ARSENAL FC

GUNNERS

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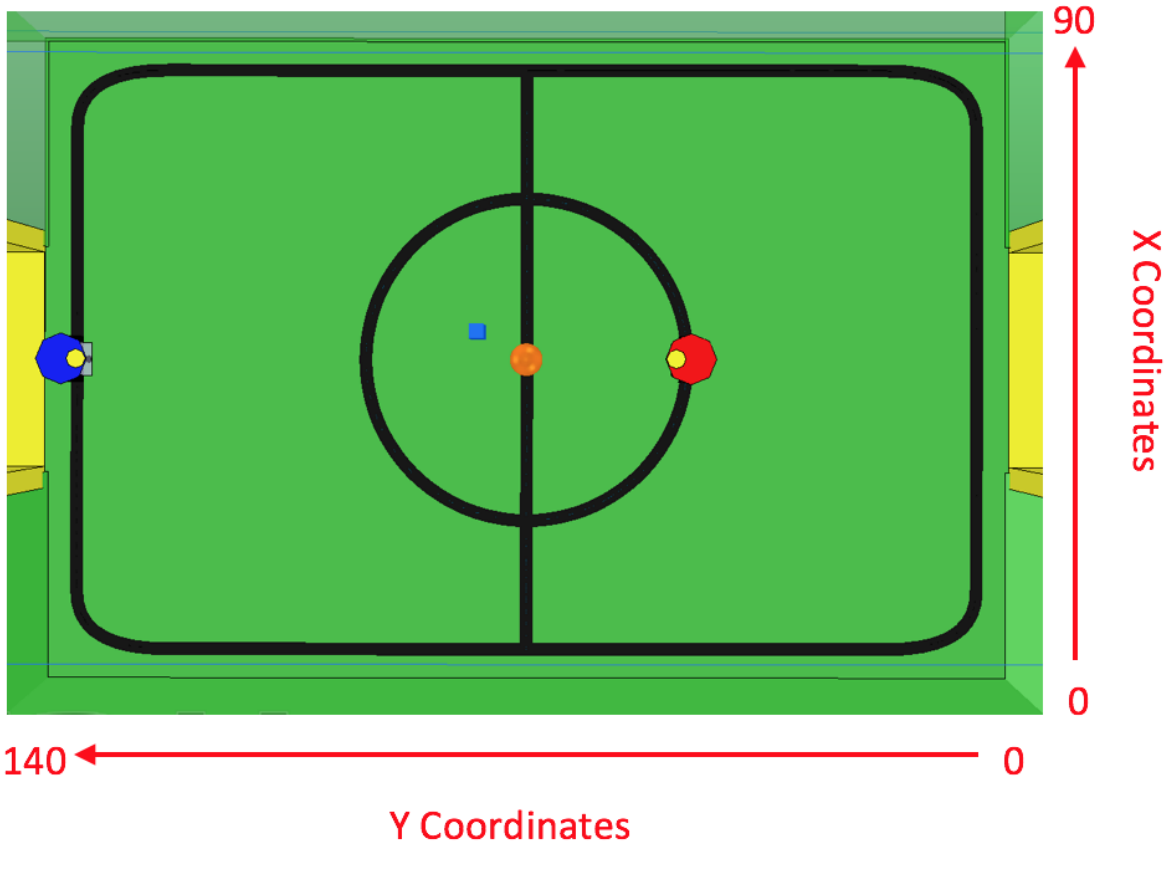
ALGORITHM AND STRATEGY

