THE UNIVERSITY OF ALABAMA
COMPUTER SCIENCE

2014 Alabama Robotics Competition
Challenge Descriptions

Winter Olympics, Part II

General Introduction

Our very first contest in 2011 had a winter Olympics theme. We continue that theme this year with a set of three new contest events focused on winter Olympic events.

The following pages provide a description of each event and an overview of how points are scored. The overall ranking for the awards ceremony is determined by the total of all three events. A tie-breaker will occur at the end of the contest, if needed. Each event will have two separate playing field instances to improve waiting time.

General Scorekeeping Rules

1. The contest will consist of 3 obstacle course challenges that the students must consider over a 3-hour period.
2. The set of obstacles will span various levels of difficulty. Each challenge is worth 100 points. The overall team score is the sum of all three scores (for a perfect score of 300).
3. The obstacle courses and project challenges will not be revealed until the beginning of the contest.
4. Teams may work on any problem in any order. It should be noted that a line may form for specific obstacle courses and challenges, such that the wait time to get onto the playing field is a factor that should be considered as a strategy.
5. Ranking will be based on the overall combined score from the individual challenges.
6. Some obstacle courses or challenges may have disqualification measures (e.g., going off the playing surface or past a boundary). Other problems may have a penalty (e.g., navigating in the wrong order).
7. A team may try each obstacle and challenge multiple times, but must start at the back of the line for each new attempt. Each team may be in line for one event at a time. It is not permissible to spread team members across multiple lines at any specific time.
8. When multiple attempts are made for a specific obstacle course, the best score of all attempts will be used in computing the overall score. It is possible for teams to go back to their computers and modify their programs and make additional attempts at a specific obstacle course to improve their score. Robots may be slightly modified to incorporate new sensors, but may not be significantly altered such that there is a size violation (13in x 13in x 13in).

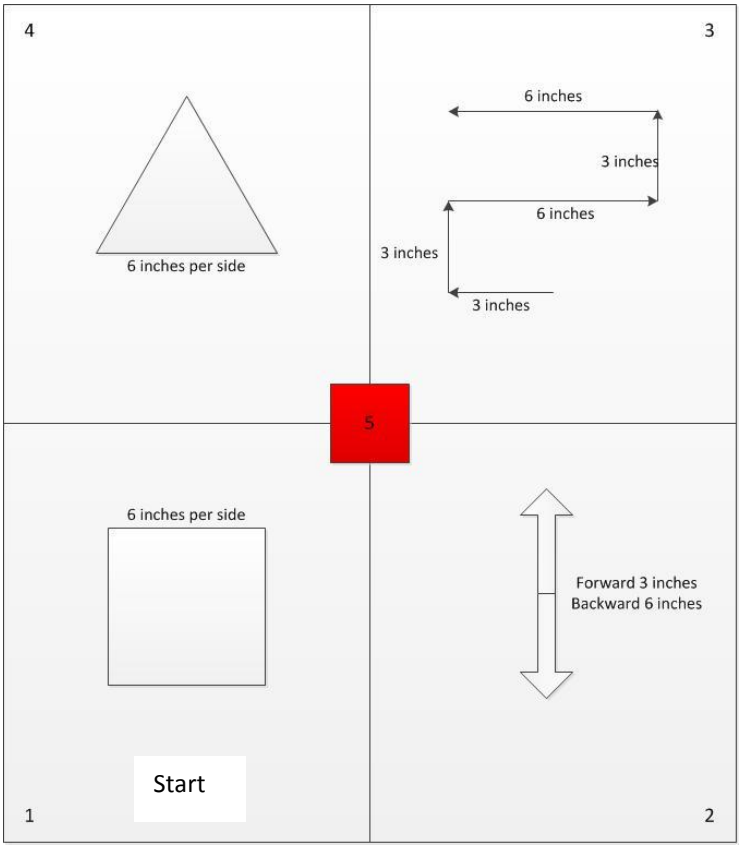
Figure Skating

Goal: In this problem, the robot must perform a figure skating routine.

