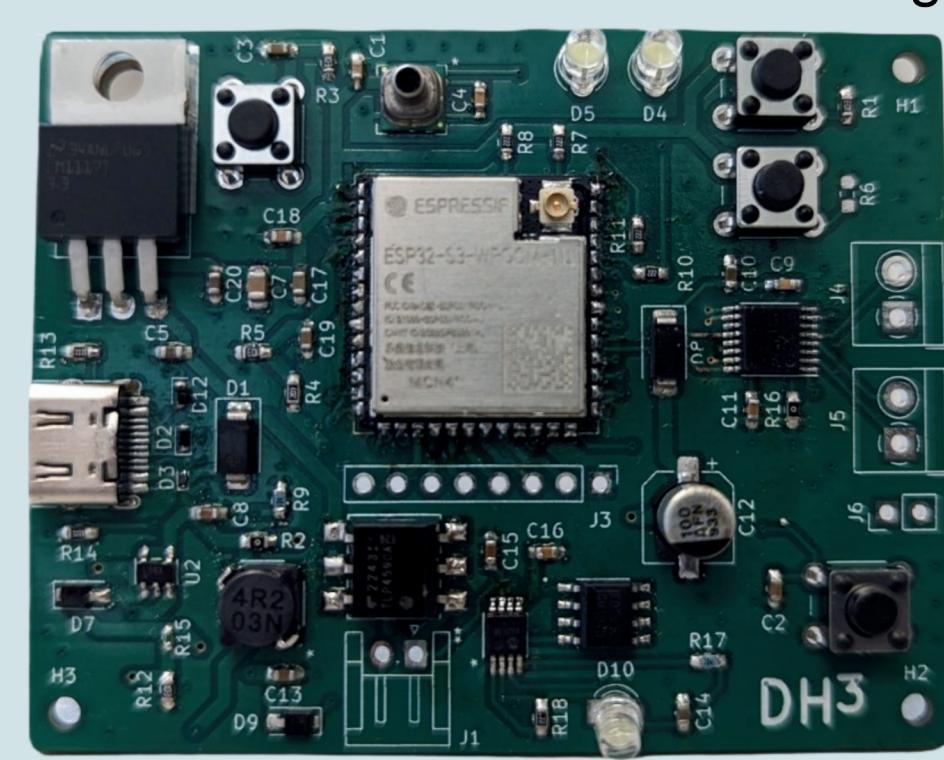
Parameters

$$K_p = 3 \quad K_i = 0.05 \quad K_d = 1$$

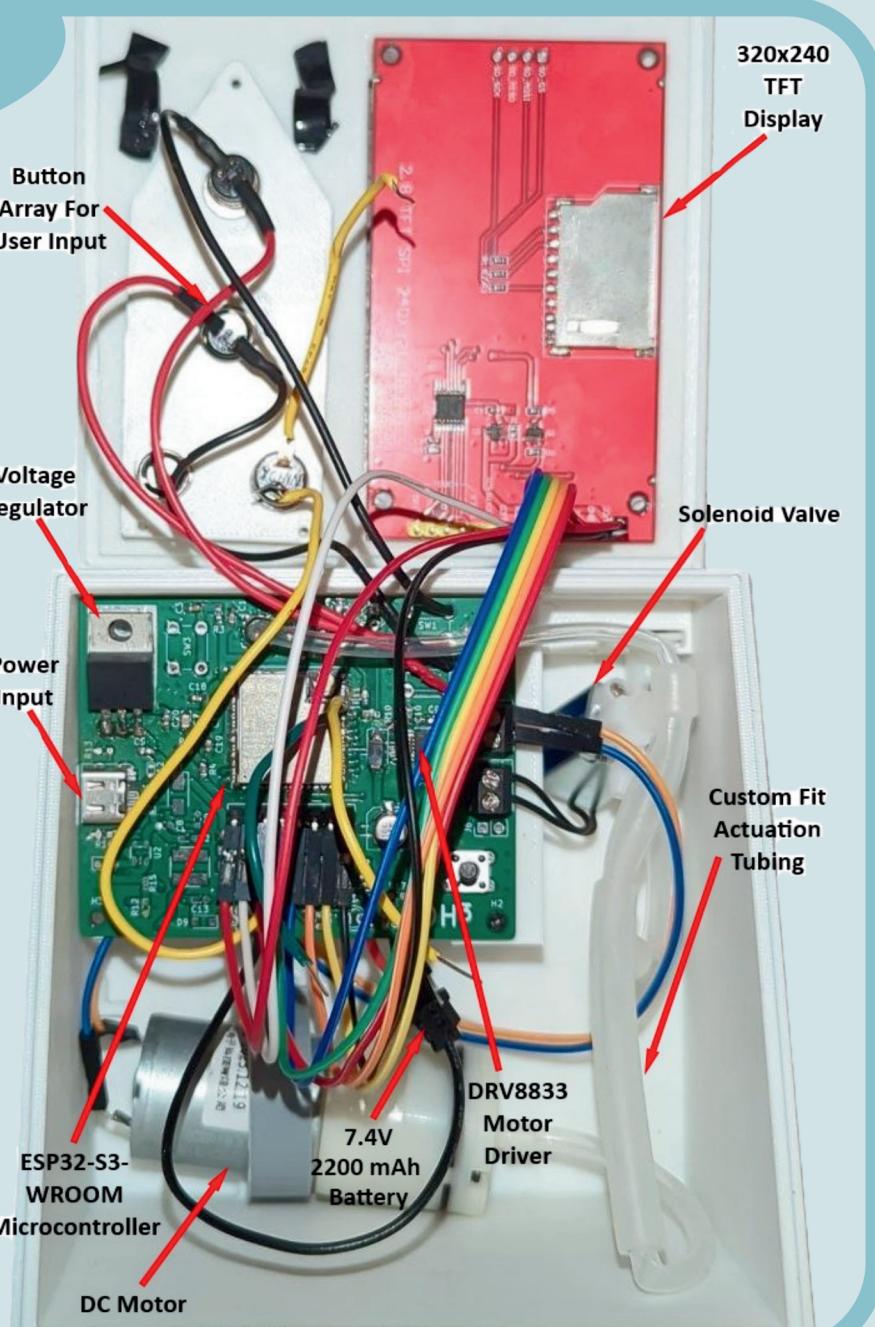


Electrical Design

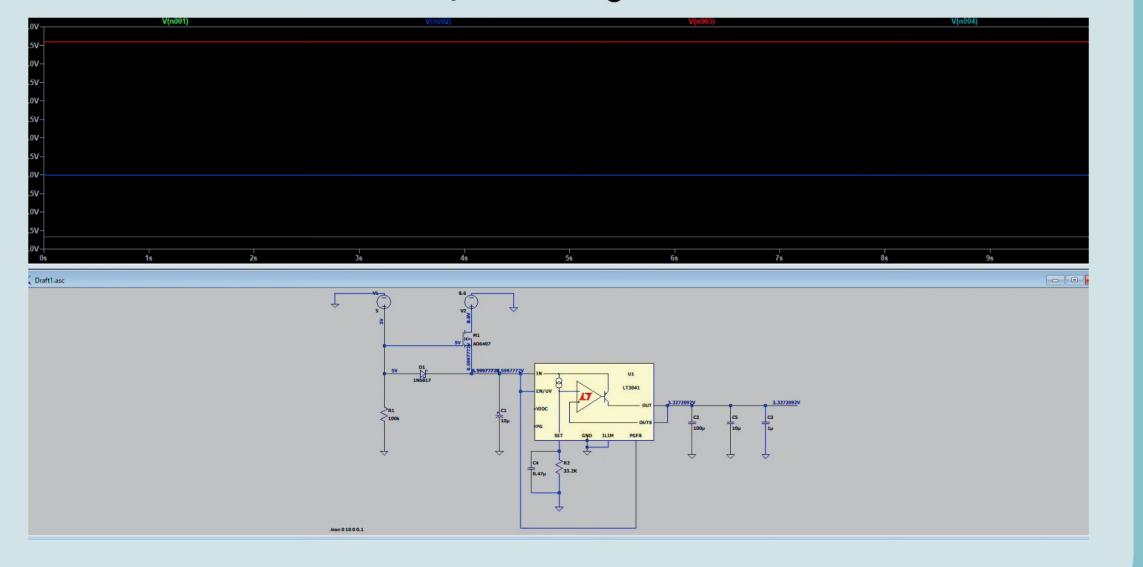
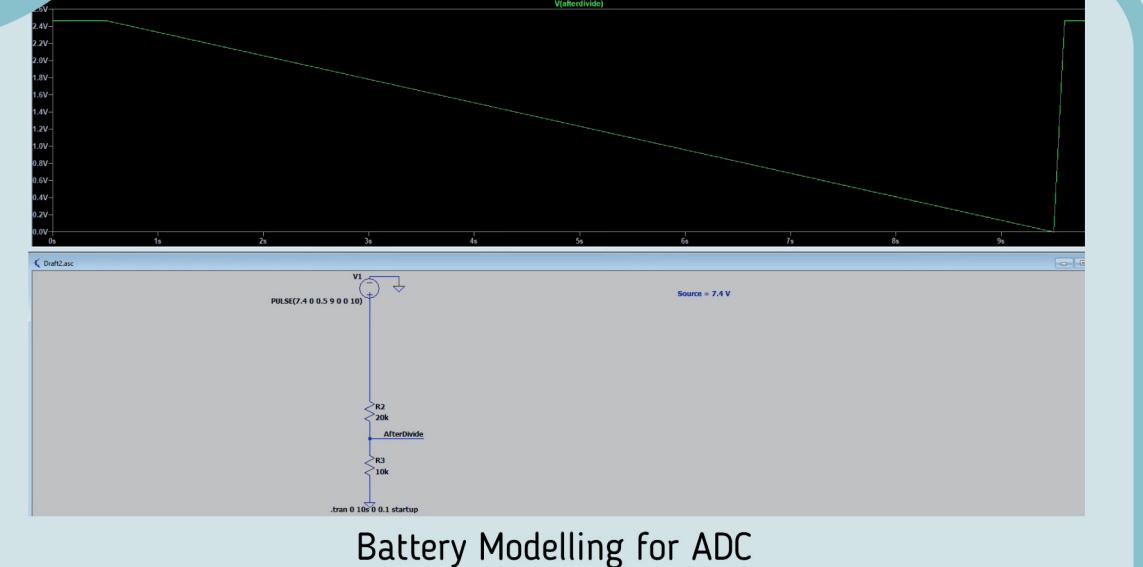
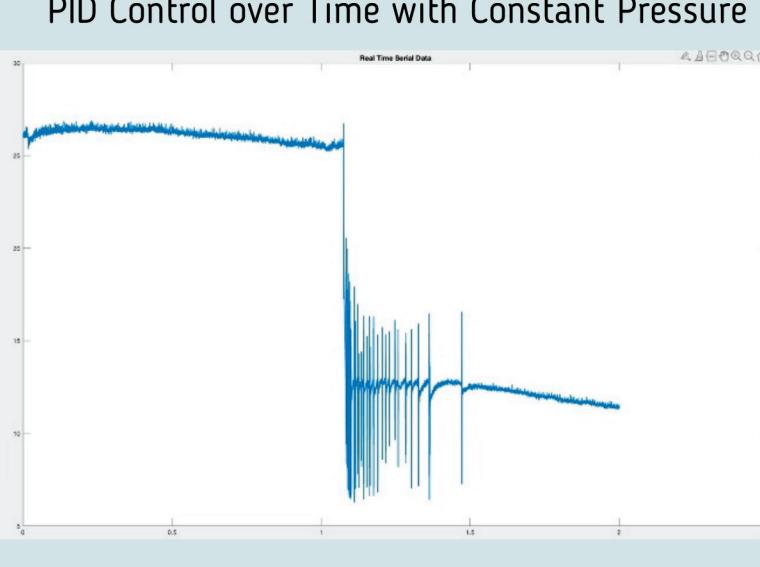
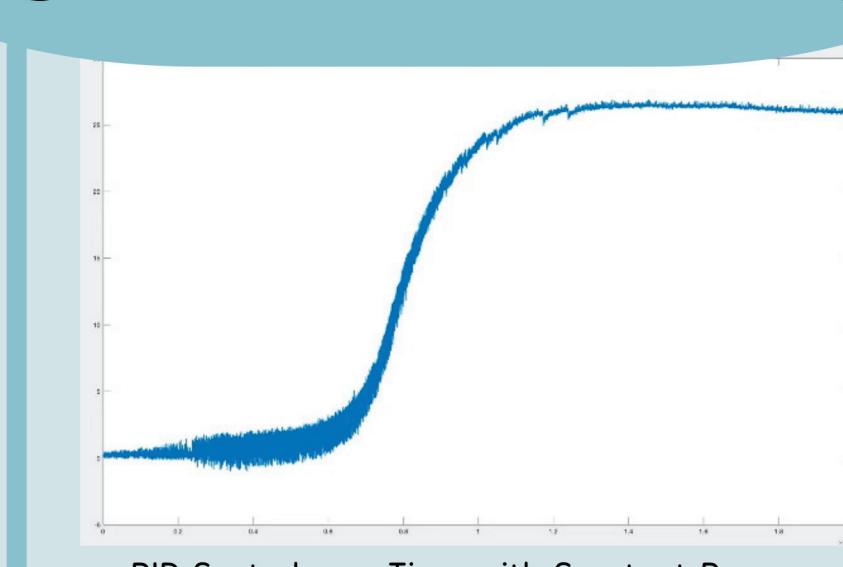
Pictured below is the final PCB design



Pictured on the right is the breakdown of all components and connections in the electrical system.



System Testing



Conclusion

Our project introduced an innovative Automated Tourniquet System that enhances safety and effectiveness in emergency and medical scenarios. Utilizing sensor feedback, it dynamically adjusts pressure, improving procedural success and reducing risks, such as arterial damage and pressure inconsistency. This goal was obtained with confirmation from user testing involving patients and healthcare personnel. Future updates will aim to incorporate real-time monitoring sensors, improve user interfaces, and extend remote capabilities.

Acknowledgments

We would like to thank our FLC, Dr. Ali Tavallaei for his continued support & guidance as well as Josh Richmond & Yi Yue for their invaluable feedback.