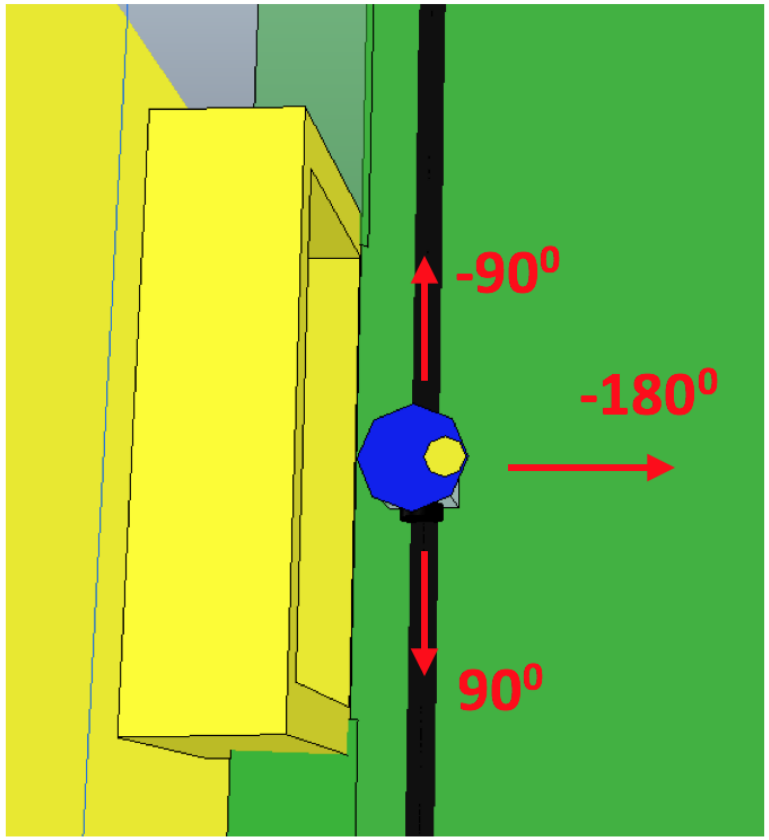
STAGE 1

- Determine the X-coordinates of ball
- Convert to readings that are simpler to use for programming
- X-coordinates
  - From -0.45 to 0.45 → 0 to 90
- Y-coordinates
  - From -0.7 to 0.7 → 0 to 140



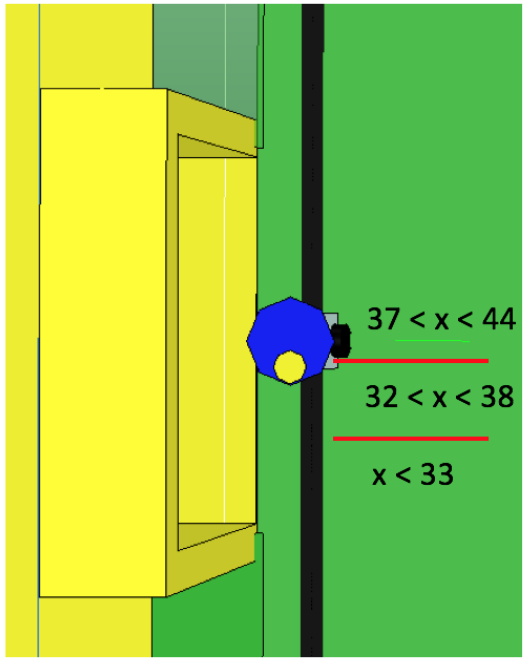
STAGE 1

- Orientation of Robot adjusted according to ball's direction (left or right)

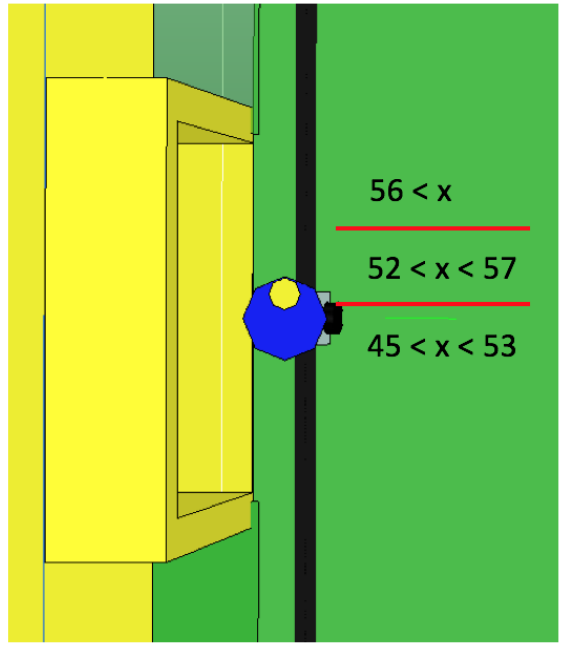


STAGE 1

- Goalpost divided into six sections
- Turn clockwise when ball is on the right
- Turn anti-clockwise when ball is on the left
- Velocities depend on which section the ball is found to be at
- Reverse Velocities available to ensure no loopholes

