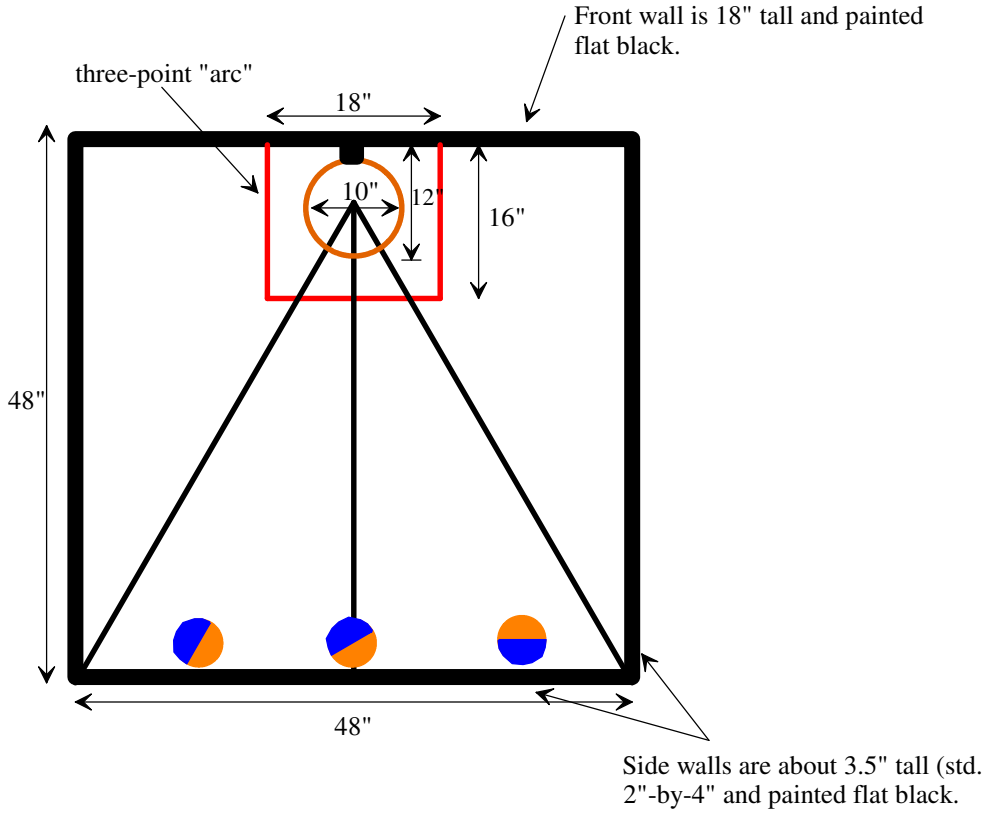
MICS 2014 Robotics Contest: Tilt-A-Hurl

The MICS 2014 robot contest will consist of a 3-point shot basketball tournament. A robot scores 3 points if it shoots a basket while entirely outside the three-point "arc." A basket shot on or within the three-point arc (including a dunk) scores NO points. Only one robot will be on the court at a time trying to score as many points as it can in 2 minutes. Each robot will perform three 2-minute runs on the court. The sum of its best two runs will be used to decide winners with the third run being used as the primary tie-breaker (see below for secondary tie-breaker rules).

The court will be made from a 4'x4' sheet of particle board that is painted white. The front wall is 18" tall, and the remaining walls are standard 2"-by-4" lumber so they are about 3.5" tall. All walls are painted flat black. A "standard" (~10" diameter Nerfoop) Nerf basketball hoop is positioned 9" high along the middle of the back wall and parallel to the court floor. Three black lines (3/4"-wide black vinyl electrical tape) radiate from the center of the hoop as shown. The three-point "arc" will actually be an 18"-by-16" red rectangle (3/4"-wide red vinyl electrical tape). All walls will be perpendicular to the court-floor, but the front end of the court will be elevated 3.5" (hence the name: "tilt-a-hurl") so balls will tend to roll toward the back wall.



Rules:

1. The objective of the contest is to design an autonomous robot that can score points by picking up foam balls (4" diameter Nerf basketballs) and shoot 3-point shots into a single, netless, basketball hoop (10" diameter Nerfoop; 9" off the ground. A robot scores 3 points if it shoots a basket while completely outside the three-point arc. A basket shot from on or within the three-point arc (including a dunk) scores NO points. A robot is trying to earn as many points as it can during a 2-minute period.

2. Each robot will perform three 2-minute runs on the court. The sum of its best two runs will be used to decide places among all the robots. The third run score will be used as the primary tie-breaker. A secondary tie-breaker (only used to determine the top three places) will be a fourth run on the court, but the goal is to reach 6-points (two 3-pointers) in the least amount of time.
3. At the start of a 2-minute run, a robot must be touching the back wall and can be touching or holding one ball. Before the run starts, the team can position the remaining balls anywhere along the back wall. A total of one to three balls can be be on a court. Balls leaving the court during a 2-minute run will be returned to the back wall by a judge so as not to interfer with the robot.
4. The three foam balls used in the competition are the standard Nerf basketballs included with the Nerfoop hoop. Ours are blue and orange with diameters of approximately 4". A robot can start play holding one ball, but during the match it may carry any number of balls. A robot that permanently deforms or scarred a ball in any way will be disqualified. A robot may shoot the same ball more than once.
5. The maximum size of the robot at the start of each run is 12" by 12" by 18" (vertical). That is, at the start the robot should fit within a box with inside dimensions 12" by 12" by 18"(vertical). After the run starts, the robot can assume a maximum size of 18" by 18" by 18". The robot is not permitted to exceed 18" by 18" by 18" in overall dimension at any time during a run.
6. A robot must be fully autonomous, i.e., no remote control by another external computer or human.
7. A robot which, as determined by the judges, intentionally damages the playing field, hoop, or balls in any fashion will be disqualified immediately. Once a robot is disqualified, the robot shall not be permitted to engage in any additional runs. The ruling of the judges is final.
8. Robots may undergo physical transformations, reprogramming, and reconfigurations between rounds. Repairs and changing of batteries are clearly allowed. Alterations and changes may not result in a delay to the start of a match.
9. Any robot that violates the spirit of the contest rules, in the judgment of the organizers, will be eliminated from competition.