



Southeast IEEE Southeast Con Hardware Challenge 2017

Group #1
EEL 4911C

Advisor: Dr. Harvey
Instructor: Dr. Hooker
Reviewers: Dr. Roberts & Dr. Yu

TEAM

Michael Pelletier
Project Manager
Computer Engineer



Colin Fortner
Financial Advisor
Electrical Engineer



Hunter Fitch
Lead Mechanical
Designer
Electrical Engineer



Nicole Perry
Lead Electrical Designer
Electrical Engineer



TIMELINE

Research Update (Overall Bot) – November 3th

Research Update (Stages)– November 10th

Parts Ordered – November 18th

Stages Complete – December 9th

PROJECT DESCRIPTION

- 2017 IEEE Southeast Con Hardware Challenge

- March 30

- Objective: Success

- Oct. 9, 2016 Rules

- Autonomous robot



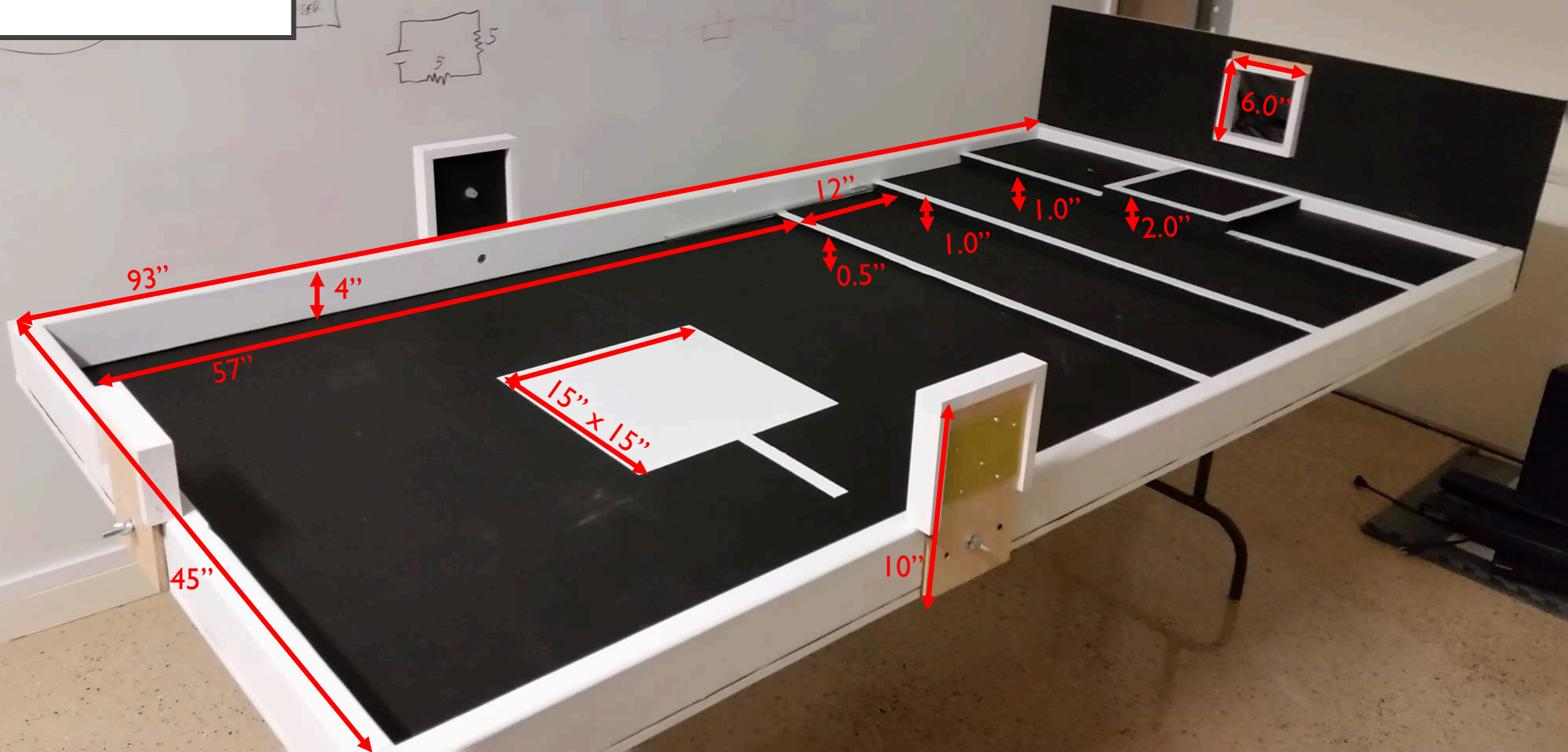
IEEE

4 STAGES

- Star Wars Themed
- “Uncovering the Unknown”
- “Lightsaber Duel”
- “Bring Down the Shields”
- “Launch a Proton Torpedo”

The image shows the iconic Star Wars logo, which consists of the words "STAR" and "WARS" stacked vertically. The letters are thick, blocky, and outlined in black, with a white fill. The font is a stylized, slightly irregular sans-serif typeface.

