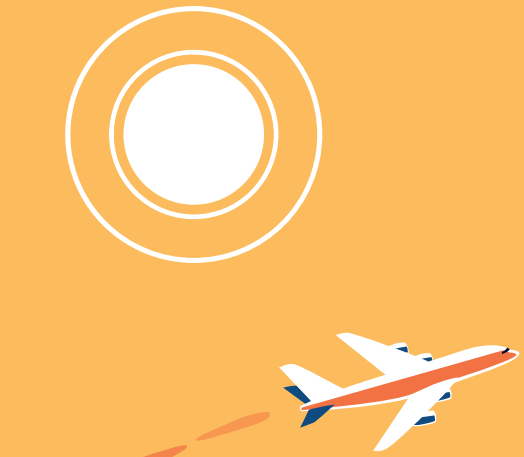

STABLE TABLES

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ECE 196 Spring 2024, Team 10

The Problem?

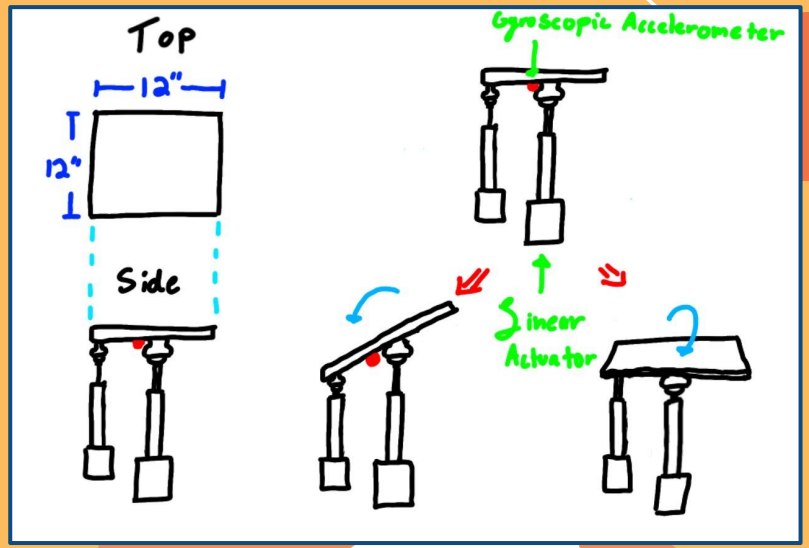
Unstable Tables

People often need a stable surface to set their food, drinks, and personal items on. However, this may not always be available, such as inside of a moving vehicle.

The Solution?
SLS: Self Leveling Surface

A surface that keeps objects level, even in unstable environments!

- Arduino responds to accelerometric readings
- Dual linear actuators to control pitch and roll
- Custom PCB to control speed of actuators
- Ball joint connections for maneuverability



OUR HYPOTHESIS

Our product can hold a 266 mL cup with 250 mL of water when the base is rotated 15° at a rate of 7.5°/s or more, such that the cup does not lose more than 50 mL of water.

Milestones

1. Is physically stable at multiple heights and orientations
2. Can hold a cup of 250 mL liquid at rest
3. Can stabilize when the base is rotated 15° or moved at a rate of 7.5°/s
4. Can stabilize with a cup of 250 mL liquid while in motion
5. 250 mL cup of liquid does not lose more than 50 ml of liquid
6. 250 mL cup of liquid does not lose any liquid

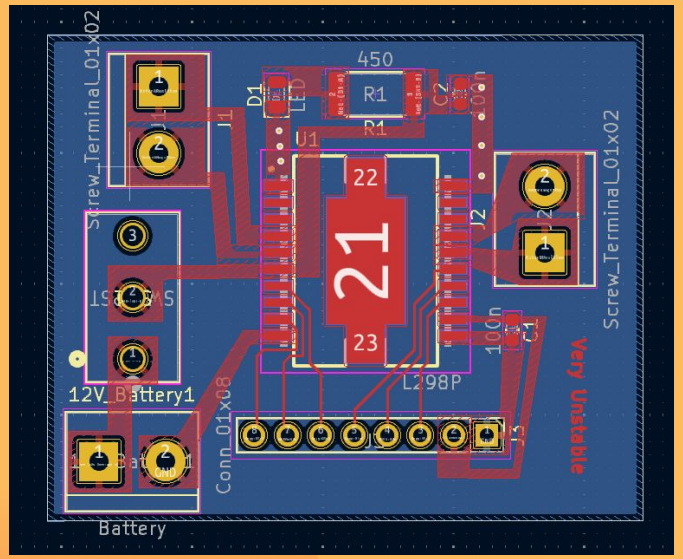
Some Critical Setbacks...

