# Robot Design/Fabrication Overview

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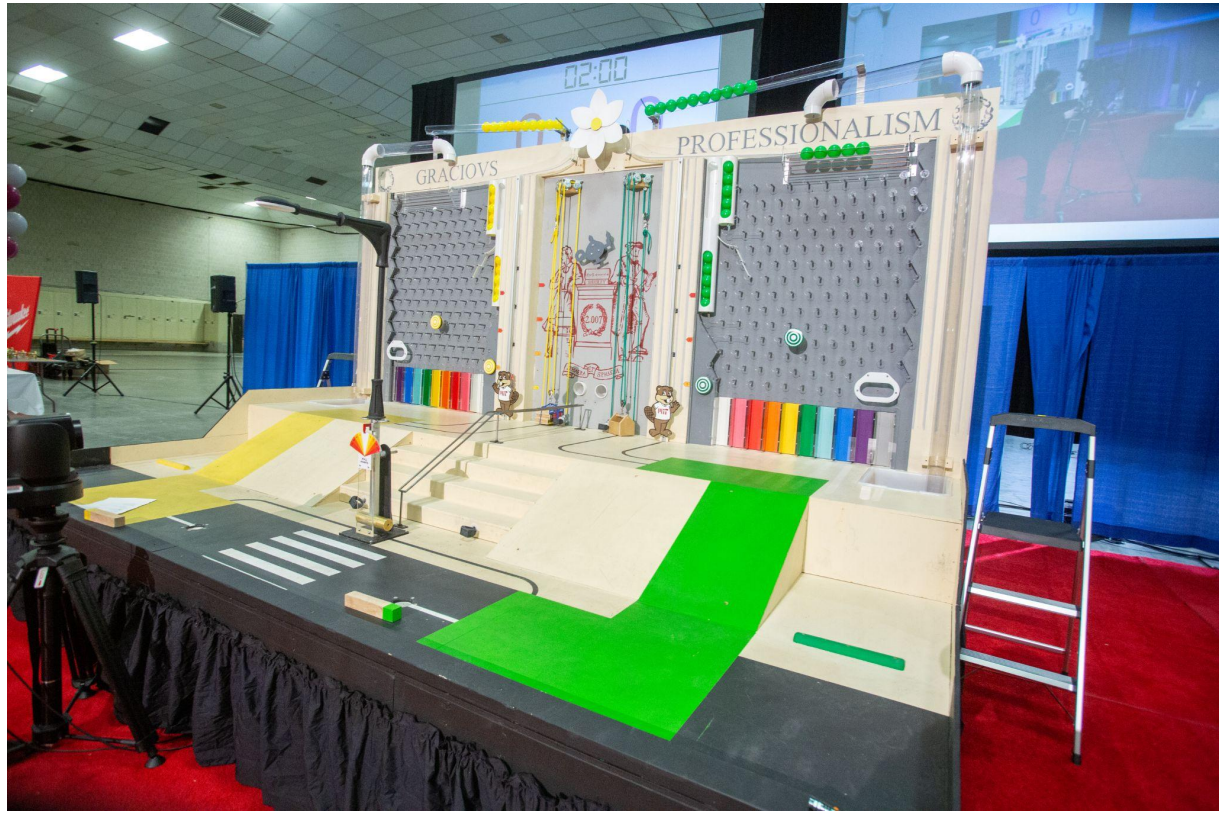
2.007 Design and Manufacturing I

# Motivation

- MIT's annual design and manufacturing class
- Final competition
  - Acquire points by
    - Collecting plastic balls
    - Moving a wooden peg into a slot
    - Pressing buttons at various heights
    - Lifting a model of Tim the Beaver
    - Pulling weighted rings horizontally
- Objective: Design and manufacture a robot to acquire a maximum number of points within 3 minutes (given size + weight constraints)



# Strategy

- How to earn the most points?
  - Metrics:
    - point values
    - proximity to starting region
    - cost in terms of difficulty/time
- Game plan
  - Autonomous peg drop first
  - Imperative to achieve multiplier
  - Aim for more valuable tasks
    - Beaver lift
    - Street lamp pull
  - Aim for simpler tasks
    - Pushing target buttons
  - Ball collection comparatively trivial, time-consuming

