To Predict ▶ To Design ▶ To Perform

College of Engineering
Department of Mechanical & Industrial Engineering

ME, ECE, BE Capstone Design Programs

Team 7: Julian Wants to Play Basketball

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Objective Statement

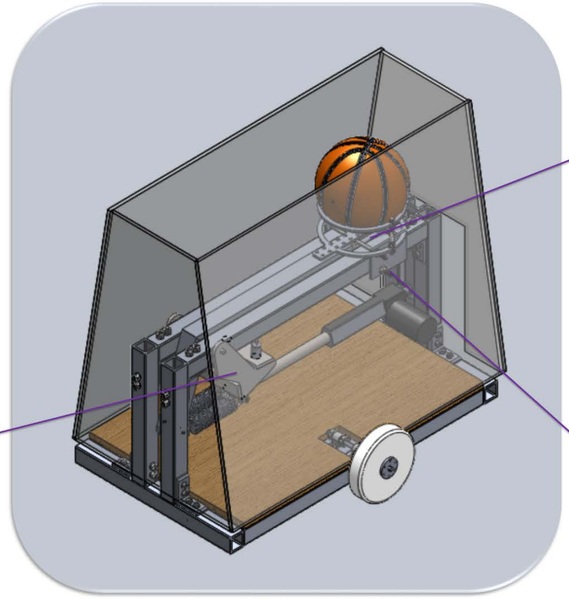
The purpose of this design is to give Julian, an individual with CP, the opportunity to play basketball through an electro-mechanical device designed with the intent of allowing him to shoot a basketball.

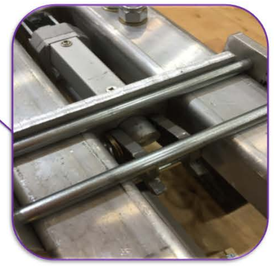
Functional Requirements & Engineering Specifications

- Safe
- Manually Mobile
- Shoot ball
- Interface with Julian

Specification	Correlating Value
Power Supply	840Wh
Range of Operation: Kill-Switch Feature	13ft-22ft from goal
Budget/Cost Effectiveness	$3200.00
Structural Integrity of Wall	No interference w/ Julian
Shooting Accuracy	40%
Weight (overall system)	200lbs or less
Dimensions	4ft L x 4ft W x 3ft H
Actuator Displacement	0.98”/sec
Relay Circuit Consistency & Programmatic Prevention	100% success rate
Drive Shaft Yield Stress	45 KSI
Catapult Beam Bending Strain	Less than 0.002
Graphical User Interface	Julian’s Satisfaction

Product Overview





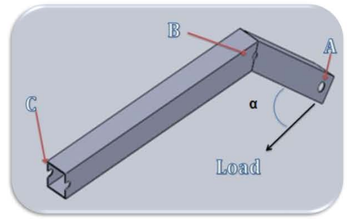
Testing & Results

Variables	Trial 1	Trial 2	Trial 3	Trial 4
Shock Absorbption Setting	8	8	6	4
Distance from Freethrow line	58"	58"	58"	58"
Spring Actuated Distance	5.875"	6.3125"	6.3125"	6.3125"
Number of Shock Absorber Pads	2	3	3	3
Shots Made	2 out fo 11	11 out of 45	5 out of 22	8 out of 20
Shooting Percentage	18%	24%	23%	40%

- The distance from the free-throw line is measured from the back of the free-throw line to the front of the device. It is essentially shooting a high school 3-point shot.
- The shock absorber pads are ¼” pieces of rubber that are added to the shock absorber holster. This decreases the release angle to allow for a higher arc in the ball path.
- Interfacing capabilities were determined to be a success only when all commands were executed 100% of the time..
- The maximum shock absorber setting on each is 8.

Analysis

Material Properties for Aluminum 6061 T6:
- Low density- 0.098 lb/in^3
- High yield strength- 37 ksi
- High Modulus of Elasticity–10,000 ksi



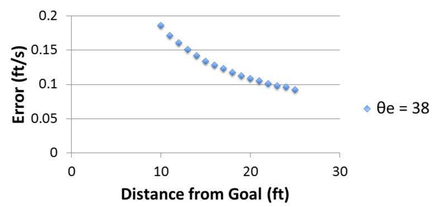
Minimum Deflection

$$\sigma_{max} = k_t \sigma_{nom}$$
$$\delta_{max} = \frac{P_{max} L}{AE}$$

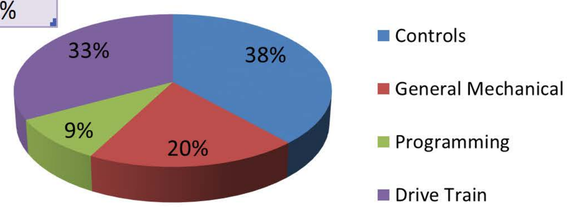
Conservation of Angular Momentum

$$E = \frac{1}{2} I\omega^2 \approx 1200\ in \cdot lb$$
$$F_{req} = \frac{I\omega}{r\Delta t}$$

Allowable Error as a Function of Distance



Budget & Costs



Total: $3200.00

Material Donations: $2600.00

Sponsors: St. Lillian’s Academy, Exxon, Bayou Fabricators Inc., Thorpe PME, David Fleshman, RPKBBM Law Firm, Dow Chemical

Adviser: CAPT David Giurintano