

# Interim Design Review: Self-Leveling Stow-Away Pool Table



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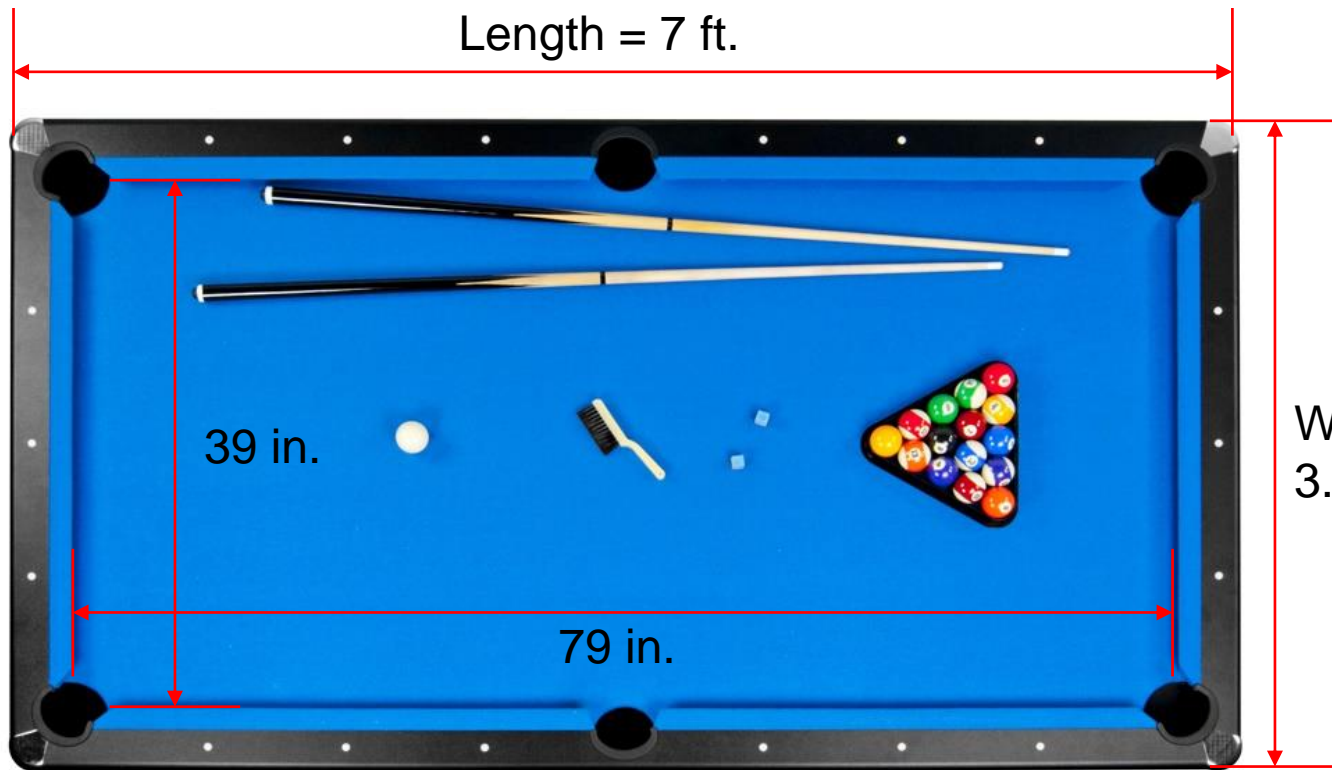
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# Background

- Sport played for hundreds of years
- Not just a table with rails; precise craftsmanship is required
- Popular all around the world
- Competitive sport or game of leisure



# Regulation Pool Table Dimensions



Top View



End Side View

# Problem Statement

## Pool Tables:

- must be extremely level
- require leveling if moved
- take up an entire room
- are heavy and difficult to move