ARENA



SCORING

Stage	Maximum Points
Starting	40
Stage 1	135
Stage 2	290
Stage 3	325
Stage 4	210
Total	1000

BOT CHASSIS DESIGN

- Starting size must not exceed 12"x12"x12" (as per official Rules)
- Preliminary Research has resulted in the following design aspects
 - Material: Water-Jetted Aluminum, 3D Printing
 - Bot Size 10"x10"x10" to allow for possible expansion if needed
 - Perforated to reduce weight
- Exact specifications cannot be determined until after all components for stages 1-4 have been determined. The chassis will be designed to house all components effectively

MICROCONTROLLER



Raspberry Pi



Arduino



MSP Launchpad

PLATFORM



Wheels

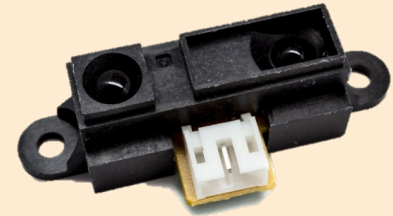


Tracks



Legs

NAVIGATION



Infrared Distance Sensor



Ultrasonic Distance Sensor



Laser Distance Sensor

CONSTRAINTS

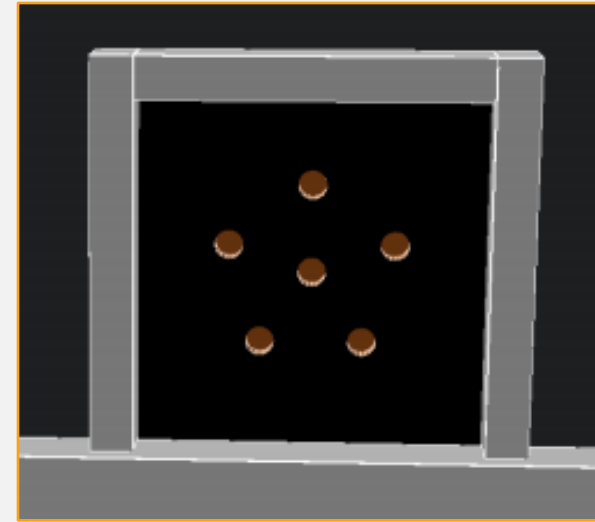
- Cost
 - \$750
- Size
 - 12" x 12" x 12"

NEEDS

- Robot that can move
- Autonomous operation
- Navigation in the Arena
- Complete Stages 1-4

