3-way Syringe Mixing Team

Team: Vincent Jencks, Colton Smith,
Andrew VanDenburgh,
Handi Xi, Yunchen Zhu
Client: Dr. Timothy Becker
Faculty Mentor: Ashwija Korenda

Aneurysms and Their Risks

- 500,000 deaths a year
- 4 of 7 people who recover gain disabilities
- 1 in 50 American people

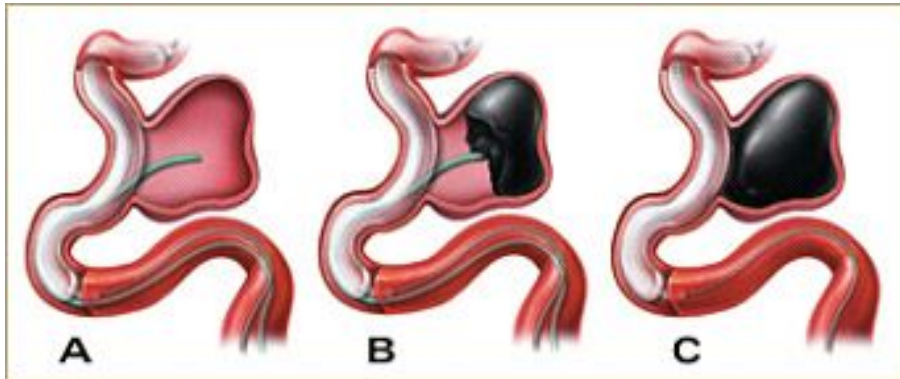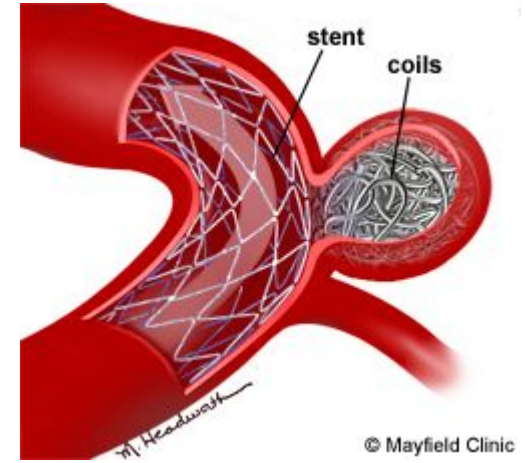**Types of Cerebral aneurysm:**

Saccular Aneurysm

Fusiform Aneurysm

Ruptured Aneursym

Presenter: Andrew

Aneurysm Solutions

- Gelatins
- Coils
- Liquids

Presenter: Andrew

Meet the Client

-Timothy Becker

- PhD, Bioengineering, Arizona State University, May 2001
- Chief Technology Officer of Aneuvas Technologies Inc.

Research includes

"In vivo embolization of lateral wall aneurysms in canines using liquid-to-solid gelling PPODA-QT polymer system: 6-month pilot study" in the Journal of Neurosurgery 2013 publication

Presenter: Colton

Client Needs and Requests

- Autonomous system
- Ability to mix 3 syringes in a T formation
- User defined time variability
- Be able to mix syringes with a force of 25 lbs
- At least mixes at a speed of 2 inches per second
- User interface for setting the mixing length and speed