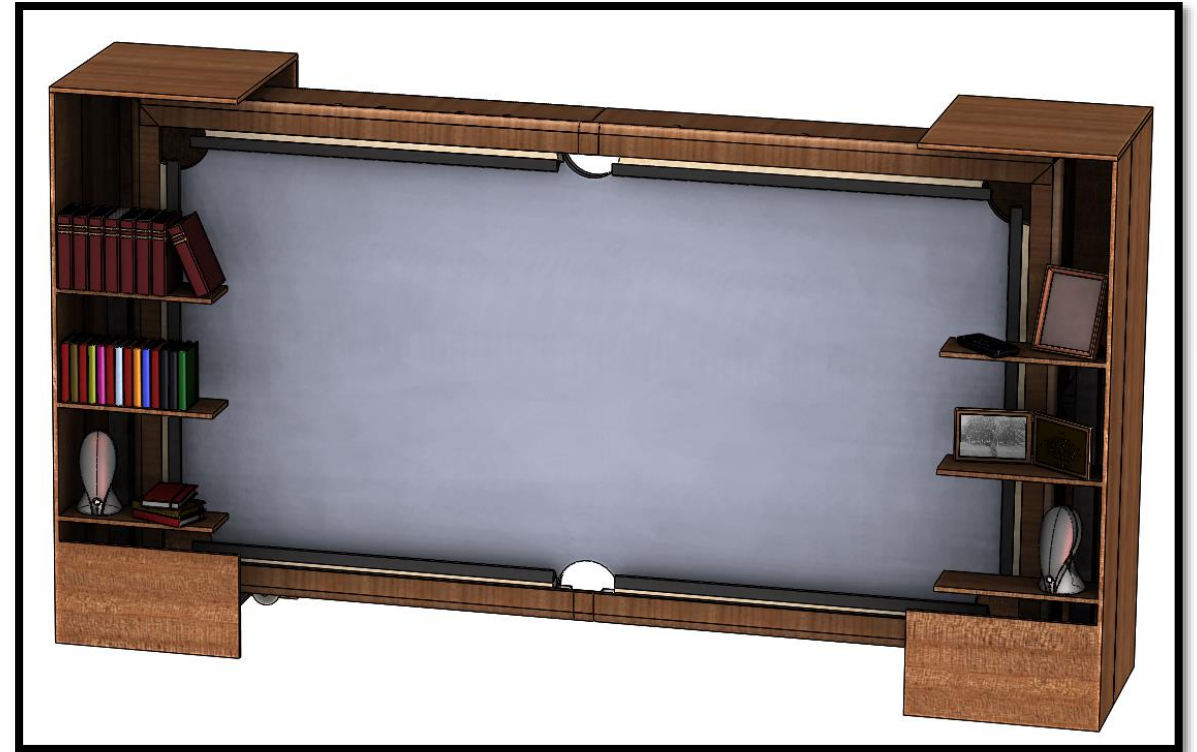
**Dedicated gaming room**

# Project Goals

- Reduce footprint (area that pool table takes up) by 75%
- Level table in 5 minutes
- Stow table away easily by one person
- Control height of table with buttons
- Tournament regulation dimensions

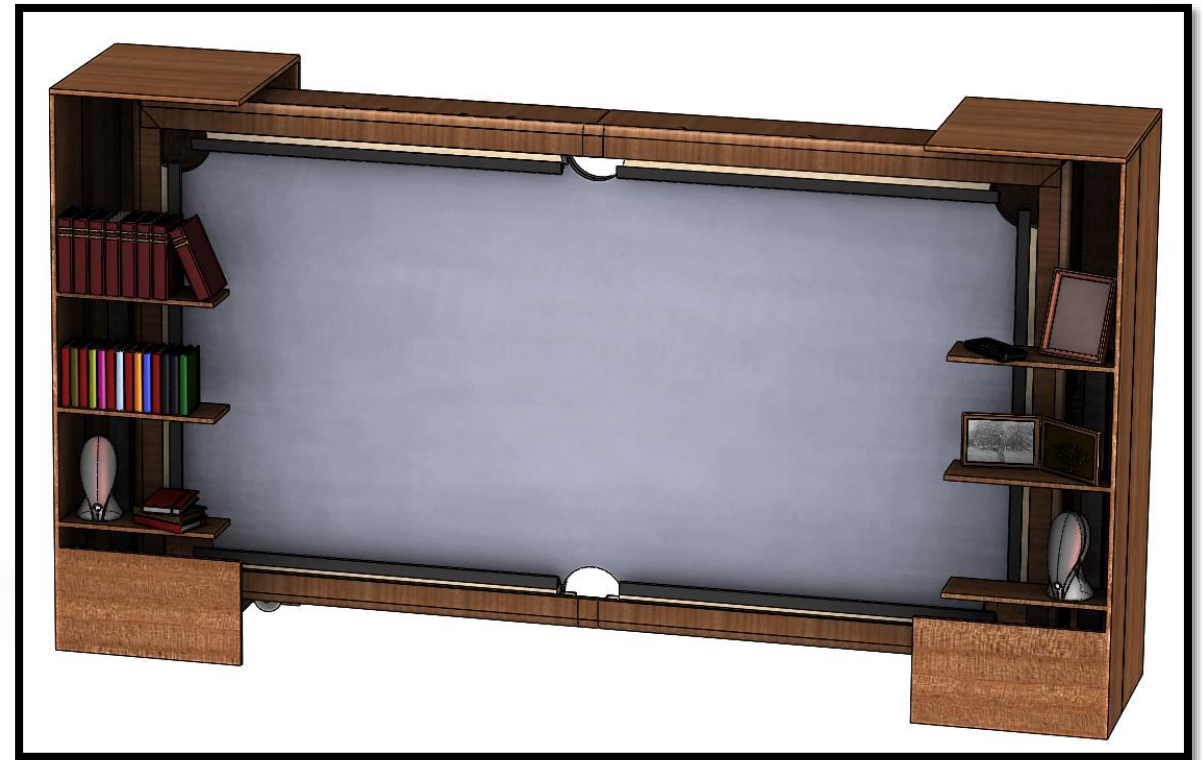
# Project Concept

- Reinforced steel frame/rail assembly
- Motor controlled extending foldable legs
- Self-Leveling mechatronics system
- Dolly system for moving table
- Multi-use stow-away housing