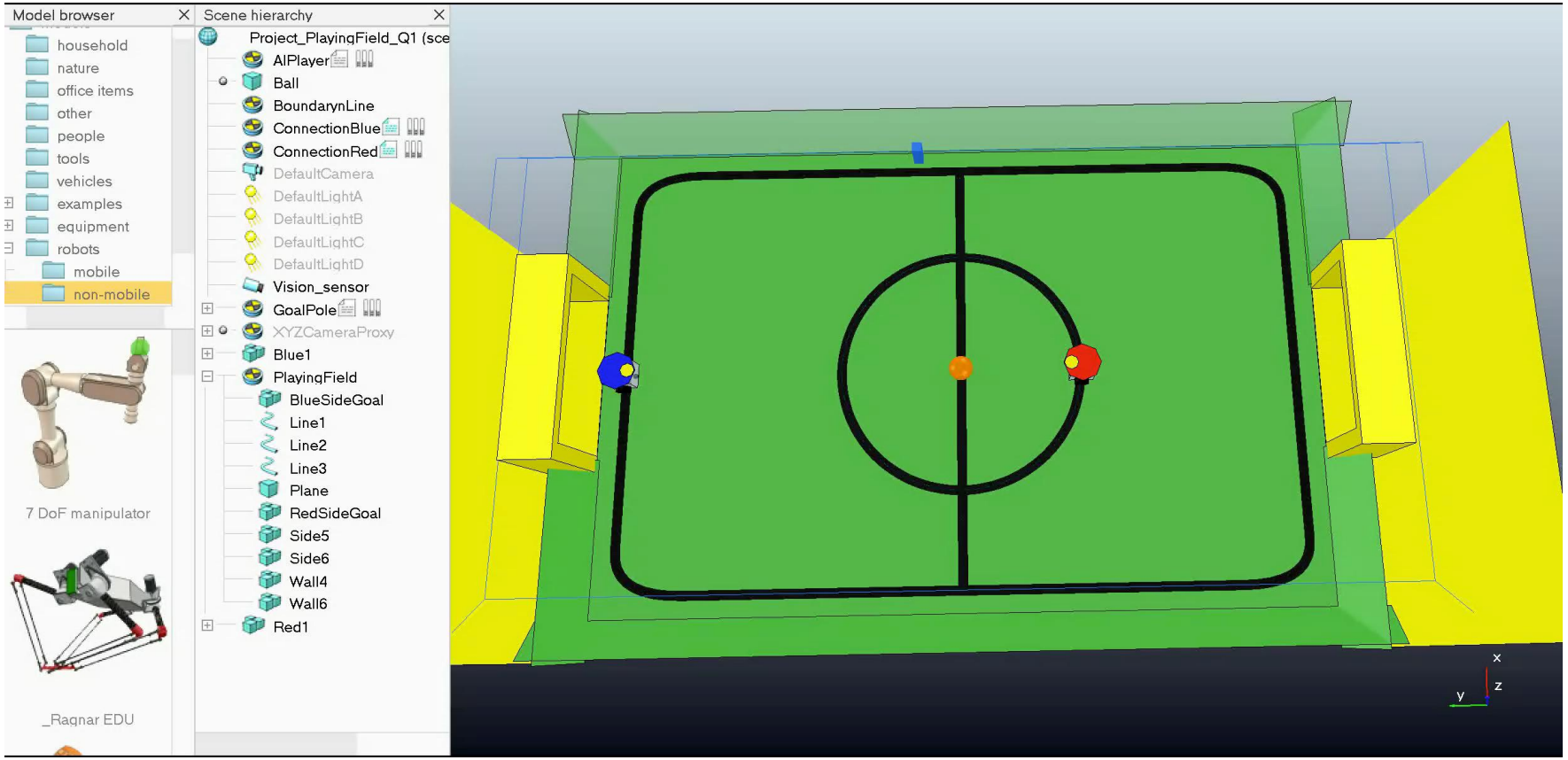


Clockwise

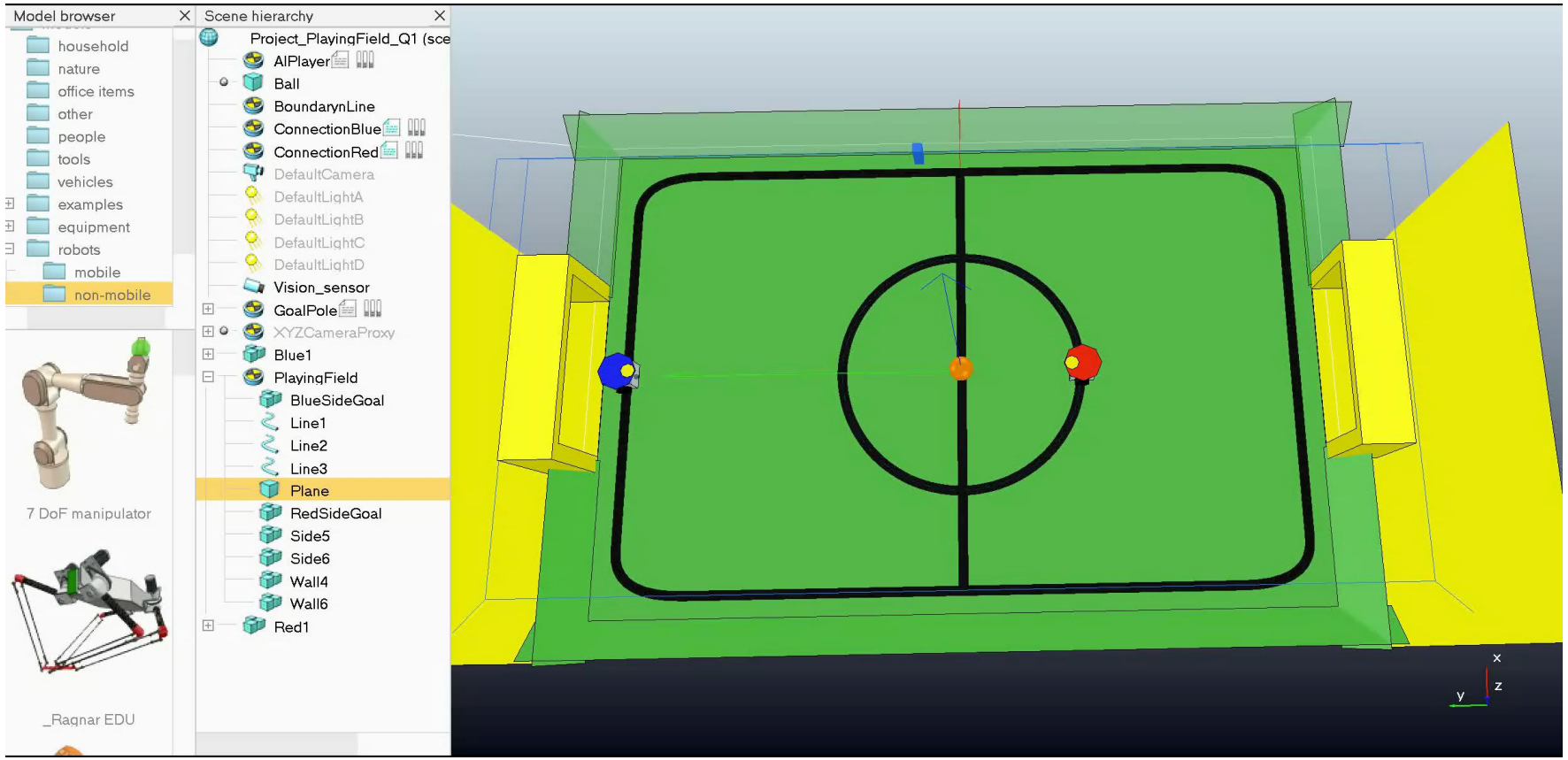


Anti-Clockwise

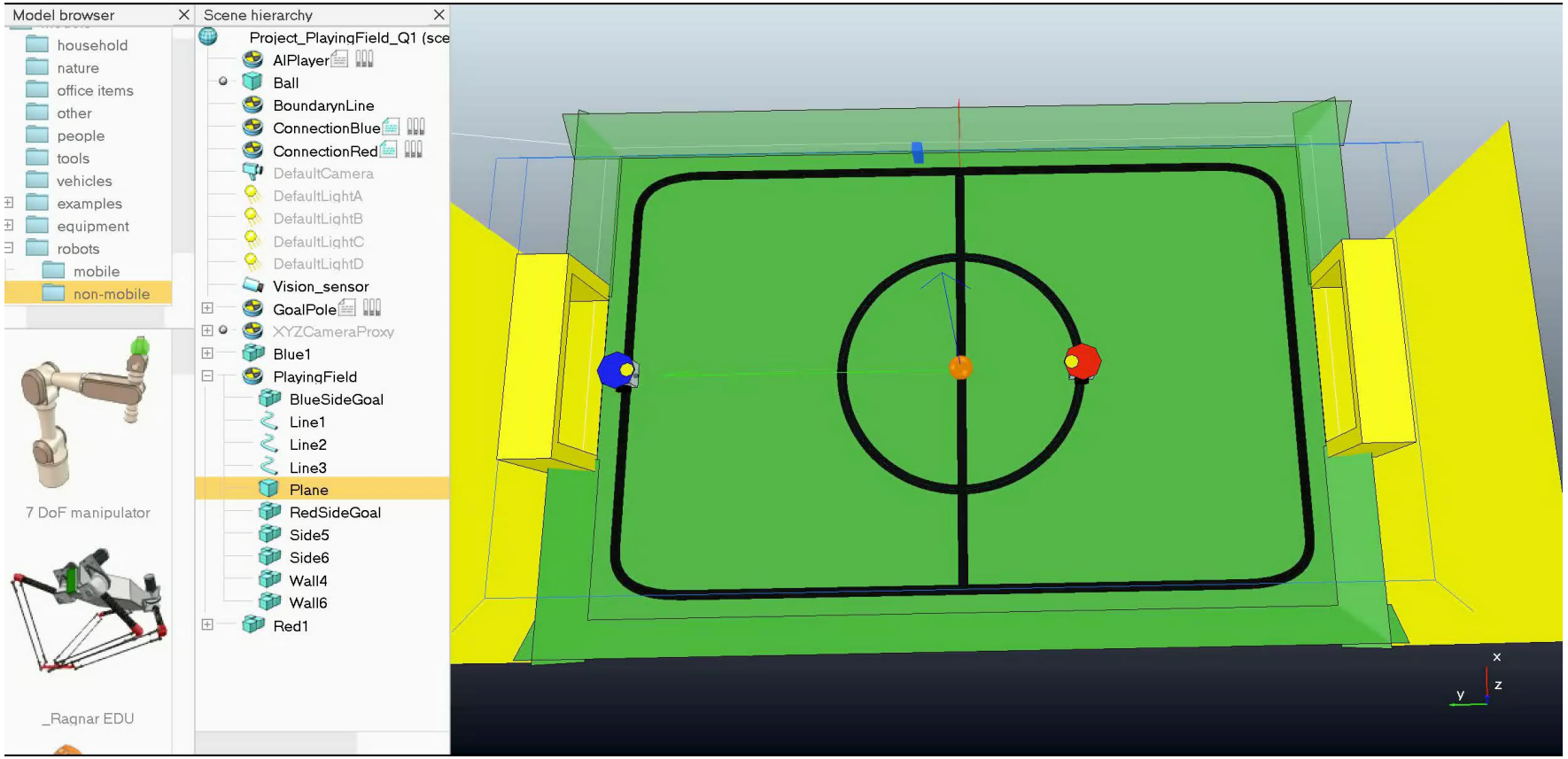
VIDEO: TRIAL 1



VIDEO: TRIAL 2



VIDEO: TRIAL 3



STAGE 2

- Dribbling:
  - *Heavy* image processing (128 by 256)
  - Utilizes cell position of robot and ball
  - 2 Potential Fields
    - 1st Potential Field has 4 layers
    - 2nd Potential Field has 2 layers