Presenter: Yunchen

Design Breakdown

1. Actuators and Base
2. Control Circuit
3. Microcontroller
4. User Input
5. Display (GUI)

1: Motor/Actuator

2. Connecting Circuit

3. Microcontroller

4. User Input

5. GUI

Presenter: Yunchen
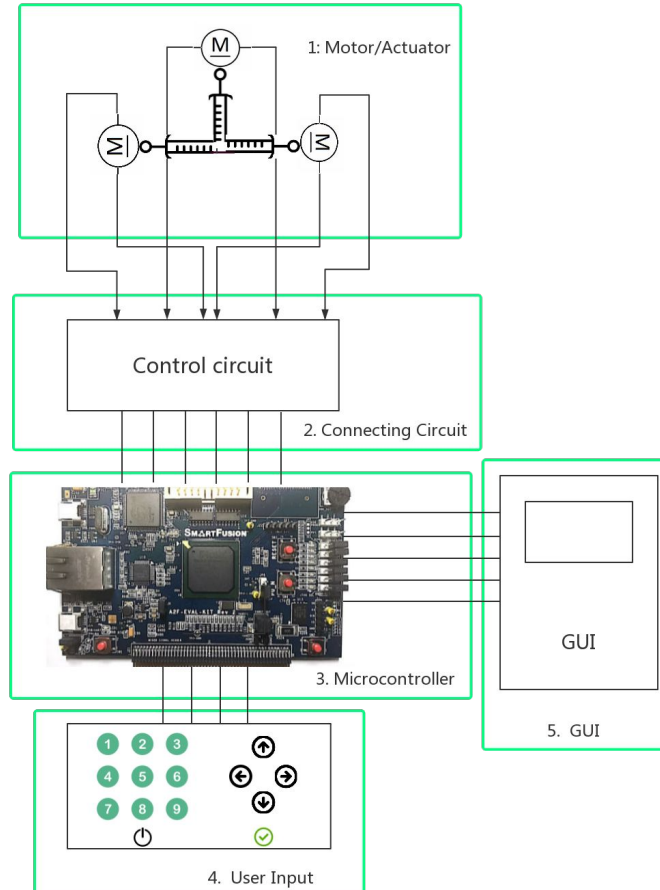
Actuators
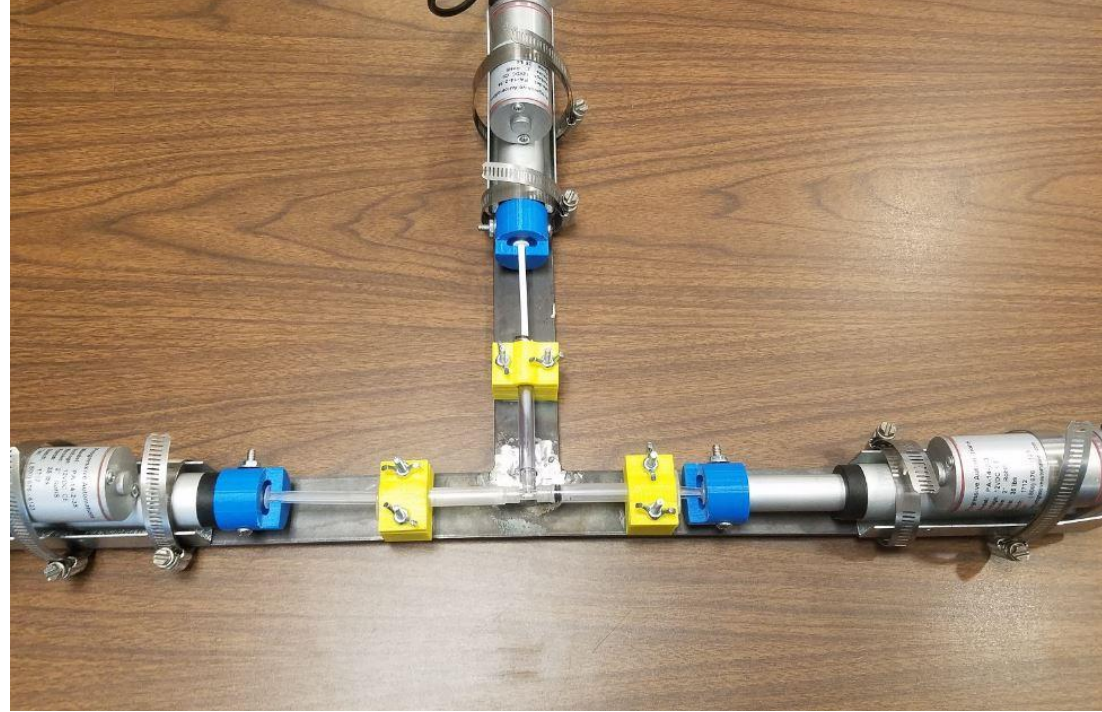
- Actuators are better with linear motion than motors
- PA-14 capable of pushing at a speed of 2 inches per second