Problem: The field consists of separated quadrants plus the center of the playing field. Please refer below to the drawing of the field and the description of what is to occur in each section. The robot will begin in Section 1, at the location indicated on the drawing. The robot may progress through each section in any order desired, except for Section 5, which must conclude the routine. To receive full points for each section, the robot must execute the complete movement in each section. Below are the movement descriptions for each section:

- Section 1: the robot should move in the shape of a square that has at least 6 inch sides
- Section 2: the robot should move forward at least 3 inches and then reverse at least 6 inches; the movement must be vertical (not horizontal) as shown in the diagram; movement forward/backward may begin at either the top or the bottom of Section 2 (diagram shows one possibility, but the reverse is also allowed)
- Section 3: the robot should draw a maze-like shape, moving to the left 3 inches, forward 3 inches, right 6 inches, forward 3 inches, left 6 inches
- Section 4: the robot should move in the shape of an equilateral triangle with at least 6 inch sides
- Section 5: the robot should do two spins in place – this section must be done last; all other sections must be completed before any points can be received for Section 5 (it is not possible to just go to the center of the field and do spins to receive 20 points)

Scoring: All sections are worth 20 points. The first four sections may be done in any order, with 20 points awarded only once per completion of each section per round (only 20 points total per section – it is not possible to get additional points by re-doing the same routine in the same round). The points for Section 5 can only be awarded if all of the first 4 sections are completed. There is a 2 minute time limit – the cumulative points scored within two minutes will represent the overall score for each round.



Ice Hockey

Goal: Score as many goals as possible within a 1.5 minute time limit.

Problem: The robot will begin with a ball placed in the front of the robot. The robot must move the ball and break the plane of the goal. However, there will be a brick placed in in position B for the first round of this challenge. The distance between the starting position and the goal is not specified explicitly, but may be observed empirically during the start of the contest.

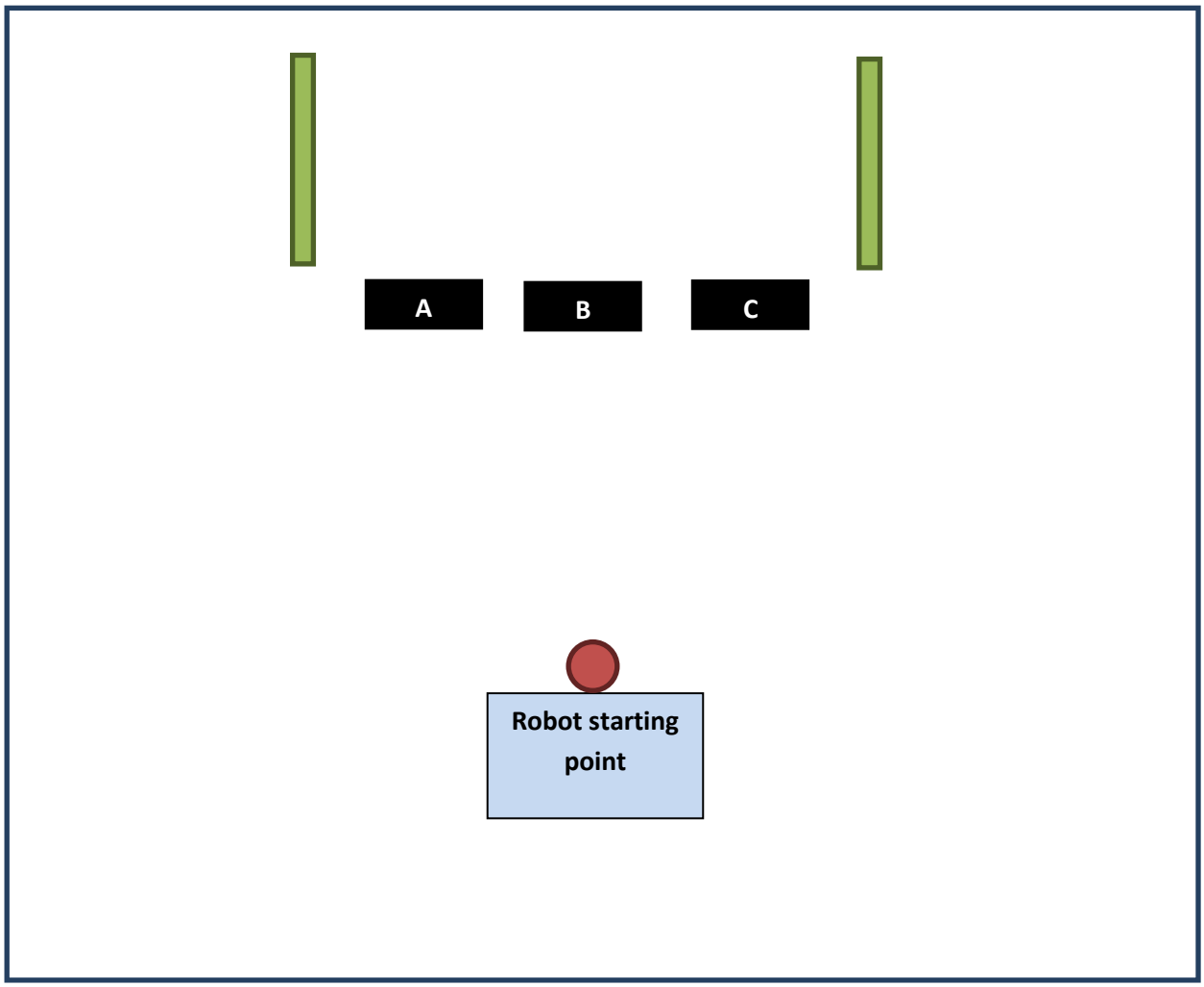
After the first goal is scored, a second brick will be added randomly (either location A or C) and the robot will be placed back in the original starting position with the ball in front of the robot. After the second goal is scored, a third brick will be added (to complete all locations of A, B, and C) and the robot and ball will be reset to the starting position. All goals must be scored within a 1.5 minute time limit.