- Passing of Ball
  - Calculating Desired Angle Using Trigonometry
  - Using PID to get to ideal position to kick ball

STAGE 2: DRIBBLING

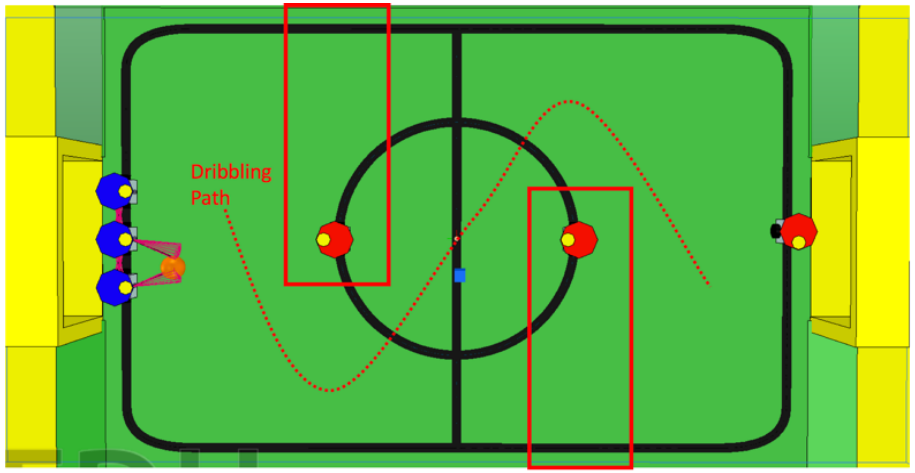
- 1st layer of Potential Field
  - Value of 1000 in potential walls
- 2nd layer of Potential Field
  - Set the desired destination point
  - Using the algorithm: $300 + \sqrt{x^2 + y^2}$

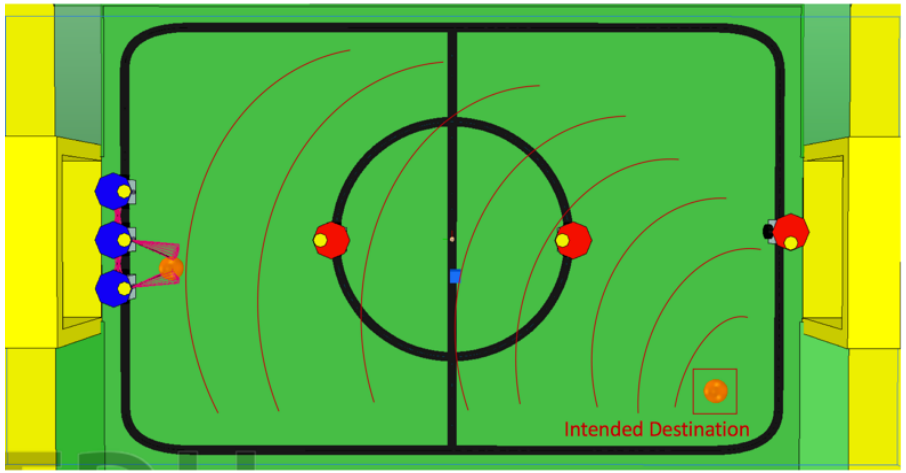
$$x = \left(\frac{|x_{gps}|}{45} \times 55\right) + 67 \qquad \text{for } x < 0$$

$$x = 62 - \left(\frac{|x_{gps}|}{45} \times 55\right) \qquad \text{for } x > 0$$