STAGE I – DESCRIPTION

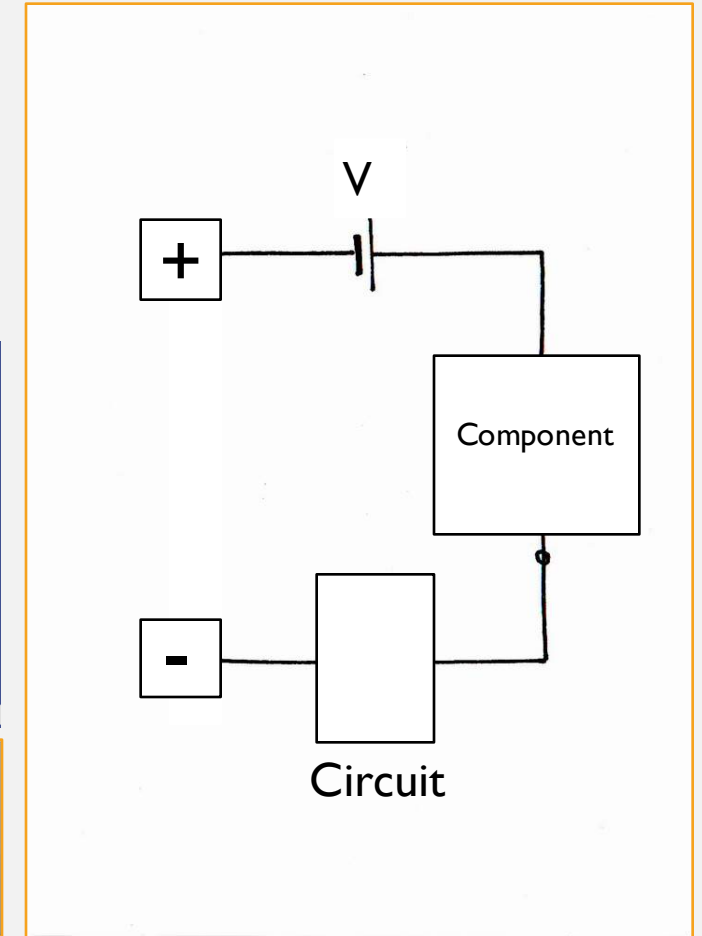
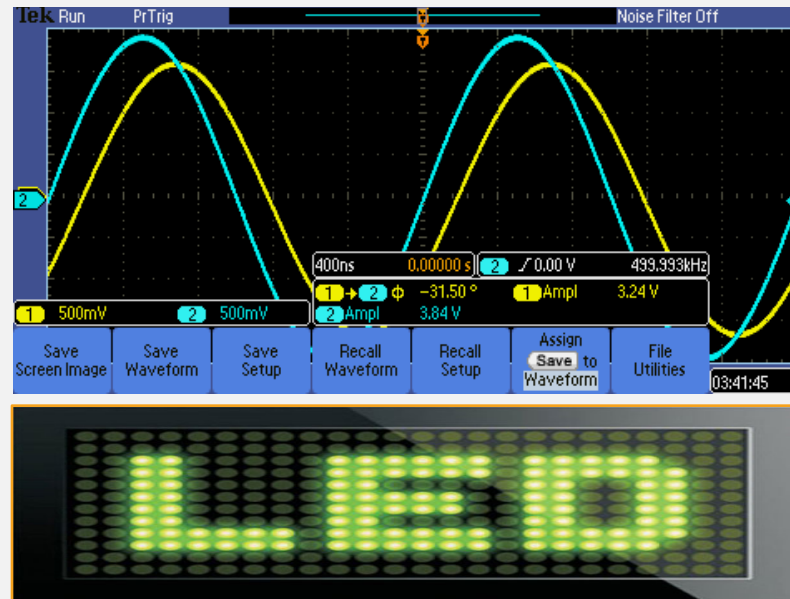
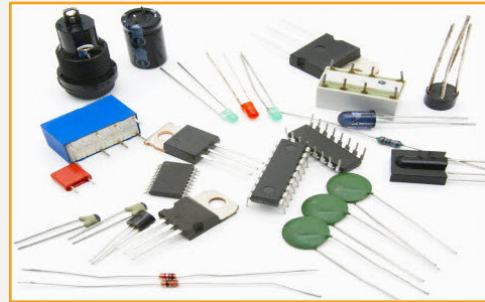
- Rotational dimensions for copper pads are:
 - 1 - 0°
 - 2 - 72°
 - 3 - 144°
 - 4 - 216°
 - 5 - 288°
- Center pad is common ground
- Capacitor is non polarized
- Diode can be forward or reversed