Presenter: Colton
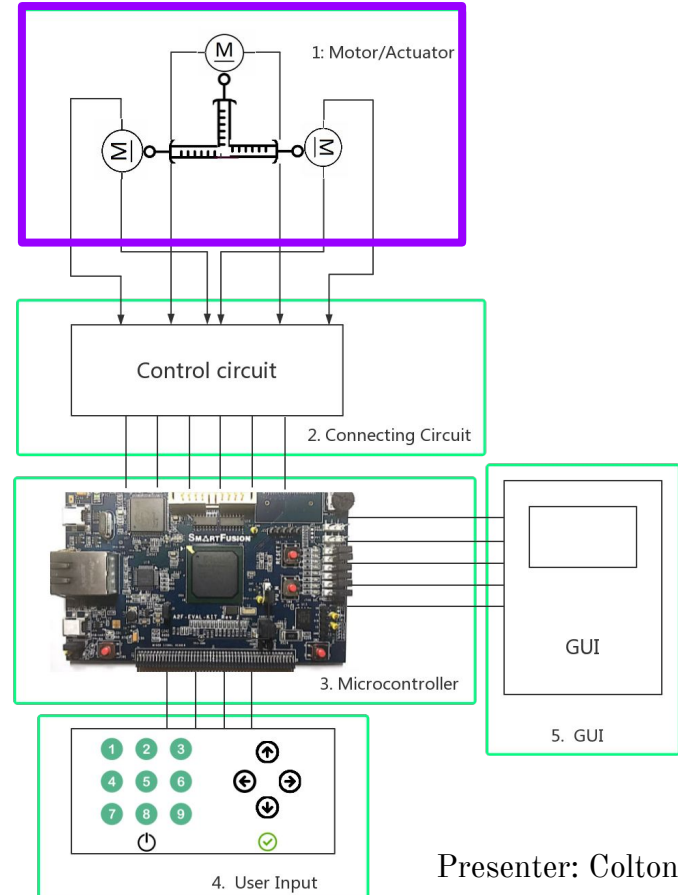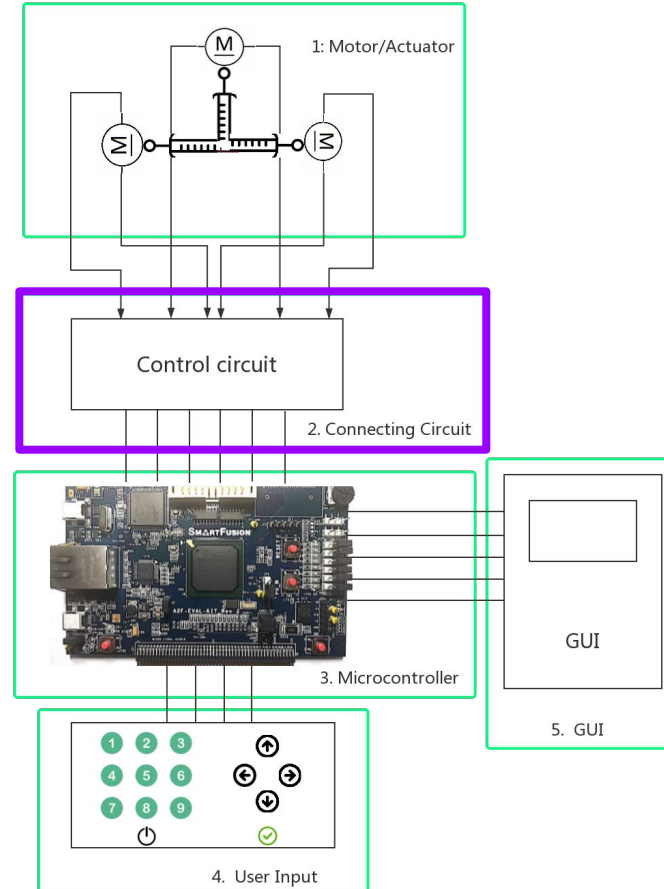
Base/Chassis