Contestants must remove their shoes and enter the playing surface. On the judge's count, on "Go" a member from the team will press the button to start their own robot for the first round. If a robot does not start after the call of Go, they may continue to start their robot, but no additional time will be given to that team. During rounds 2 and 3, a team may move their robot move immediately to the starting position and restart the robot as soon as desired.

Scoring: The overall problem score is based on the number of goals made within the 1.5 minute time limit, with each goal contributing to a higher point score (for a perfect total of 100 points).

- First goal: 20 points Second goal: 30 points Third goal: 50 points

Field: Below is a drawing of the field where A, B, and C represent the three possible locations for the goalie.



Speed Skating - Short Track

Goal: Complete a lap as quickly as possible without going out of bounds.

Problem: Three robots will begin at the starting line (three teams are needed to attempt this problem). The robots will race around the track – bumping and blocking are allowed ("No holds barred"). If a robot goes out of bounds (i.e., the entire robot goes off of the playing surface, not including dangling wires), the robot is disqualified from the race. If robots move one of the middle-track bricks more than one inch, all robots touching the brick are disqualified at the judge's discretion. The first robot of the three to pass the finish line will receive first place; the second robot will receive second place; and the third robot will receive third place FOR THAT SPECIFIC ROUND. All robots must finish the race within 1.5 minutes. At the end of the day, there will be bonus points for the three fastest lap times for each division (Elementary, Middle, High).

Contestants must remove their shoes and enter the playing surface. On the judge's count, on "Go" each team will press the button to start their own robot. If a robot does not start after the call of Go, they may continue to start their robot, but no additional time will be given to that team. False starts will require a recount, and two false starts per round by the same robot will result in a disqualification for that robot for that round (and the two remaining robots may then compete together, not having to wait for a third robot to join).

Three robots are needed to begin a race. If no other teams are in line, a team will need to wait for other robots to enter the contest. Younger teams have the option of waiting for other teams from their division. For example, an elementary school team may have the option of waiting in line until other elementary school teams to emerge – they do not have to enter the round with an older team (the same is true for middle school – they do not have to compete against a high school team and may wait). However, a younger team may have to wait until other younger teams emerge and must allow other older teams to move ahead in line. If an older team is challenged by a younger team, the older team must compete with the younger team (e.g., if an elementary school team wants to compete with both a middle and/or high school team, those older teams are forced to compete). Teams may not wait for specific teams to emerge and must compete with whoever is in line closest to them (considering also the rules above regarding younger/older teams).

Scoring: The scoring is based on the finishing place in each round, plus bonus points for overall fastest time across all rounds throughout the contest (per division).

Individual Rounds:

- First place: 70 points Second place: 50 points Third place: 30 points

Bonus points determined and end of overall contest:

- Overall place within division: 1st - 30 points, 2nd – 20 points, 3rd – 10 points

Field: Below is a drawing of the track. Please see actual field for exact dimensions.