Competitions

Competitions are great both as stand-alone events and as a culmination to class. An ideal competition has an interesting goal: not trivial but also not overly complicated. A competition should be geared so that every student has the ability to build a competitive robot. Depending on the competition it may be desirable to limit the size of the robots; a reasonable restriction is to require the footprint to fit on a large building plate. I suggest setting a maximum on the number of motors, wheels, sensors, or other scarce parts that a robot may use.

Exit the room

The robot is to be designed to exit a room containing a variety of obstacles in a minimum amount of time. The layout of the obstacles (possibly furniture, tennis balls, or even Lego constructions) should not be known to the students before the competition. The amount of information disclosed to the students about the obstacles and the restrictions they pose to the robots should depend on their level of experience and ability. Each robot should start in a marked location (tape on the floor works well) facing a specified direction, or more interestingly with a random facing. Robots must thus be able to navigate the obstacles and find the exit in the shortest amount of time.

Some possible approaches include random walks, wall crawling, and the pool ball or light beam approach of 'bouncing' or 'reflecting' off obstacles. In all cases much of the difficulty will come in ensuring the robot does not get stuck on the obstacles. Partly for this reason (and also because it's more fun to have the robots succeed) I suggest going lightly on the obstacles (but make sure there's no line of sight between the starting point and the door).

Variations include running multiple robots at once (a nice time-saving measure) and indicating the location of the door (such as using IR beacons).

Sword Fighting

Two robots start in an arena surrounded by a low wall (easy to make with Legos). Both robots have identical swords (wooden dowel) and shields (plastic lids, or just some connected Lego plates). A robot loses if it exits the arena or is hit anywhere other than on its shield by the opposing robot's sword.

Although simple to run, this competition is very challenging to compete in. If the arena is large even finding the other robot will be difficult (so keep the arena rather small). Even more challenging is actually hitting the other robot (but not the shield) with the sword. The best robots will not rely on extensive programming but rather on good design and engineering to maximize use of the sword and shield. Rather humorously, one of the more successful robots was just a sword attached to a motor; no shield at all. Once turned on the robot would flap around wildly, until it hit the other robot or jumped out of the arena.

Table Top

Two robots start at opposite ends of a table (a longish coffee table works well). Behind each of them is a short pillar of Legos. The goal of each robot is to push the

opposite pillar off the table, while protecting its own pillar and staying on the table itself. Make sure the ground around the table is padded or there are people ready to catch the robots when they fall (or are more likely pushed) off.

The most common design for this competition was a robot that went straight forward with a maximum of either torque or kinetic energy. This is nice if you're trying to test who has the best engineering skills but is not very interesting (and whoever has the best wheels and motor has a big advantage). Variations to encourage more diversity include offsetting the robots and/or pillars so they aren't all lined up, making multiple pillars which must be knocked off, allowing multiple robots per side (one can defend and one can attack), or even just putting an obstacle in the center of the table.

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