- T-frame formation
- 3D printed parts interface with the base
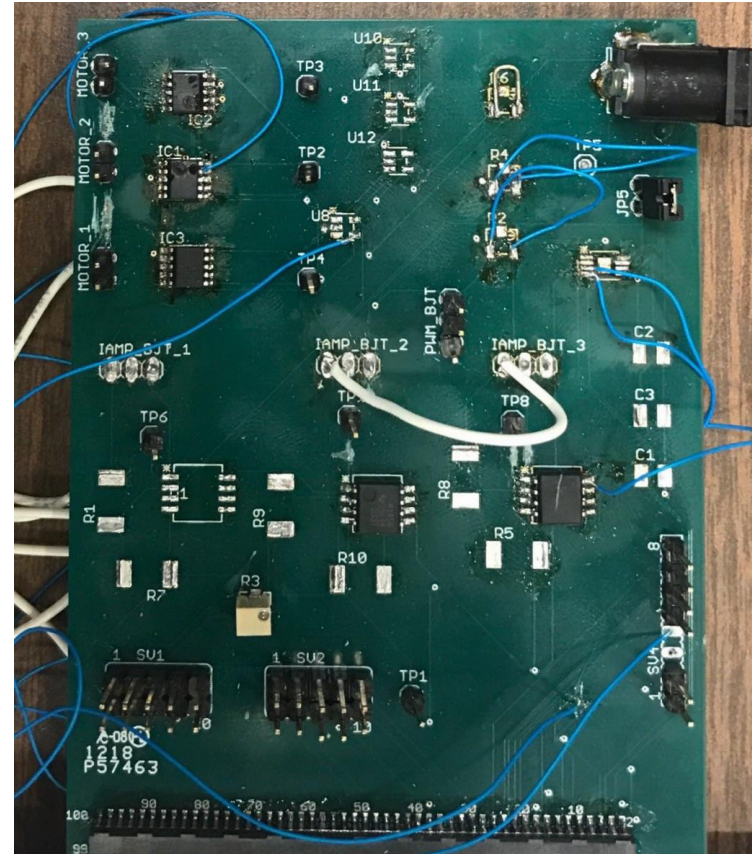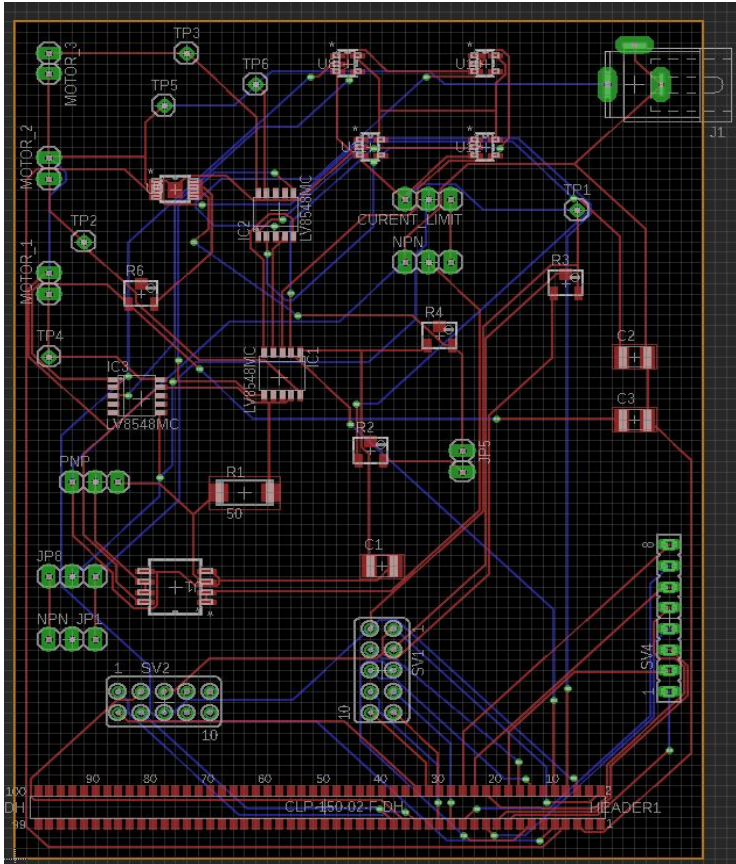- Adjustable base