- PCB delay due to ordering miscommunication
- 2nd actuator and main structural components not yet delivered

But we have a backup plan!

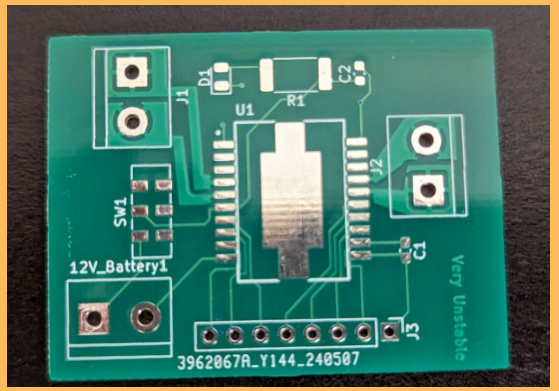
- Backup Arduino Motor Shield for prototyping
  - same functionality as designed PCB
- Working on software and smaller components first
  - doing as much as we can with first linear actuator while we wait for remaining parts

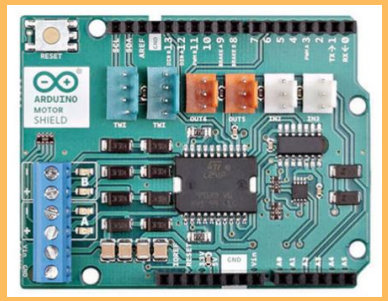
PCB Design & Linear Actuators



Controller for Linear Actuators

- L298P Dual Full Bridge Driver
- Simultaneous dual motor control



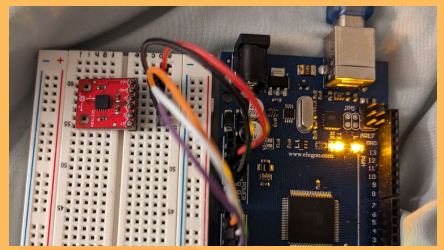


Similar to an Arduino Motor Shield Rev3

https://store.arduino.cc/products/arduino-motor-shield-rev3

Accelerometer

- Tested and working!
- Now we need to get it hooked up to a PID loop

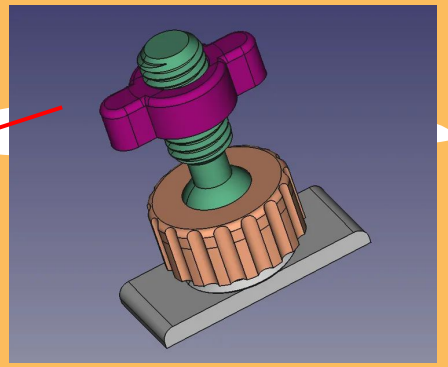


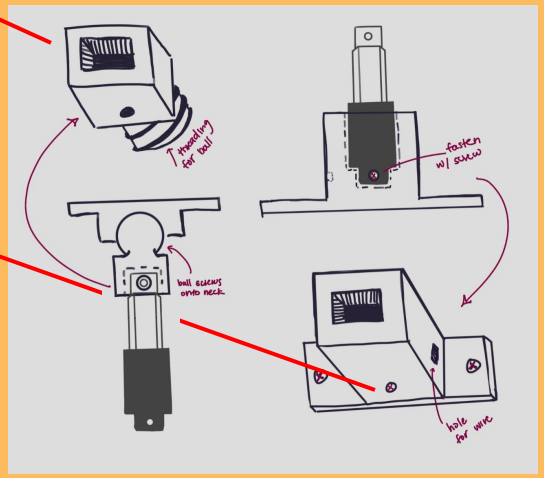
movement in x direction

https://docs.google.com/presentation/d/1Rjkgy87YWaNgfVqQtBgpB4WRgCLpy6bBST5LtIhCbrM/edit#slide=id.p23

Ball Joints

- Interface between linear actuators and tabletop
- Design modified from existing CAD
- Need one more!