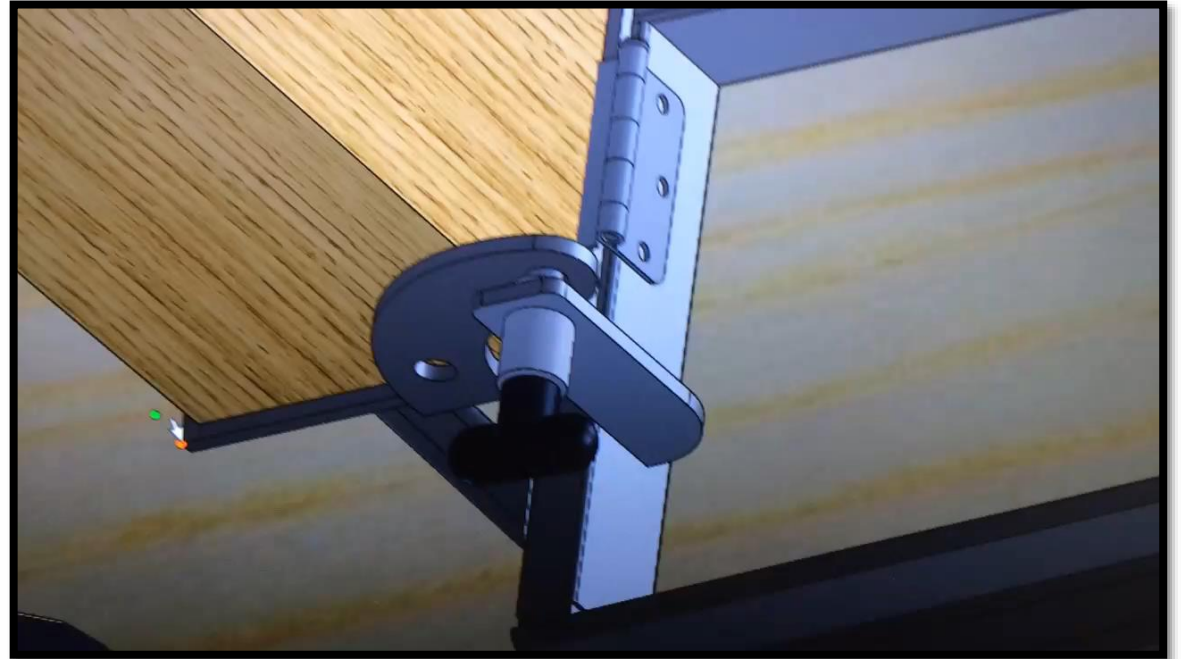
# Stow-Away Method

- Dollies brought to ends of pool table
- Table raised by linear actuators
- Dollies pushed into position
- Table legs lowered for table to be fully supported by pins
- Table rotation into vertical position
- Table legs are folded up
- Table pushed into housing unit for storage



# Folding Leg Assemblies

- Simple hinge design
- T-handle quick release locking pin
- 2 locking positions
  - Stow-away
  - Standing