Presenter: Colton

Control Circuit

- Selection of actuators
  - Relay
- Selection of actuator direction
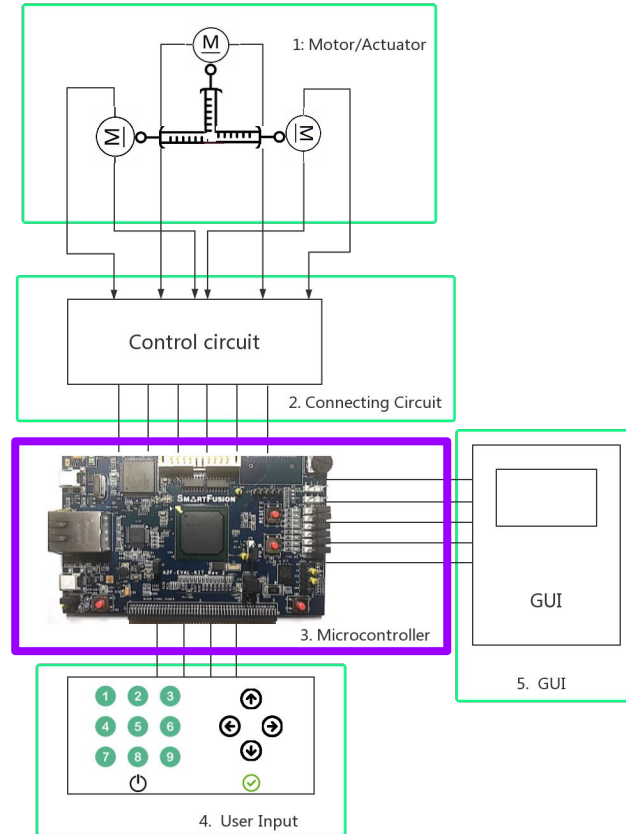 - H-Bridge
- Vary the actuator speed
  - PWM/Transistor

1: Motor/Actuator

Control circuit

2. Connecting Circuit

3. Microcontroller

4. User Input

GUI

5. GUI

Presenter: Handi

Control Circuit(cont)

Presenter: Handi

Microprocessor

- Smartfusion Board

1: Motor/Actuator

Control circuit
2. Connecting Circuit

3. Microcontroller

GUI

5. GUI

4. User Input

Presenter: Handi
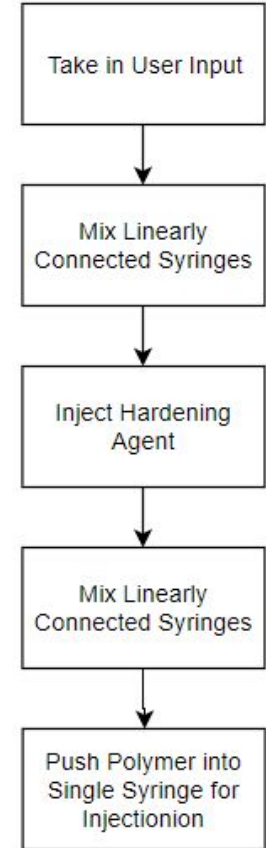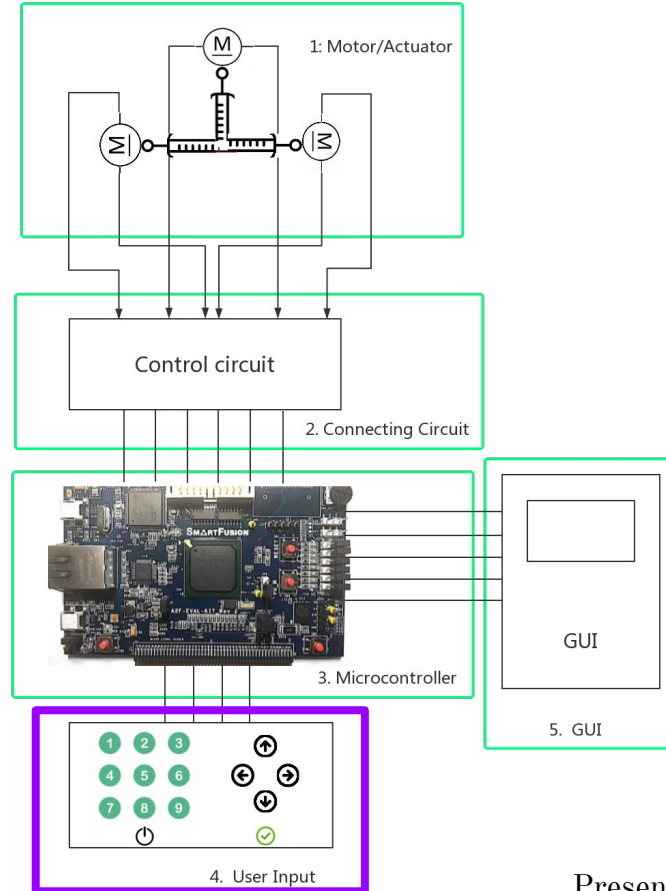
Code Breakdown