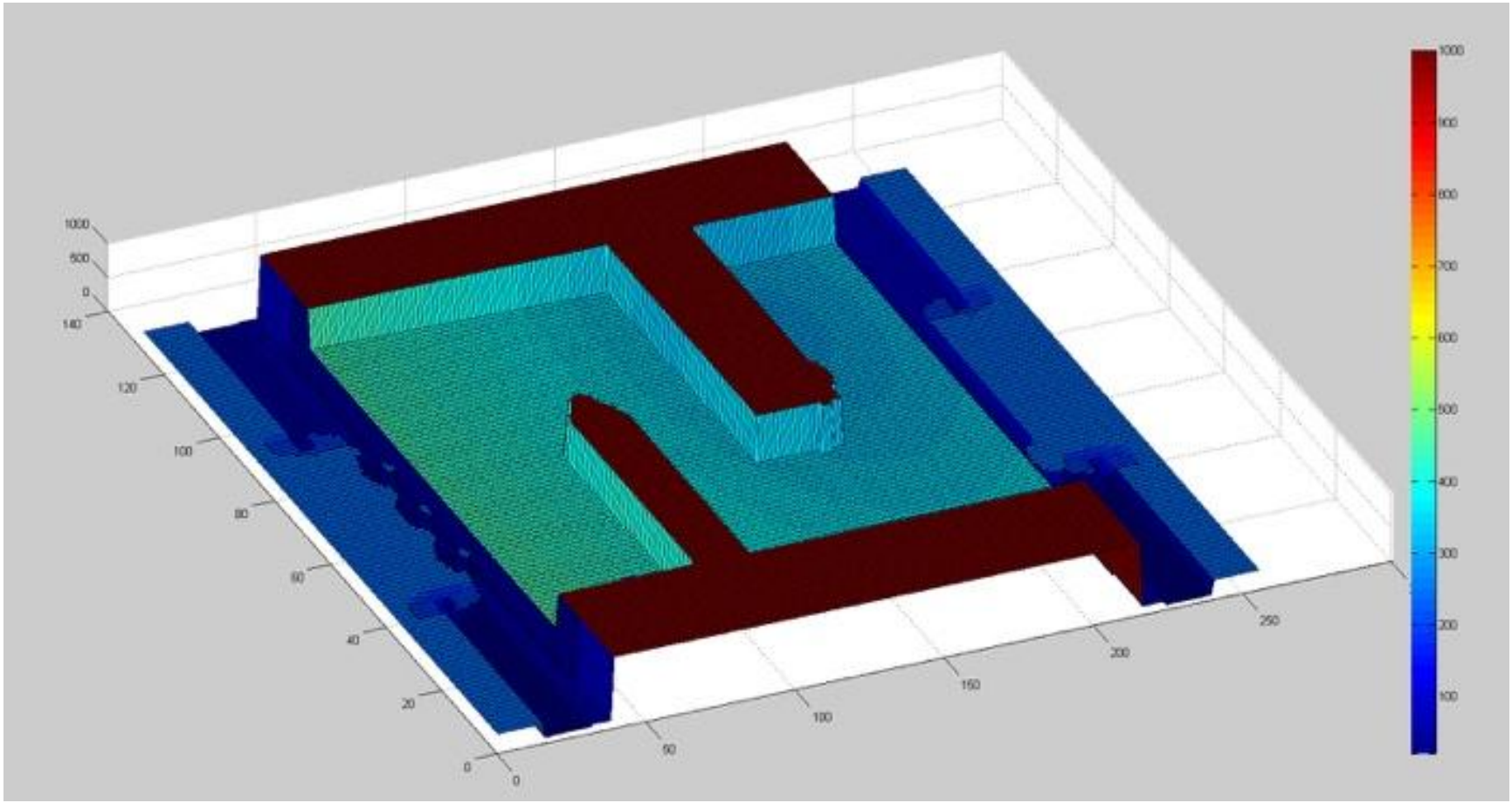
$$y = \left(\frac{|y_{gps}|}{70} \times 88\right) + 128 \qquad \text{for } y < 0$$

$$y = 126 - \left(\frac{|y_{gps}|}{70} \times 88\right) \qquad \text{for } y > 0$$