Code	Component type	Component value
1	Wire	N/A
2	Resistor	10K, 10% tolerance
3	Capacitor	0.1uF, non polarized
4	Inductor	500mH
5	Diode	IN4001–cathode/anode can be oriented in either direction

STAGE I – APPROACH

- 6 Prong
- Voltage output
- DAC
- More Complex circuit
- Display Screen



STAGE 2 – “LIGHTSABER DUEL”

- Detect Electromagnetic Field induced
 - 1 amp supplied to a 40 turns of #20 copper wire wound around a 0.5” bobbin
- Active for 2 seconds randomly during a 30 second round interval
 - Started by robot contact
 - 4 active periods during the round with the final activation at 28 seconds

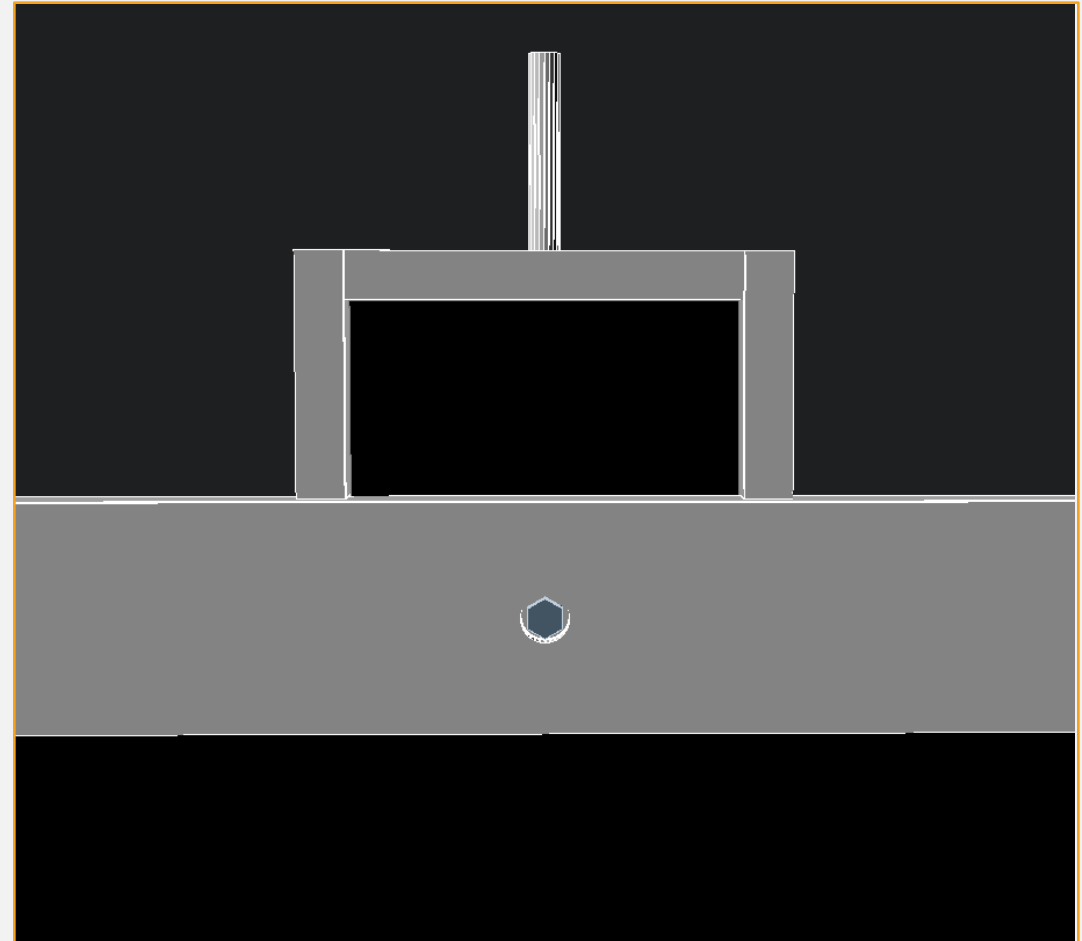


Figure 1: Arena Stage 2 with Lightsaber

STAGE 2 – THE LIGHTSABER

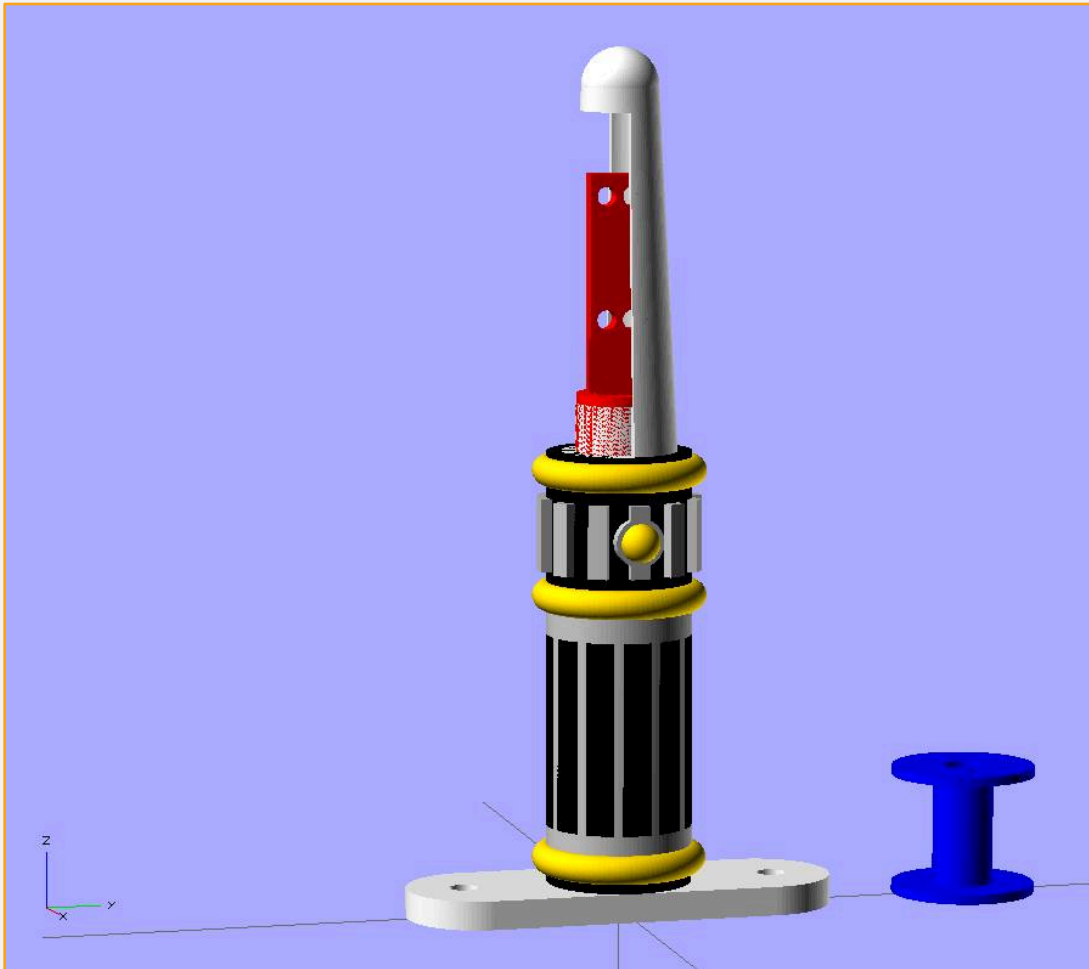


Figure 2: Lightsaber and Bobbin

- Lightsabers!
- 3" tall Field attached lightsaber
- Adafruit Medium Vibration Sensor Switch to detect contact made
- Adafruit LED array to visually indicate contact
- Red for Points Deducted, Blue for Points Awarded