- Asks user for mix duration from button inputs
- Mix linearly 14 times before and after hardening agent injection
- Frequently sends data to display
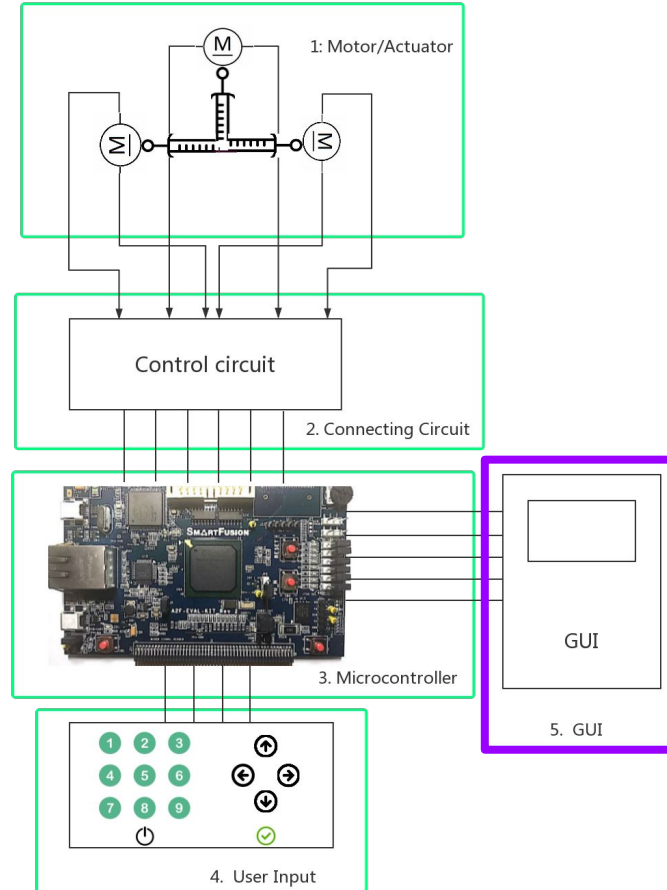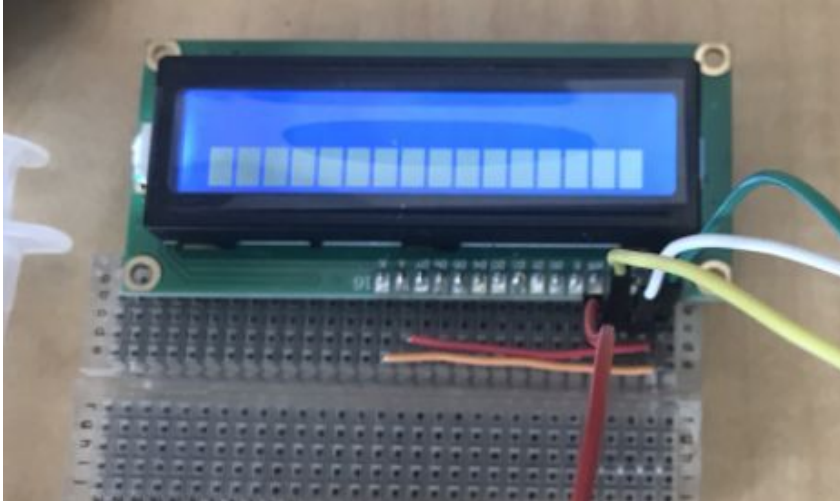- Gives total amount of the simulation ran to display