# Design Requirements

## Pusher

- Guide balls toward collection areas

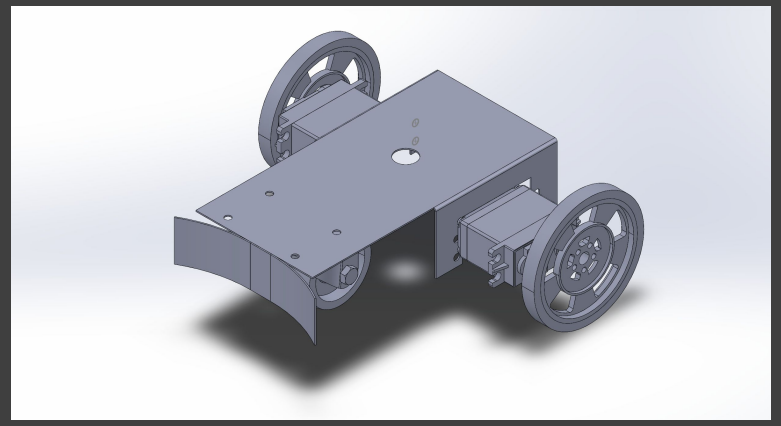
## Lift (MCM)

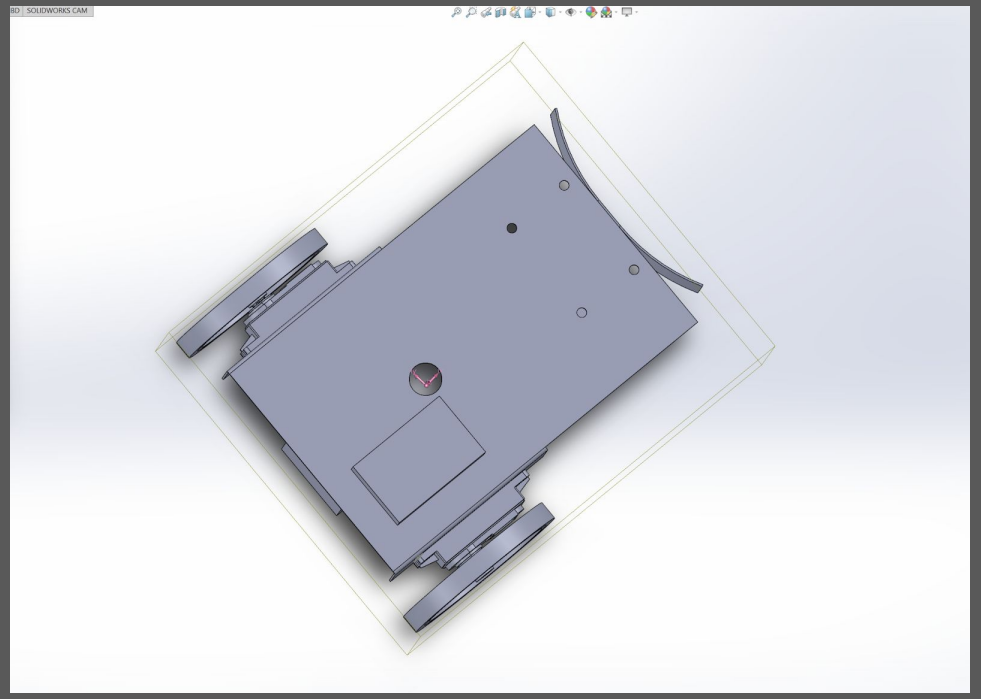
- Extend to 36”, starting from <16”
- Transmit 30N of upward force on beaver

