SSL-Vision Blackout Technical Challenge

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1 Goal of the Technical Challenge

The goal of this challenge is to intercept and manipulate a ball without access to the global ssl-vision position estimates. While the competition will still use the standard SSL vision software, this challenge is intended to encourage teams to work on the problem of onboard sensing and control. We believe teams capable of onboard control and sensing will have a significant advantage over teams that rely solely on the SSL vision position estimates.

2 Procedure

There are two main stages to this challenge. In each stage, there will be a single robot from the team undergoing the challenge. There will also be a single ball. The starting conditions and scoring will vary by stage.

Teams may still remotely control their robots as they do during normal competition, but their software will not receive data from the SSL vision software. The SSL vision software will still be running, but the vision network

will be isolated from the team undergoing the challenge. This way automatic referee programs may still be run to verify properties like ball speeds, out of bounds, etc. Teams will still receive start, stop and halt ref commands.

All robot hardware requirements apply to this challenge **EXCEPT** the height restrictions and the pattern markings. Participant robots may be taller than the rules dictate. Participants also do not need a fully visible butterfly pattern on top. However, other hardware conditions (e.g. the width of the robot, etc.) still apply. As normal the robot may not have orange markings that can be confused for the ball. Participants may use any kind of onboard sensors to detect the ball. This means, for example, you can stick a camera on top of the robot with no need to package everything inside the normal robot dimensions.

2.1 Grab a stationary ball

The robot will be placed in a random location on the field at least 2m from all edges. A ball will be placed within a 1m x 1m box around the robot at a randomly selected location. The goal is for the robot to find the ball and touch the ball with it's dribbler. Each team will have 10 seconds to complete the task. The procedure will be repeated 3 times and scores will be totaled.

The robot may move anywhere within the field boundaries. If either the robot or the ball leave the field lines then the run is ended.

Figure 1 shows an example for the initial state of a run.

Before each run the robot will begin in the halt state. A stop command will be issued to ready the robot, but the robot should not yet move. The run begins with a force start command at which point the timer starts and the robot may attempt to complete the task.

2.1.1 Scoring

touching the ball with any part of the robot $+1$

touching the ball with the dribbler $+1$

robot stopped with ball touching dribbler at the end of the run $+1$

2.2 Intercept a moving ball

The goal is to intercept and gain control of a ball rolling towards the robot.

The robot will be placed at a random location on the field at least 2m from all edges. The robot will begin by facing towards the ball's starting location.
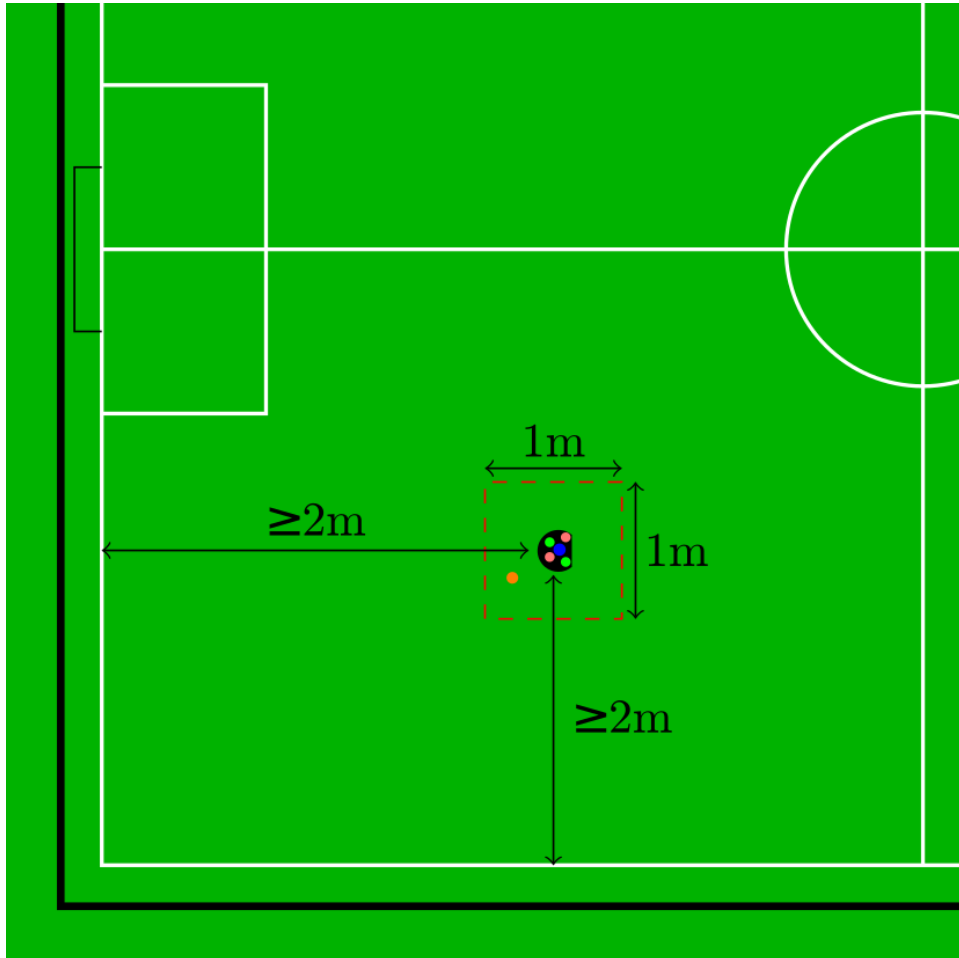
Figure 1: Example starting state for stage 1. The actual position on the field may vary. Ball may be placed anywhere in the red dashed box. This robot will be at least 2 meters from the edge of the field. The robot will begin with an arbitrary orientation with respect to the field.