Take in User Input

↓

Mix Linearly
Connected Syringes

↓

Inject Hardening
Agent

↓

Mix Linearly
Connected Syringes

↓

Push Polymer into
Single Syringe for
Injectionion

Presenter: Yunchen

User Interface

- Button Pad
- Row by column instead of n-bit
- Needed fewer than anticipated

1: Motor/Actuator

Control circuit
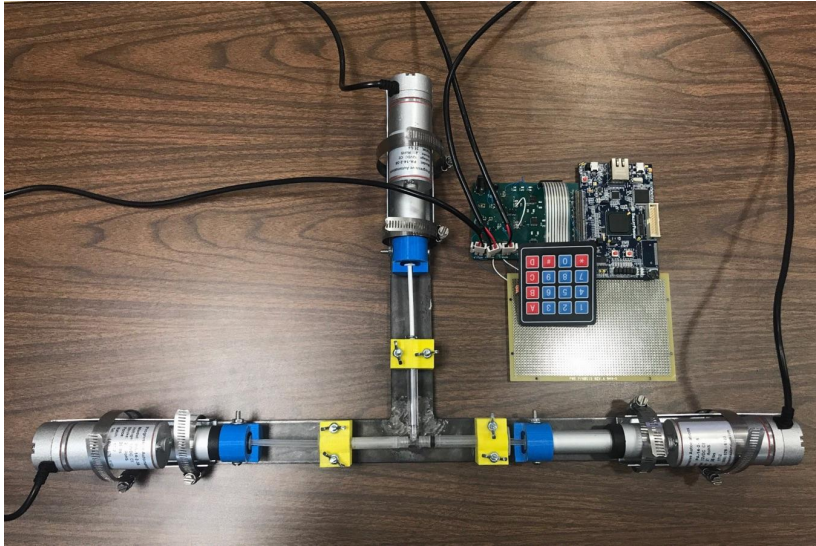
2. Connecting Circuit

3. Microcontroller

GUI

5. GUI

4. User Input

Presenter: Andrew

Display

- Allows user to define mix length
- Gives the run time
- Alerts user
- Currently: Unfinished

1: Motor/Actuator

Control circuit

2. Connecting Circuit

SMARTFUSION

3. Microcontroller

GUI

5. GUI

4. User Input

Presenter: Vincent

The Final Design

1: Motor/Actuator

Control circuit

2. Connecting Circuit

3. Microcontroller

4. User Input

GUI

5. GUI
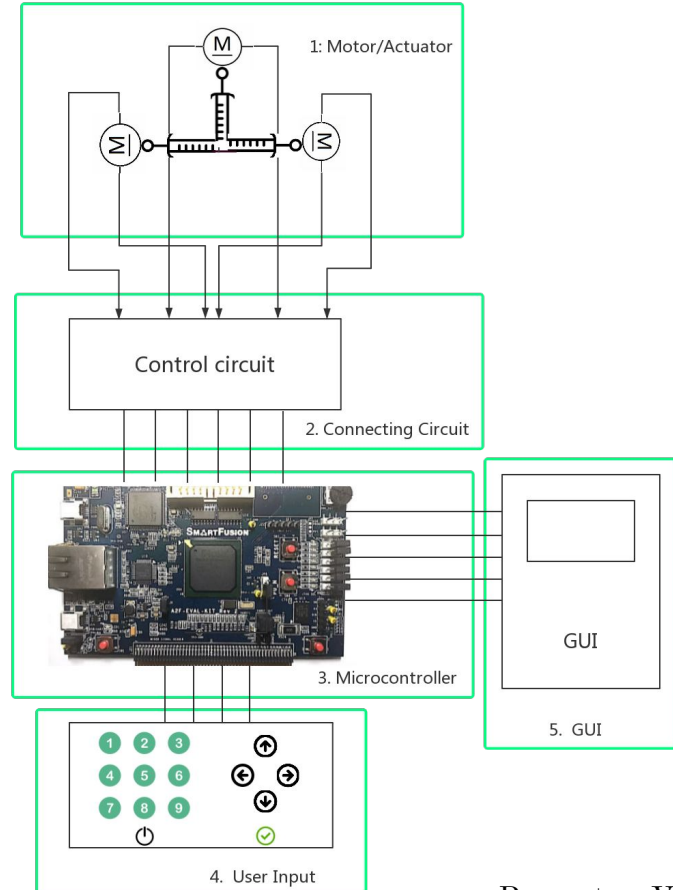
Presenter: Vincent

Conclusion

Questions?

Thank you to:

    Travis Byakeddy

    Chris Settanni

    Drew Shumway

Presenter: Vincent