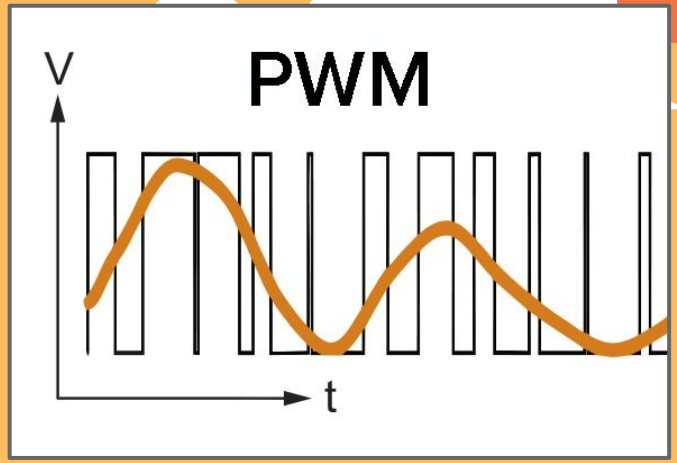


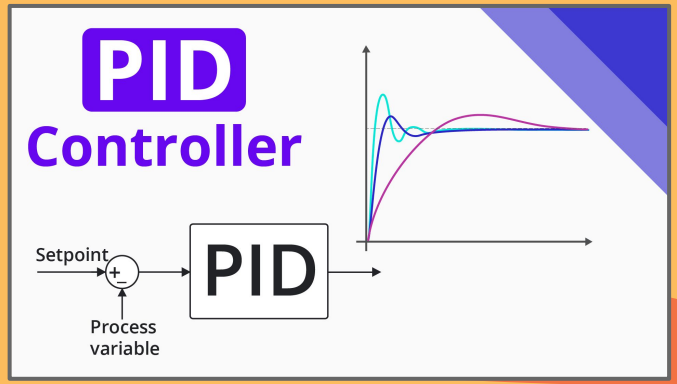


https://www.printables.com/model/370429-generic-lockable-ball-joint/files

What's Next?

- Software!
  - Integrating accelerometer and linear actuators
  - PID Controller
  - PWM input into L298





What's Next?

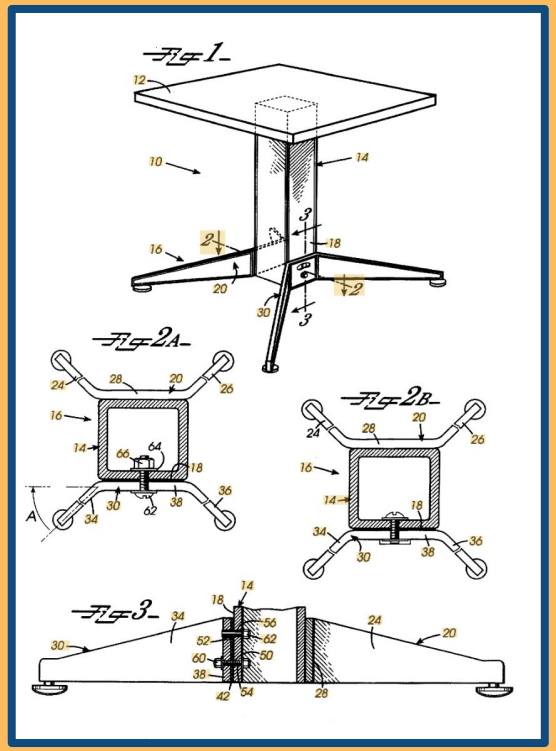
- Building physical structure
  - Ball joint 2.0
  - Attaching linear actuators
  - Supports (PVC Pipe)
- Finding Limits and Testing

References: Self Stabilizing Spoon

A tool for a pilot study on Parkinson's

- Solves similar problem to our solution
- Uses gyroscope

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7313572/



References: Self Stabilizing Table Base

A Pivoting Base for a table

- Passively adapts to static, unstable surfaces
- No power!

https://patents.google.com/patent/US5690303A/en

Inspiration: MOOG Space Industries

The Hexapod Robotic Payload

- 6 Axis!
- Powered by Linear Actuators
- Cool! But expensive…

https://www.youtube.com/watch?v=V8sGAispxbo

QUESTIONS?