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The ball will be kicked by a robot at a speed under 6.5 m/s. The ball will start it's trajectory between 3 and 5 meters from the robot. The ball's path will pass within 0.5m of the robot's starting position. If the ball trajectory fails to meet these conditions the team may choose to repeat the run, or keep the score they managed to achieve.

Figure 2 shows an example starting state for stage 2.

Figure 3 shows an example of a good ball trajectory that passes within the specified distance of the robot's starting point. Figure 4 shows an example of a bad ball trajectory, where the ball does not pass within the specified distance of the robot's starting point.

If either the robot or the ball leave the field the run will be stopped. The run will end after 10 seconds of time.

The procedure will be repeated 3 times with scores totaled.

Before each run the robot will begin in the halt state. A stop command will be issued to ready the robot, but the robot should not yet move. The run begins with a force start command, at which point the ball should begin moving and the robot may attempt to complete the task.

2.2.1 Scoring

touching the ball with any part of the robot +1

touching the ball with the dribbler +1

robot stopped with ball touching the dribbler at the end of the run +1

3 Scoring

The totals from each stage (2.1.1, 2.2.1) will be added to determine the winner. If there is a tie in terms of points, then the team which took the least amount of time on average, for runs in which the ball was touched, will win.
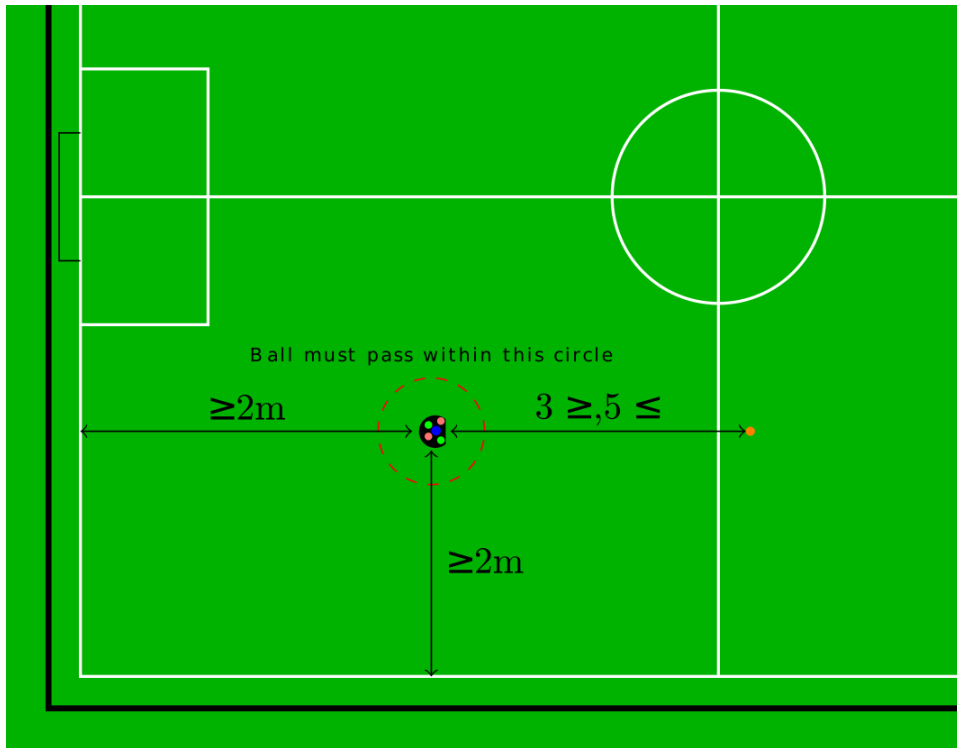
Figure 2: Example starting state for stage 2. Actual position on the field may vary.
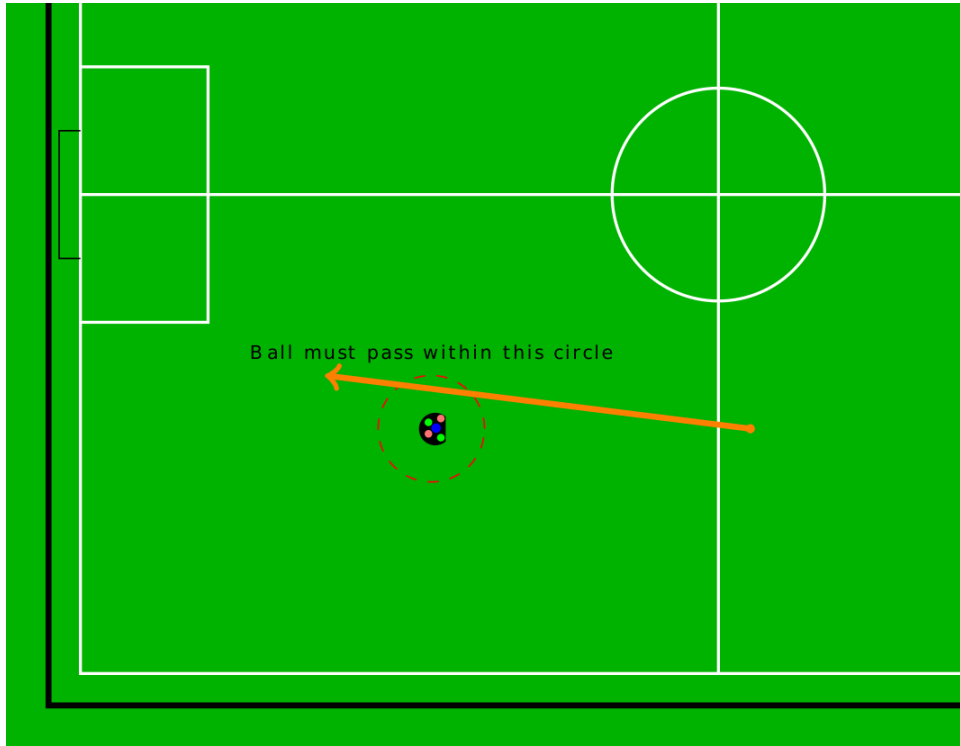
Figure 3: Example of a good trajectory for stage 2. The ball's straight line path passes within 0.5m of the robot's starting position marked by the red dashed circle
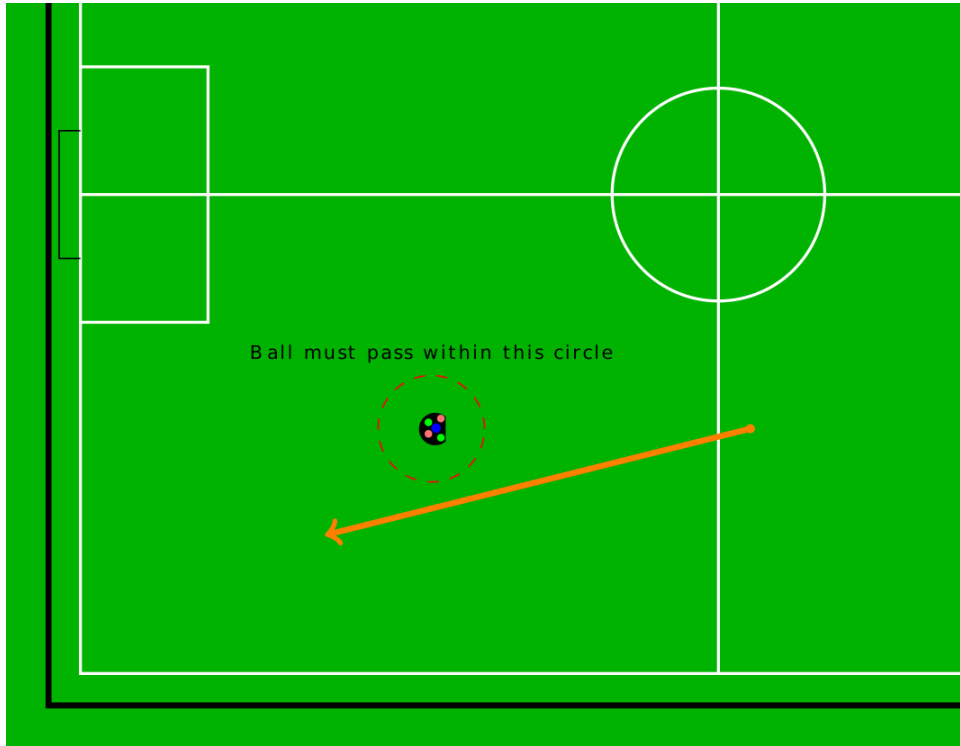
Figure 4: Example of a bad trajectory for stage 2. The ball's straight line path does not pass within 0.5m of the robot's starting position marked by the red dashed circle