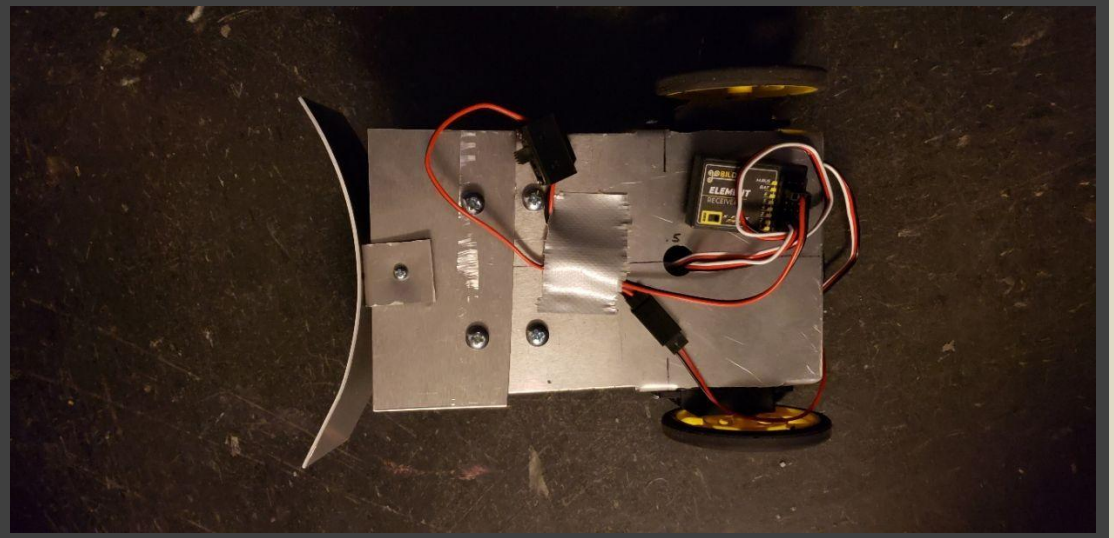
## Gripper/carriage

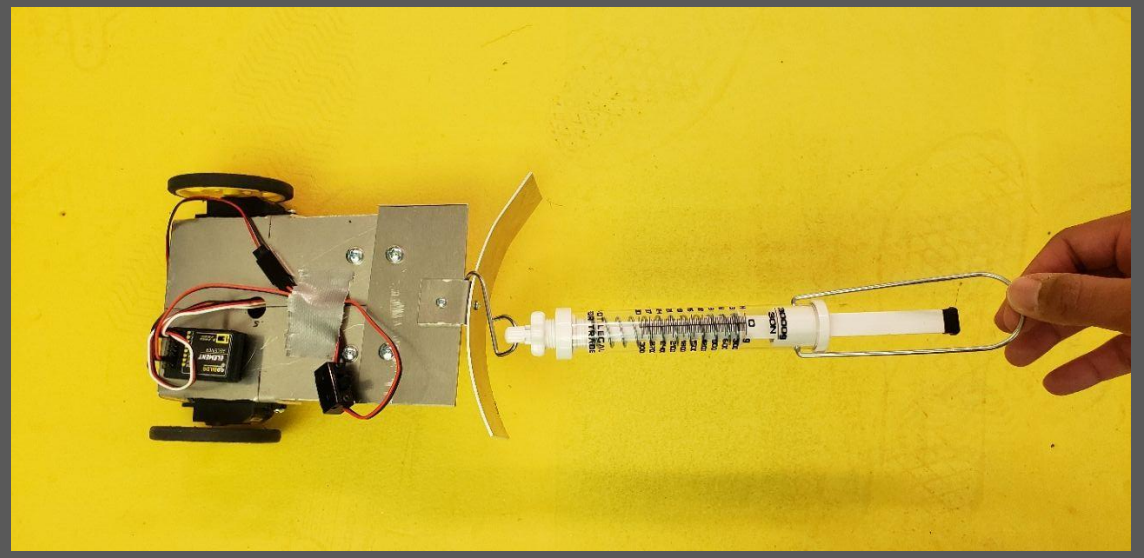
- Interface with block (1.5” × 1.5” × 8”)
- Fit underneath beaver and remain stable while transferring ~30N
- Fit around Brass Rat
  - Pull using wheels with torque motors