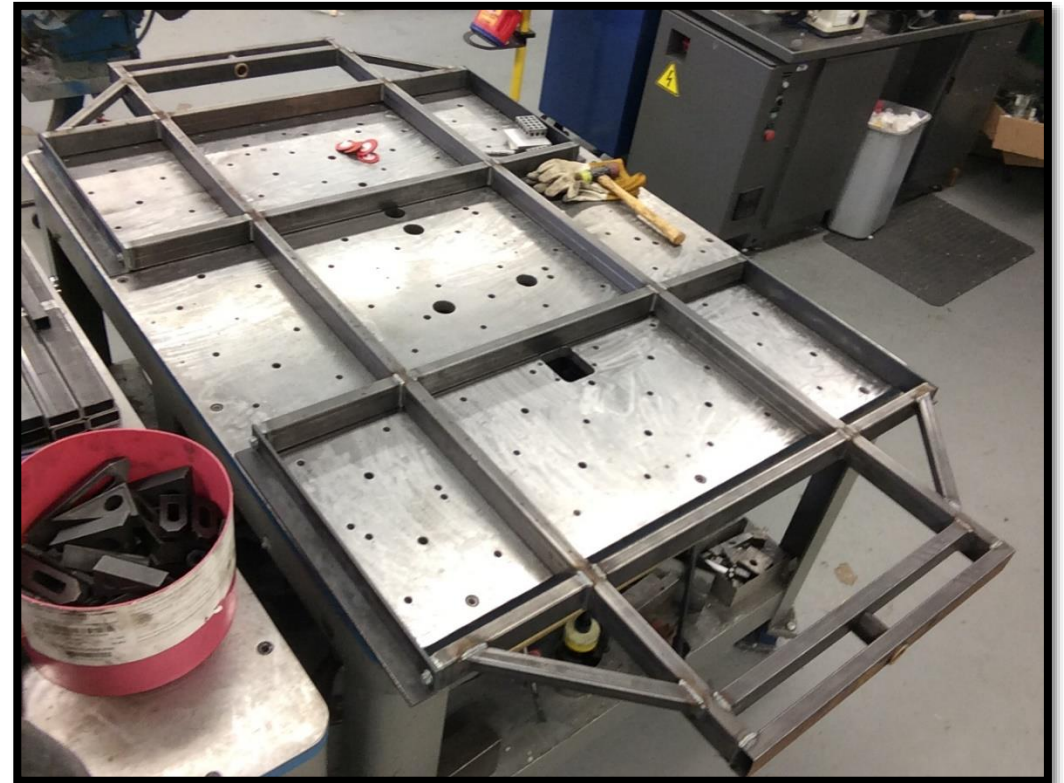


Video of Folding Legs



# Securing the Slate

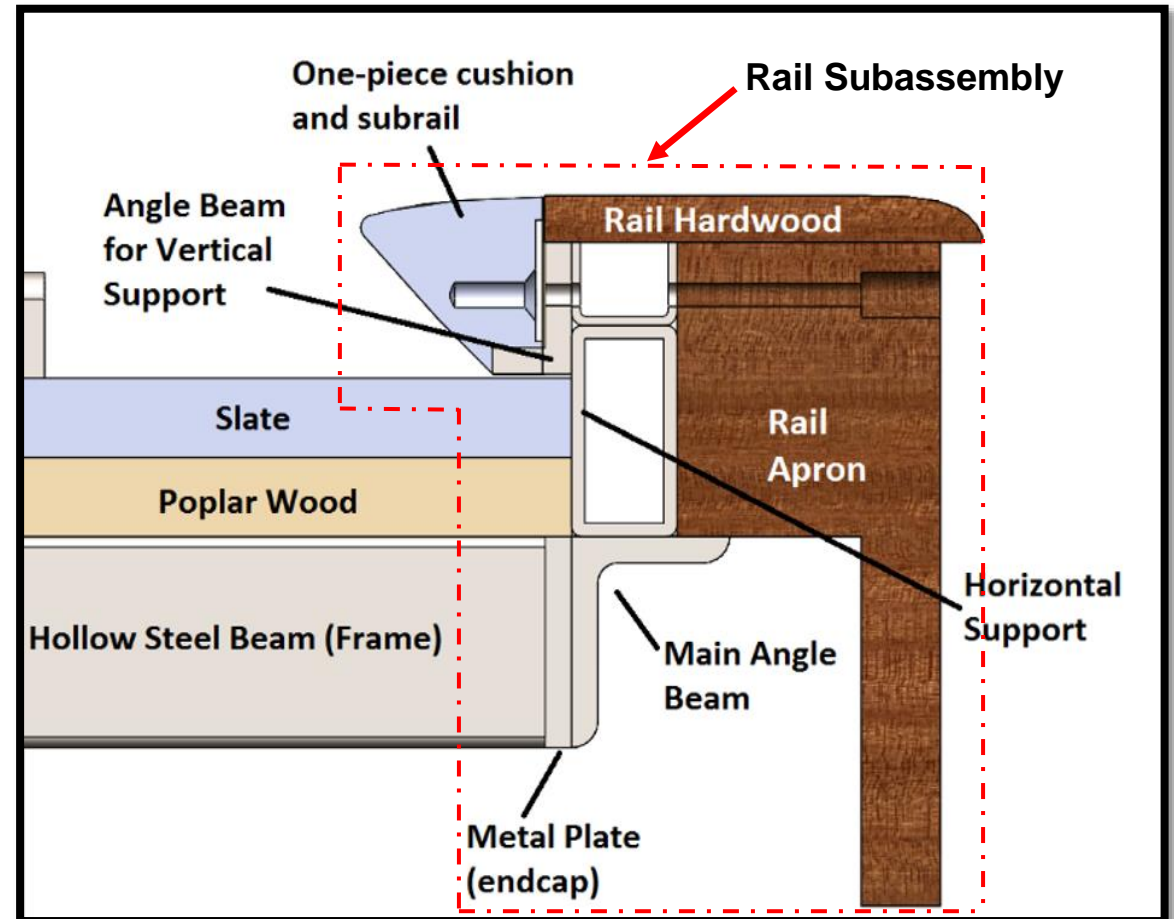
- Steel frame
- Strong, rigid support
- Hollow beams for lighter frame
- Beams welded together
- Ability to handle torsion due to rotation to vertical position



Steel Frame

# Securing the Slate

- Entire rail subassembly easily removed
- Angle beams provide support in stow away position
- Wood aesthetics