STAGE 2 - “THE FORCE IS STRONG WITH THIS ONCE” – OBI WAN”

- Electromagnetic Sensing Solution
 - Hall Effect Sensor
 - board mounted within the robot
 - code written to meet the needs specified
- Bot-mounted Lightsaber Movement
 - Small Linear Actuator Motor
 - Pinball Flipper style device

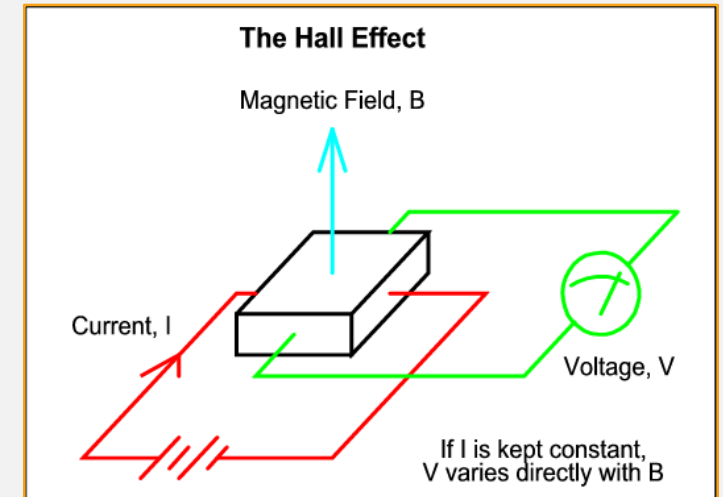


Figure 3: Hall Effect Diagram

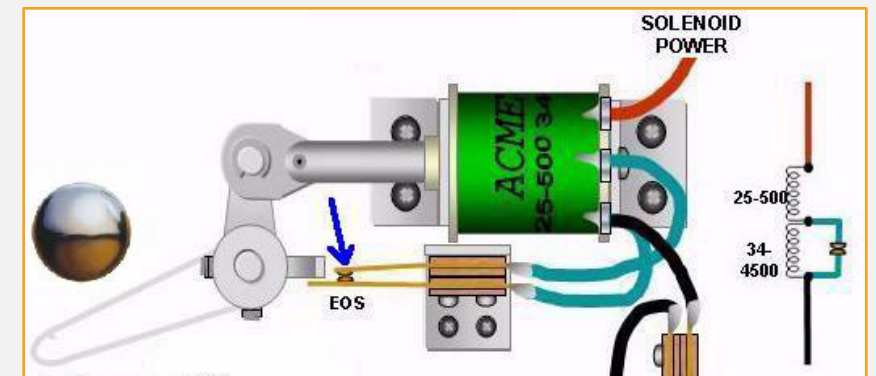
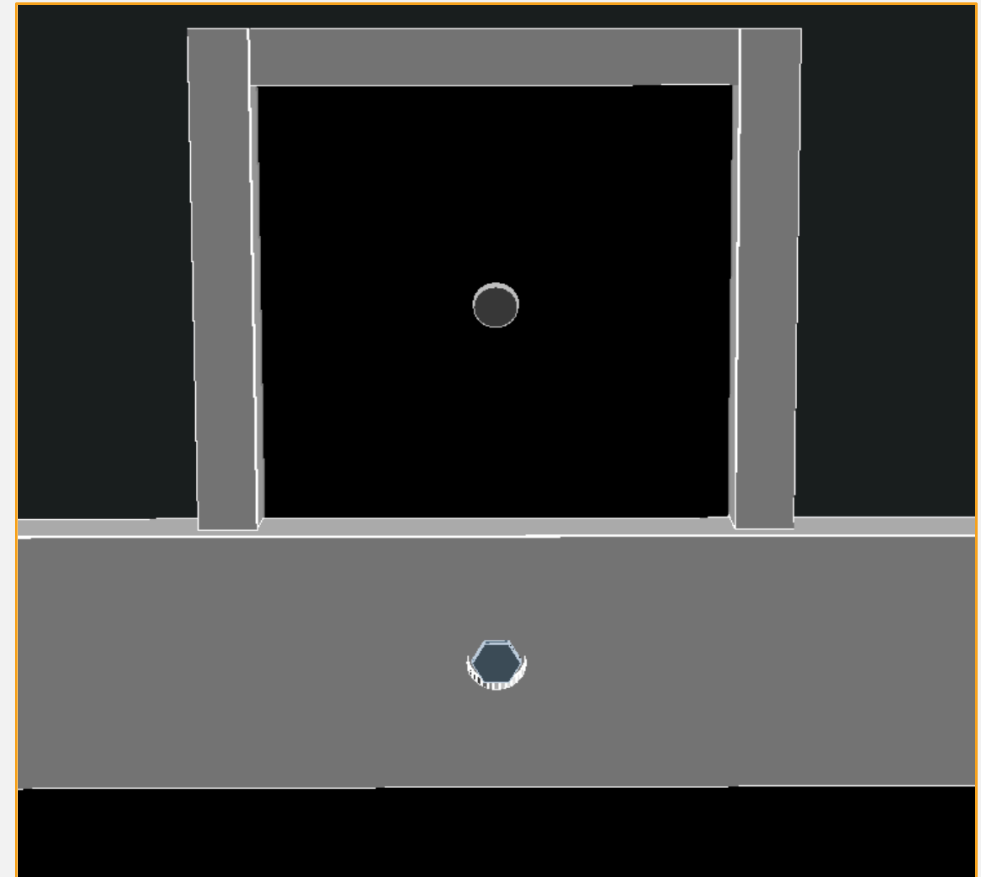


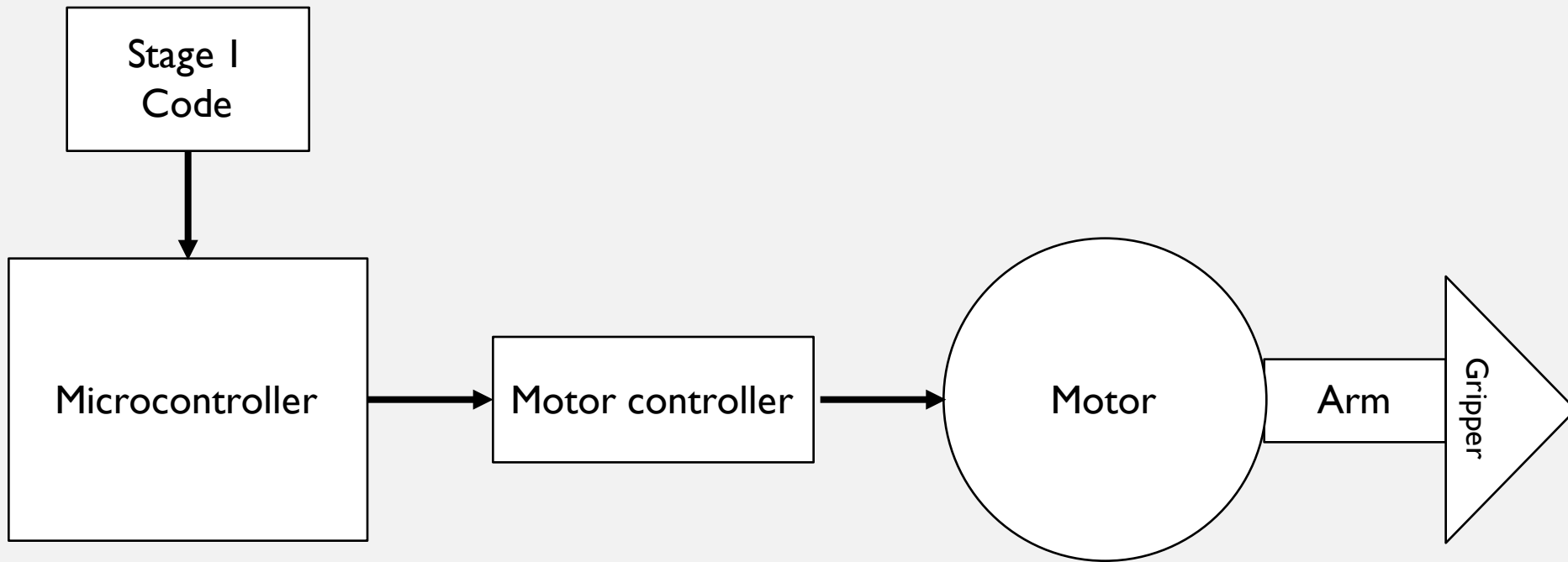
Figure 4: Linear Actuator Motor with Hinge Mounted "Flipper" Device