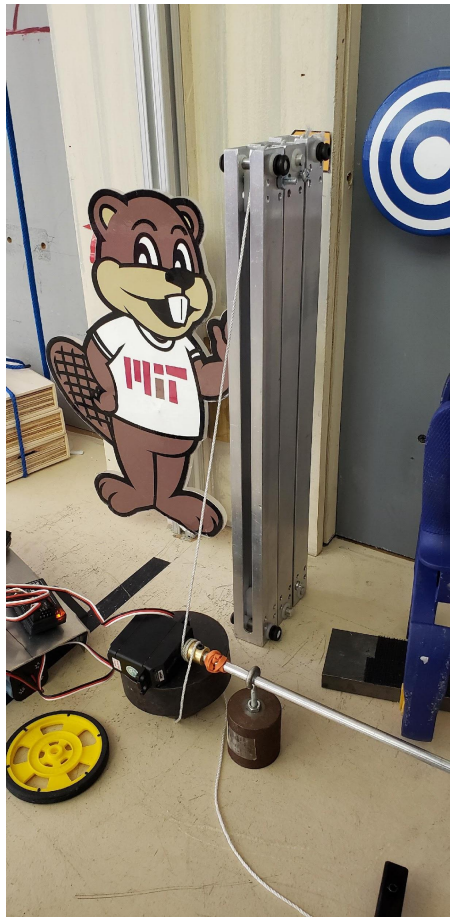
# Ball Collector Prototype







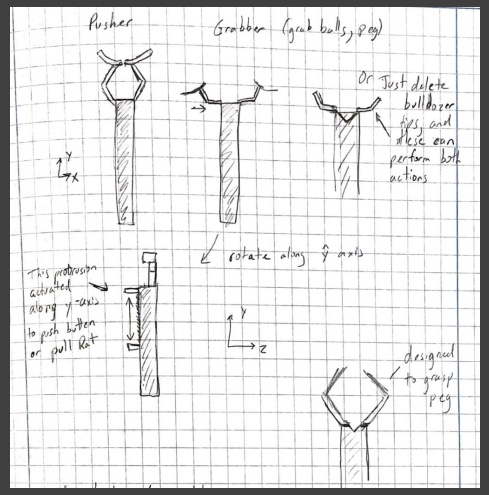


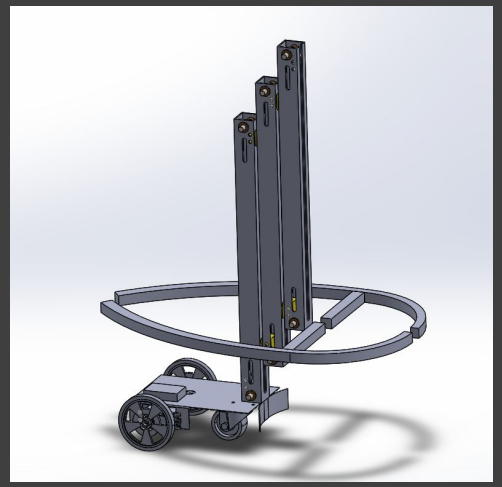


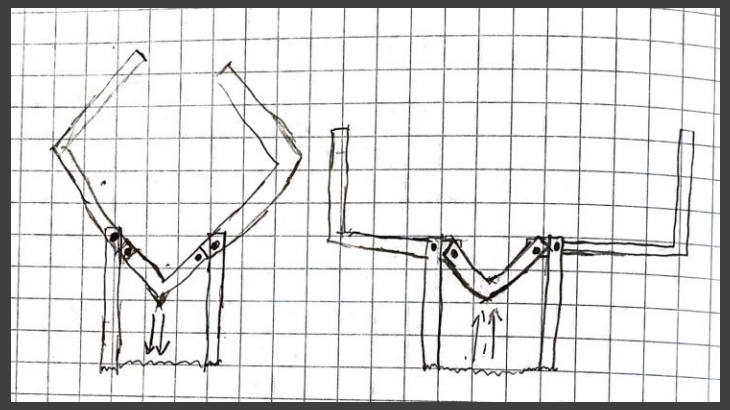

# Most Critical Module

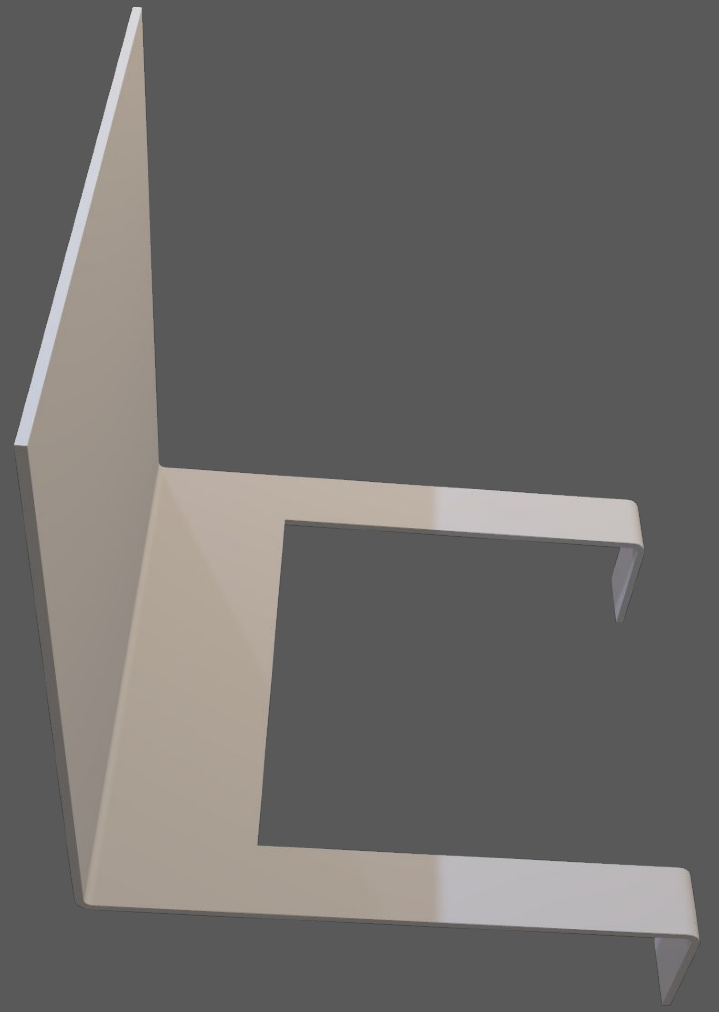
- Motor selection (25-2)
  - 30N needed to lift Tim
  - Estimated 48N to lift entire mechanism