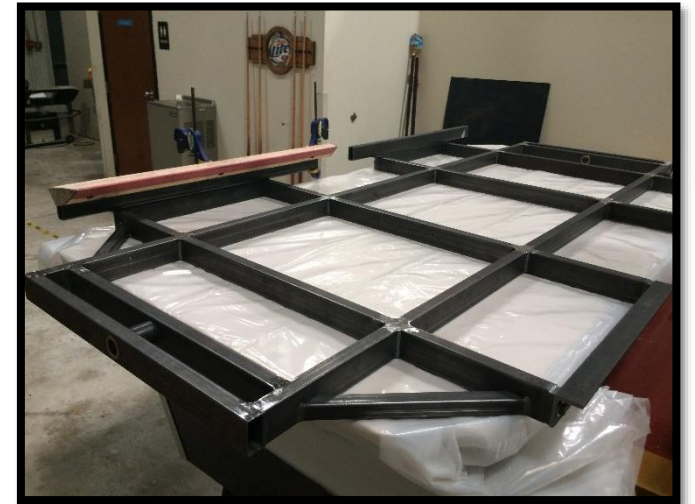


# Building Progress

- ✓ Design complete
- ✓ Steel frame welded
- ✓ Wood applied to slate
- ✓ Steel leg assemblies welded
- ✓ Continuous work in machine shop



Wood being applied to slate



Steel Frame

# Why a self-leveling system?

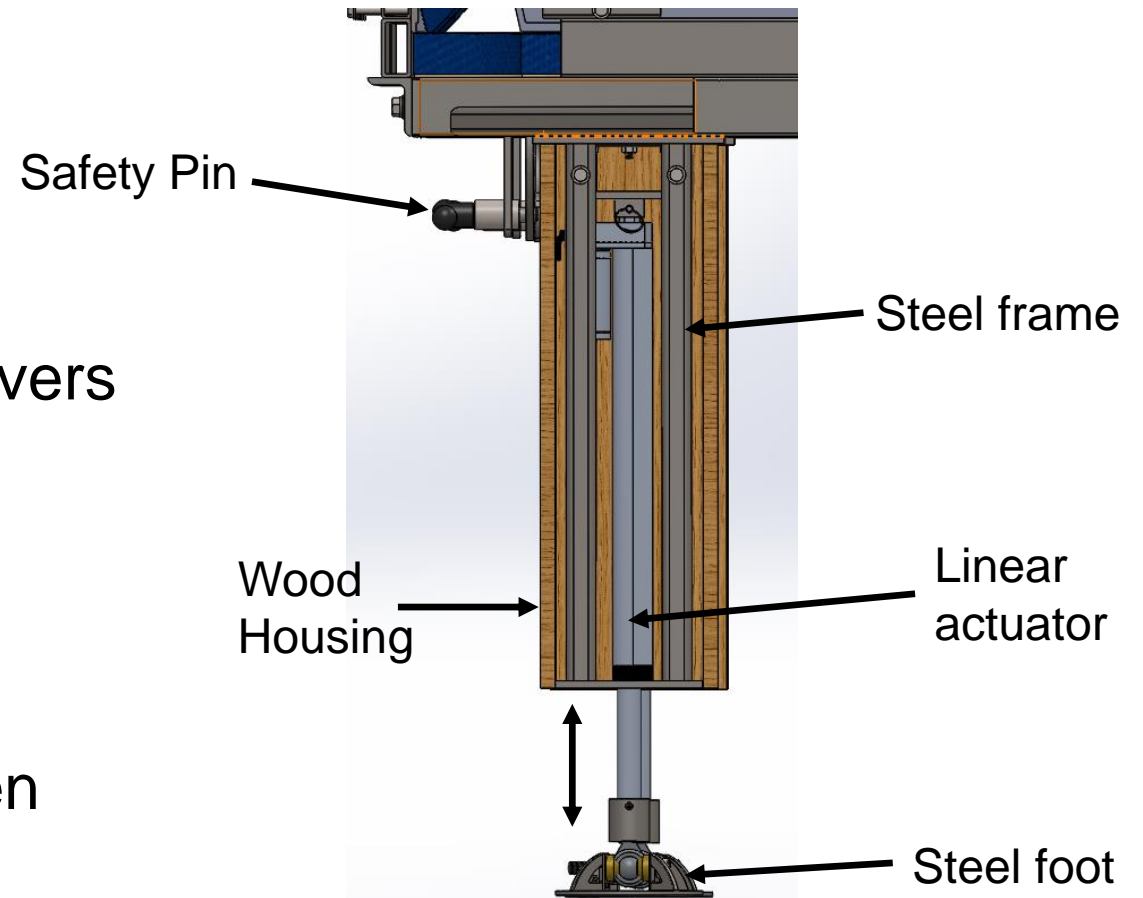
- Moving a pool table requires professional help
- Price to move and re-level: \$300<sup>[1]</sup>
- Self-leveling system is quick, safe and easy.



