Targets

Tools to Validate Design: Judges at the competition will validate all design aspects. Before the competition we will use the rulebook to estimate earned points since we will have a track to test the robot.

Derivation of Targets/Metrics: We referred to the rulebook to find what is required of our robot for basic qualification of the competition, and the point structure to prioritize which actions of the robot would be most essential to include. Critical targets were related to requirements of the competition that would result in disqualification if not included, lower levels of importance were decided based on optional actions, and their respective point values.

Catalogue of Targets

Fit within size regulation (not a function)

Metric: Box dimensions
Value: <= 1' x 1' x 1'
Justification: Needs to be within specified size limit to qualify for the competition
Importance: Critical
Methods of Validation: Fits in the size restriction box (1' x 1' x 1')
Consequence of failure: Disqualification from the competition

Include a labeled start switch (not a function)

Metric: Switch Present
Value: Present or Not Present
Justification: Needed to shut off robot in case of emergency
Importance: Critical
Methods of Validation: The switch is clearly visible by judges
Consequence of failure: Disqualification from the competition

Be autonomously operated (not a function)

Metric: Hands free operation
Value: N/A
Justification:
Importance: Critical
Methods of Validation: Conducts all tasks independently
Consequence of failure: Disqualification from the competition

Collect beads from trees

Metric: Number of beads collected
Value: x potential based on if thrown or dropped
Justification: Needed to acquire beads
Importance: Moderate
Methods of Validation: Robot is able to reach out and collect beads
Consequence of failure: No points acquired
Corresponding Function: Launching/Picking Up Bead Mechanism

Throw beads into nets

Metric: Points per bead
Value: 2 per bead and 1 for each net used
Justification: Needed to throw beads for points
Importance: Moderate
Methods of Validation: Robot is able to throw beads into the nets from a distance without missing
Consequence of failure: No points acquired
Corresponding Function: Launching/Picking up Bead Mechanism

Drop beads into trash bins

Metric: Points per bead
Value: 1 for each bead and 1 per trash bin used
Justification: Needed to place beads for points
Importance: Moderate
Methods of Validation: Robot is able to drop beads into the cups without knocking the cups over
Consequence of failure: No points acquired
Corresponding Function: Launching/Picking up Bead Mechanism

Push the marshmallows

Metric: Points per marshmallow
Value: Unknown (1 for each marshmallow)
Justification: Needed for to push marshmallows into holes for points
Importance: Moderate
Methods of Validation: Robot is able to sense the marshmallows then push them off the track
Consequence of failure: No points acquired
Corresponding Function: Marshmallow Pushing Mechanism

Digital screen with extendable mechanism

Metric: Points for the extendable display
Value: 4
Justification: Shows school spirit and for points
Importance: Low

Methods of Validation: Screen can extend to at least 4” while lighting up and showing a display
Consequence of failure: No points acquired
Corresponding Function: Display/Media

Speakers with player

Metric: Points for playing a song
Value: 2
Justification: For points
Importance: Low
Methods of Validation: Songs are able to clearly be heard from the speakers once the robot is powered on
Consequence of failure: No points acquired
Corresponding Function: Display/Media

Complete the track (not tied to a function)

Metric: Points, Ability to complete the track in either direction
Value: 10
Justification: For points
Importance: Critical
Methods of Validation: Robot is able to maneuver the track without any accidents
Consequence of failure: Not qualified to participate in the competition

Target Table

Metric No.	Need	Metric	Importance	Units	Marginal Value	Ideal Value
1	Fit within size regulation	Box dimensions	Critical	Feet	1 x 1 x 1	1 x 1 x 1
2	Include a labeled start switch	Switch Present	Critical	N/A	Present	Present
3	Be autonomously operated	Hands free operation	Critical	N/A	Present	Present
4	Mechanism to collect beads from trees	Number of beads collected	Moderate	Points per beads	2 (potential)	20, 30, 40 (per round, potential)
5	Mechanism to throw beads into nets	Points per bead	Moderate	Points per bead	2	20, 30, 40 (per round)
6	Mechanism to drop beads into trash bins	Points per bead	Moderate	Points per bead	1	10, 15, 20 (per round)
7	Mechanism to push the marshmallows	Points per marshmallow	Moderate	Points per Marshmallows	1	Unknown
8	Digital screen with extendable mechanism	Points for the extendable display	Low	Points	4	4
9	Speakers with player	Points for playing a song	Low	Points	2	2
10	Complete the track	Points, Ability to complete the track in either direction	Critical	Points	10	10

Summary

Based on the methods described in the *Tools to Validate Design* and *Derivation of Targets/Metrics* sections, we established these 10 targets that are related to our functions and requirements of the robot. The more targets we can accomplish, the more points are made available for us during the competition. The theoretical highest achievable score is ~141+number of marshmallows if all of our targets are met.