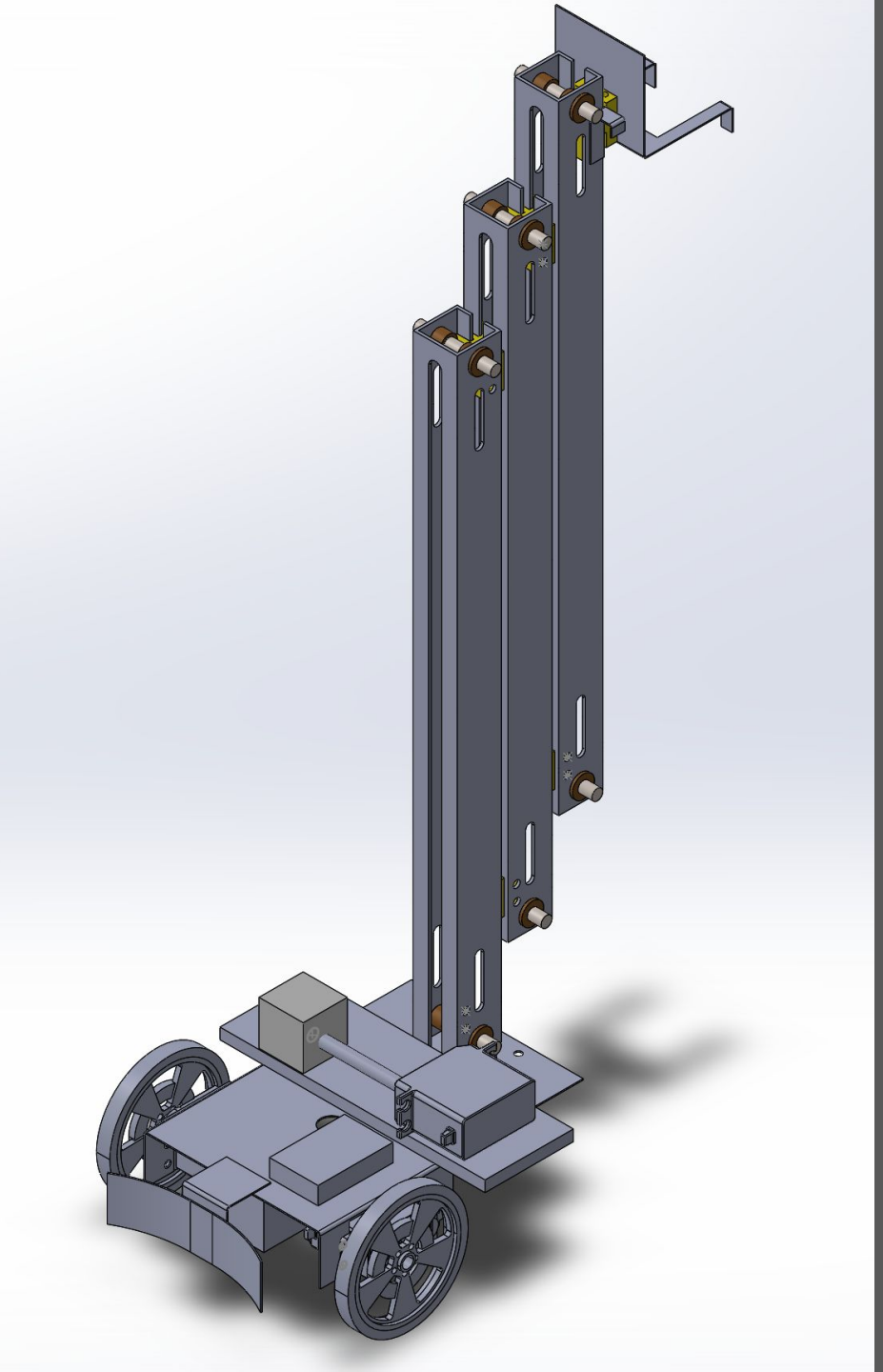
# Gripper/Carriage Design





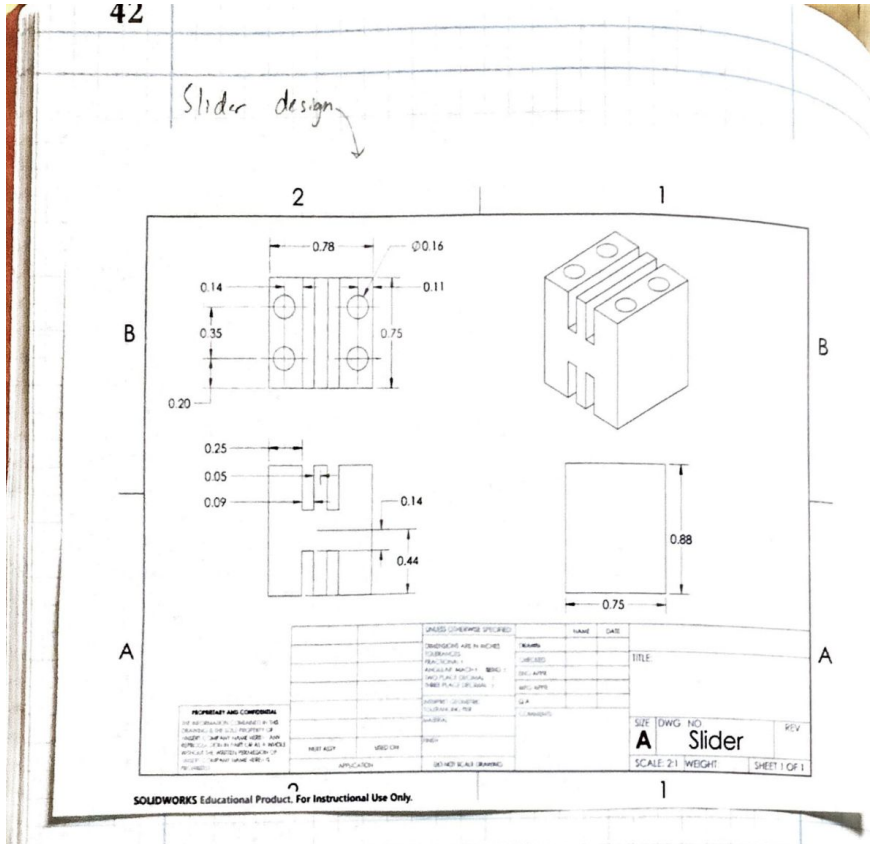


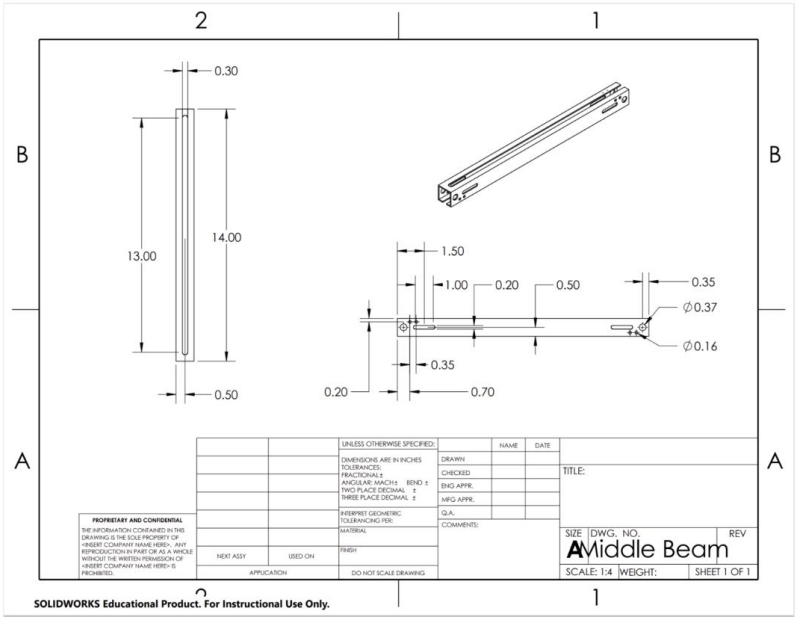