Pool table being leveled by a professional

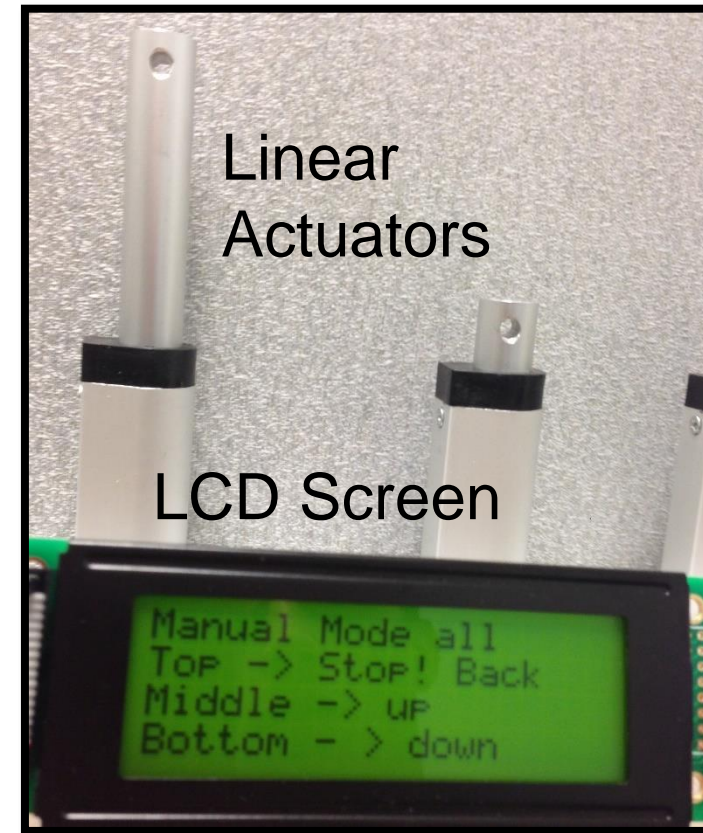
# Self-Leveling System Design

- Orangutan X2 microcontroller
- Two-axis inclinometer
- 2x - Atmel VNH2SP30-E motor drivers
- 4x - 333lbf load capacity linear actuators
- Simple user interface – LCD Screen



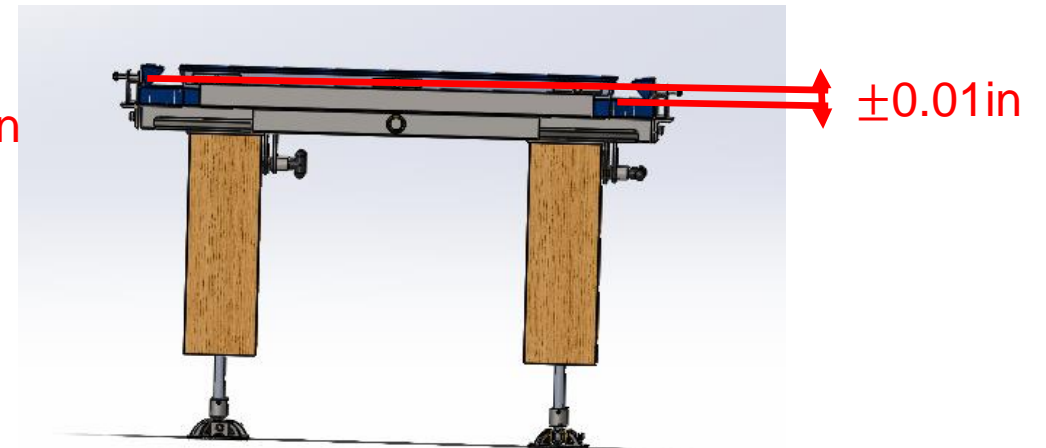
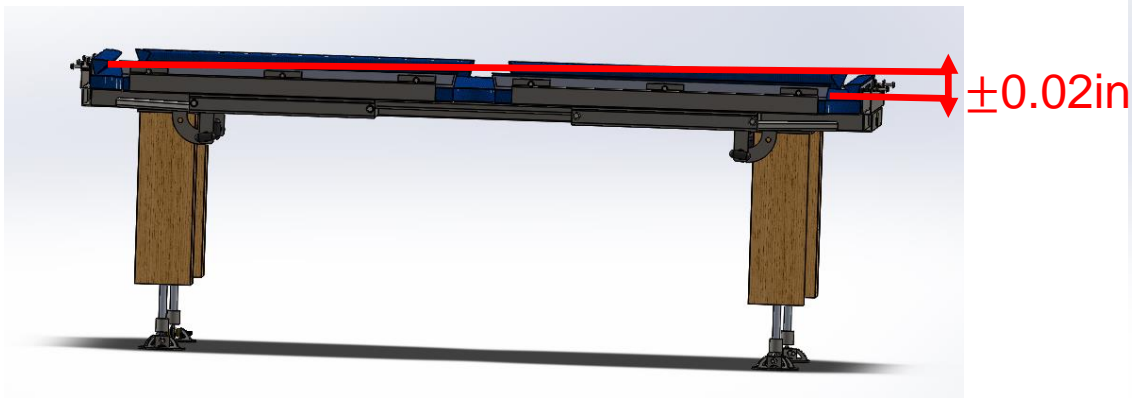
# User Control Interface