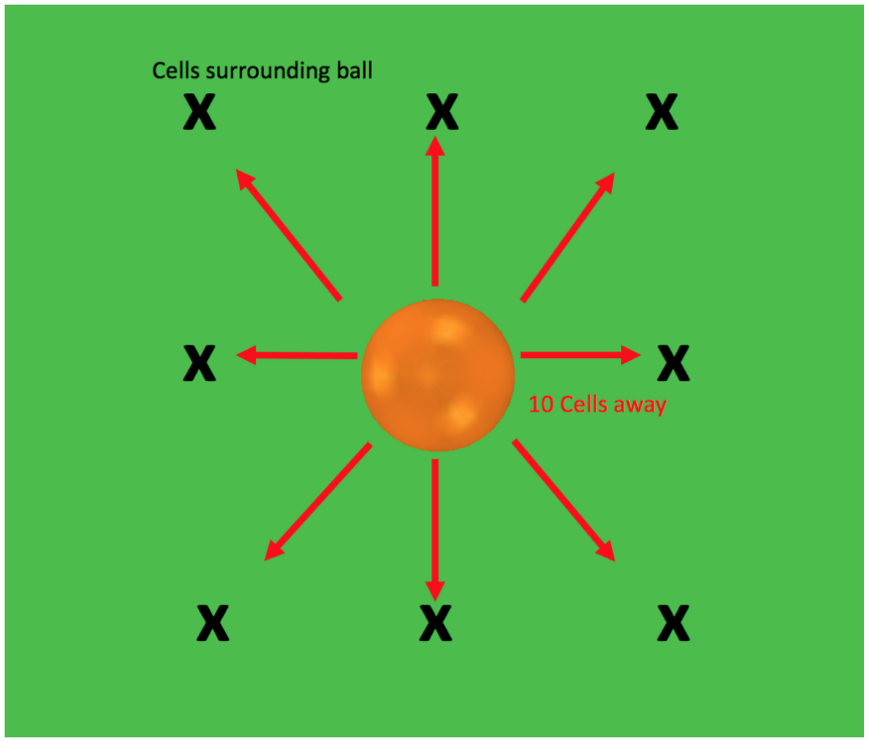


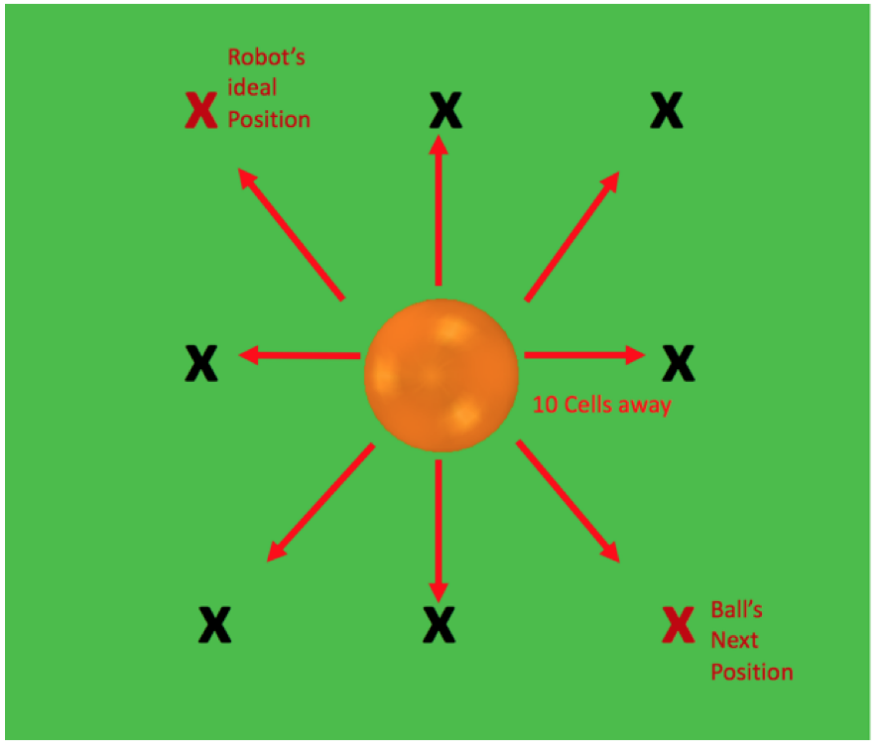
STAGE 2: DRIBBLING



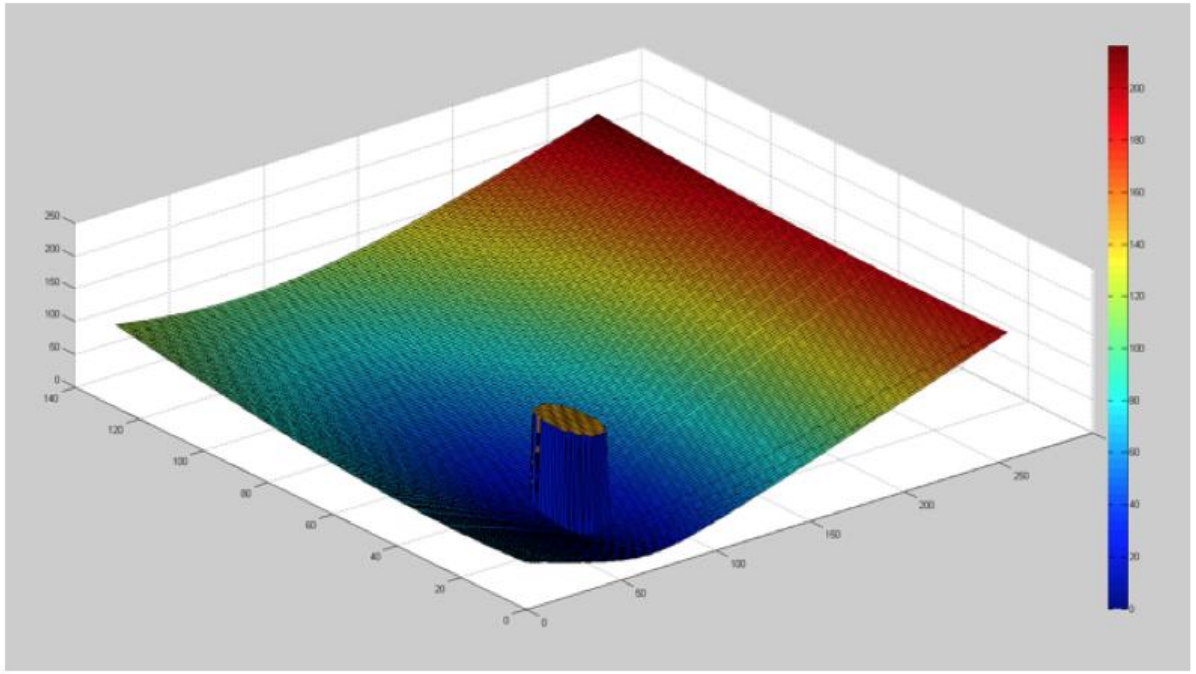
STAGE 2: DRIBBLING

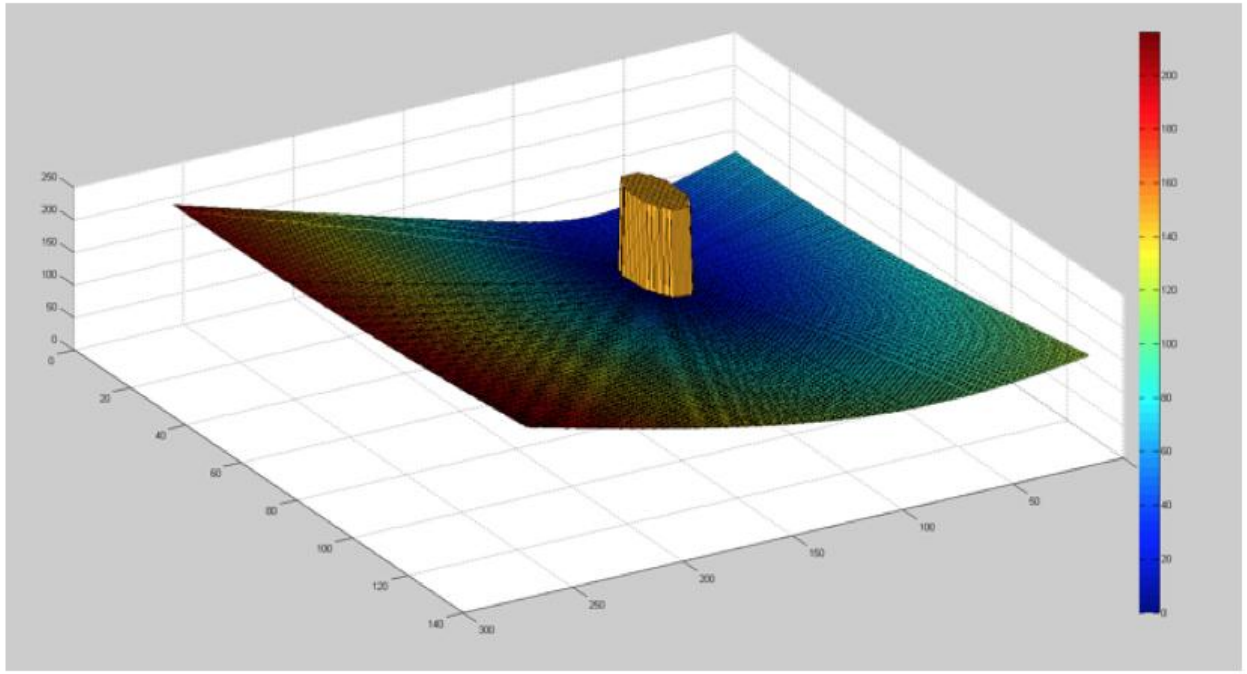