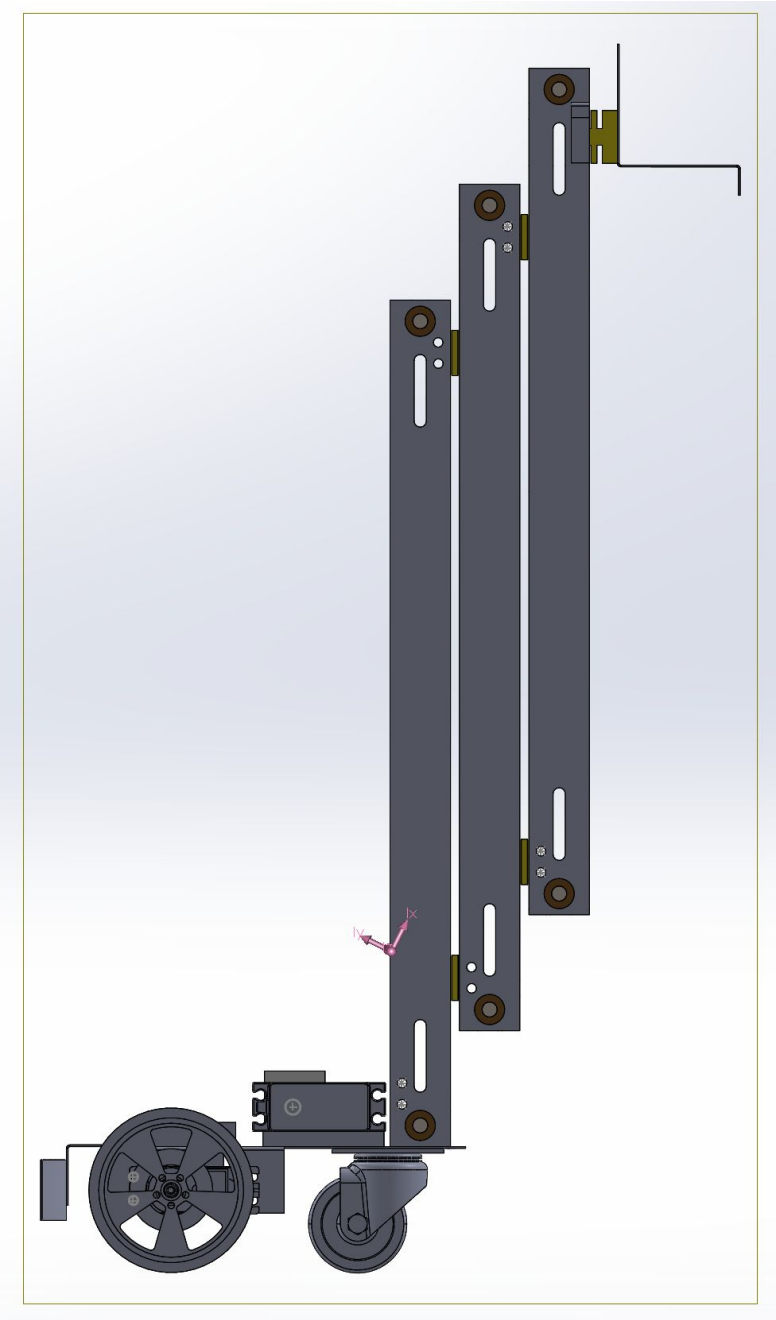
# Final Design

- Telescopic lift with multifunctional carriage
  - Driven by winch system
- Attachment for pushing plastic balls at back of the robot
  - Bot can be controlled in reverse

# Fabrication



COM directly above caster wheel (unloaded)

# Final Machine