- Manual Modes:
  - Simultaneous Mode
  - Pairs Mode
  - Individual Mode
- Set level calibration to current position
- Auto-level



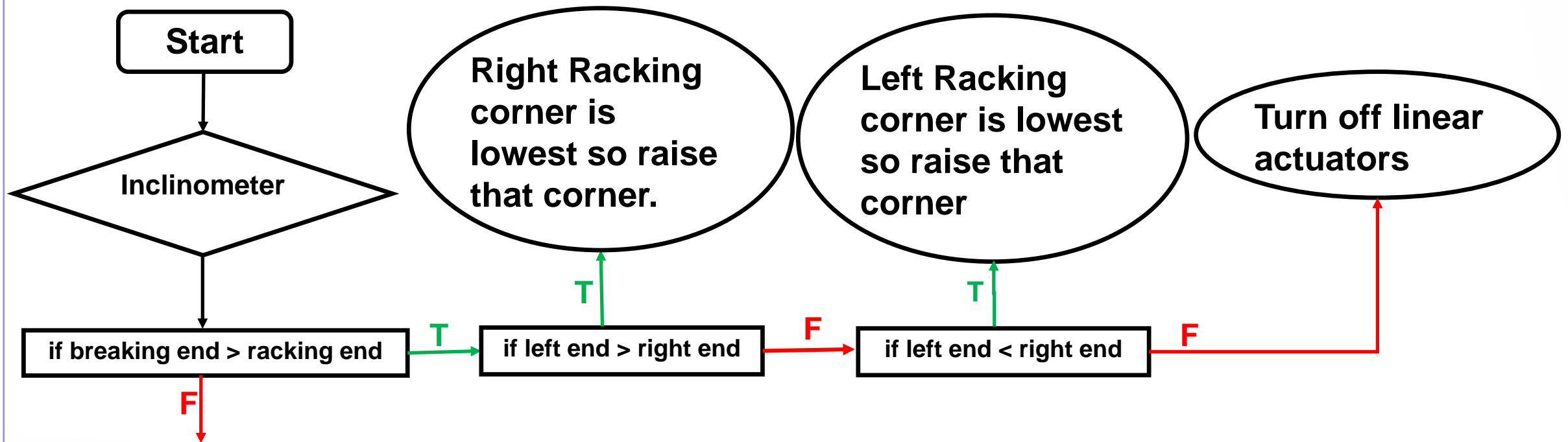
# Leveling Tolerances

- World Pool Association regulations: “an overall flatness within  $\pm 0.020$  inches lengthwise and  $\pm 0.010$  inches across the width.”<sup>[2]</sup>
- 84in×42in slate:  $\pm 0.014$  degree tolerance for both axes.



# Leveling Algorithm Development

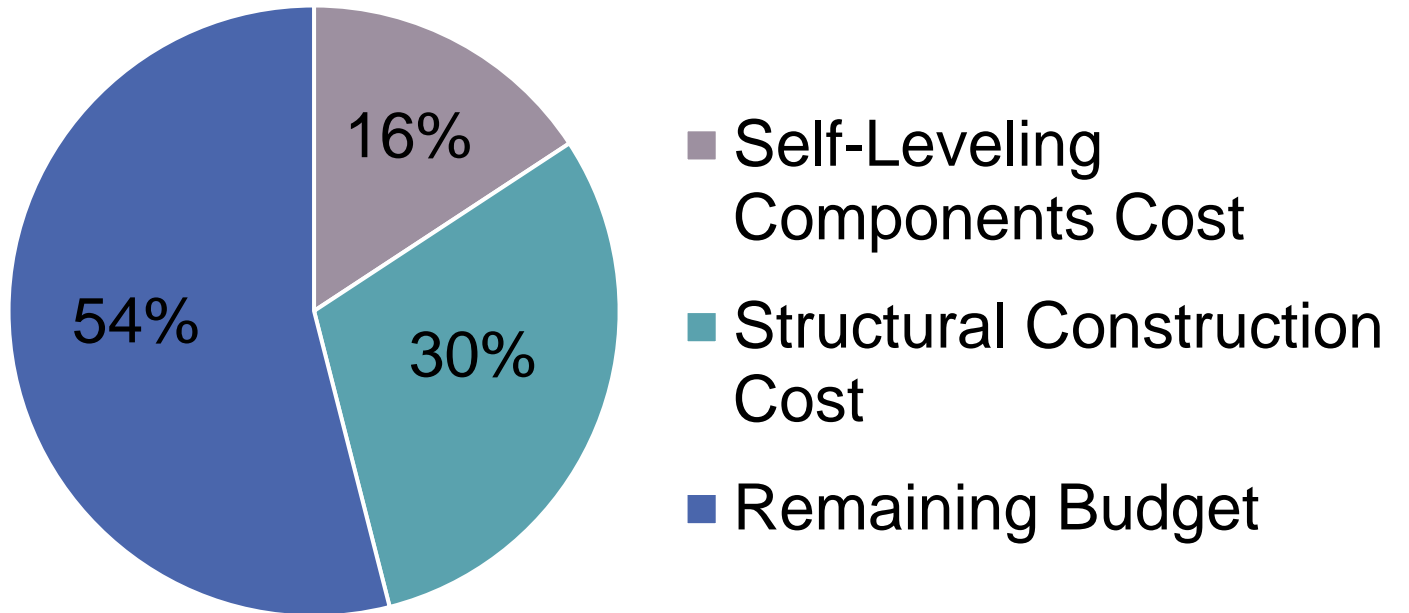
- Most time consuming process
- Requires repeated testing and reprogramming