STAGE 3 – DESCRIPTION

- “Bring Down the Shields”
- Implement Stage I Code
- Quadrature Encoder
- 345° to 375° is one turn
 - $\pm 15^{\circ}$
- Number of turns = Digit
- Direction changes = Next Digit
- Five Digits



STAGE 3 – APPROACH



- Rotate 360°
- Fast but precise

STAGE 3 – POTENTIAL SOLUTIONS

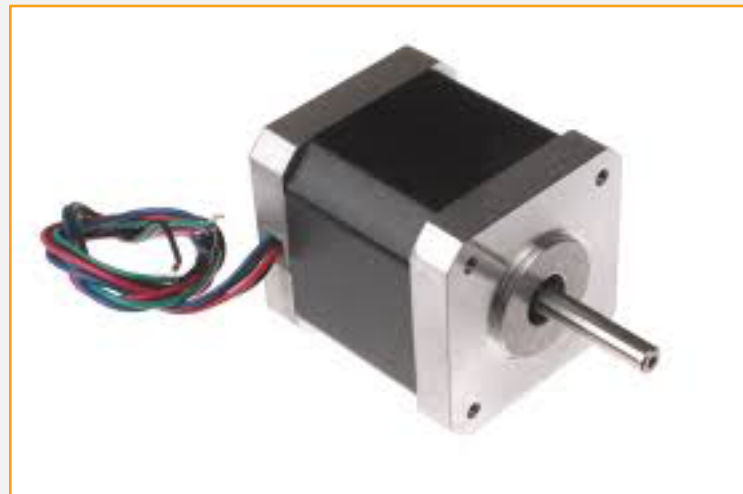
CONTINUOUS ROTATIONAL SERVO

- Rotates 360°
- Fast Rotation
- Smooth Motion



STEPPER MOTOR

- Easy to control
- Simple Implementation
- Precise



STAGE 4 – DESCRIPTION

- 6"x 6", 3.5" above the top step
- The target area is roughly 7" from the starting arena area
- Launching Position



STAGE 4 – POTENTIAL SOLUTIONS

Nerf Gun

Precision built for the projectiles being used in competition, however the size of the guns can hinder the robots complete design.



Hand Built

Would be more suited to the robot's specifications for the size constraints of the competition.



FUTURE

Research Update (Overall Bot) – November 3rd

- Submitted Arena Designs for Construction
- Microcontroller
- Drive Train
- Navigation

Research Update (Stages)– November 10th

- Individual progress → Group Decisions

Parts Ordered – November 18th

Stages Complete – December 9th