# Budget Assessment

- Budget: \$5,000
- Spent: \$2,300.90
- Remaining: \$2,699.10



# Upcoming Work

- **Self Leveling System:**
  - Further testing and debugging
  - Application to actual table
- **Fabrication:**
  - Wood Aesthetics
  - Dollies
- **Final Assembly of Table:**
  - Table Cloth
  - Pockets



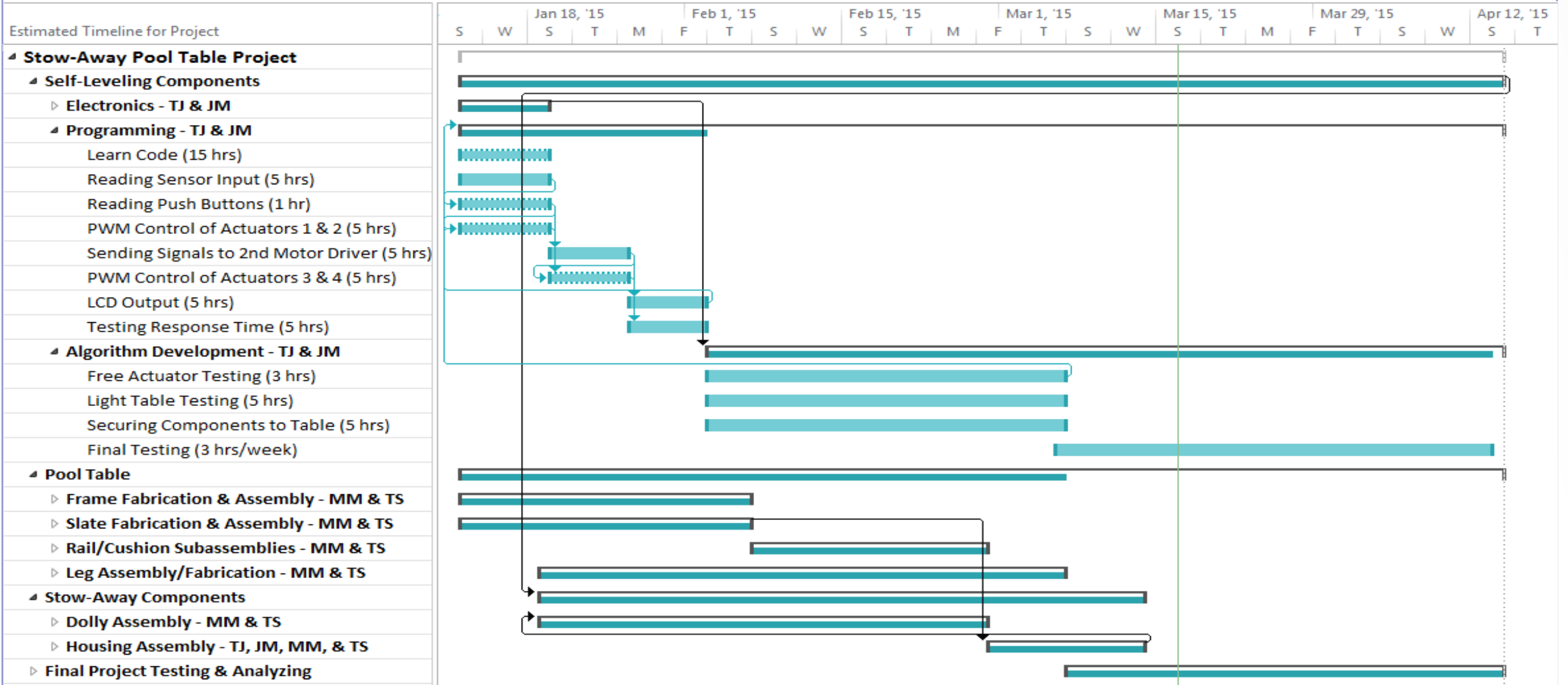
# Extended Goals

- IR range finder incorporation
- Modern graphic user interface
- Automated folding of the legs
- Dual purpose cabinets/housing
- Custom College of Engineering cloth



Infrared Range Finder

# Gantt Chart



# References

- [1] <http://localpooltableguy.com/6201.html>
- [2] [http://www.wpapool.com/web/WPA\\_Tournament\\_Table\\_Equipment\\_Specifications](http://www.wpapool.com/web/WPA_Tournament_Table_Equipment_Specifications)

# Questions?