- Identifying the Ball's Next Position and then determine Robot's ideal position to kick ball
- Involves Second Potential Field





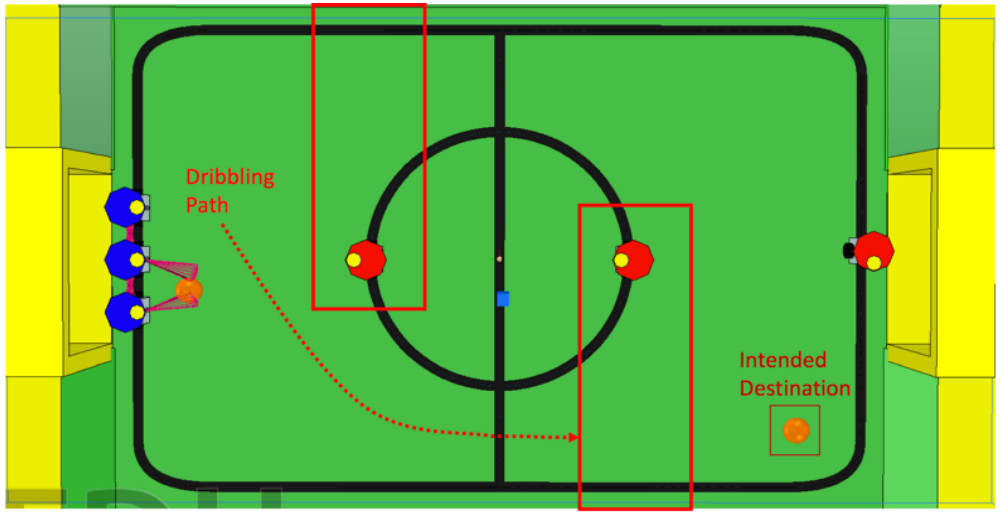
STAGE 2: DRIBBLING

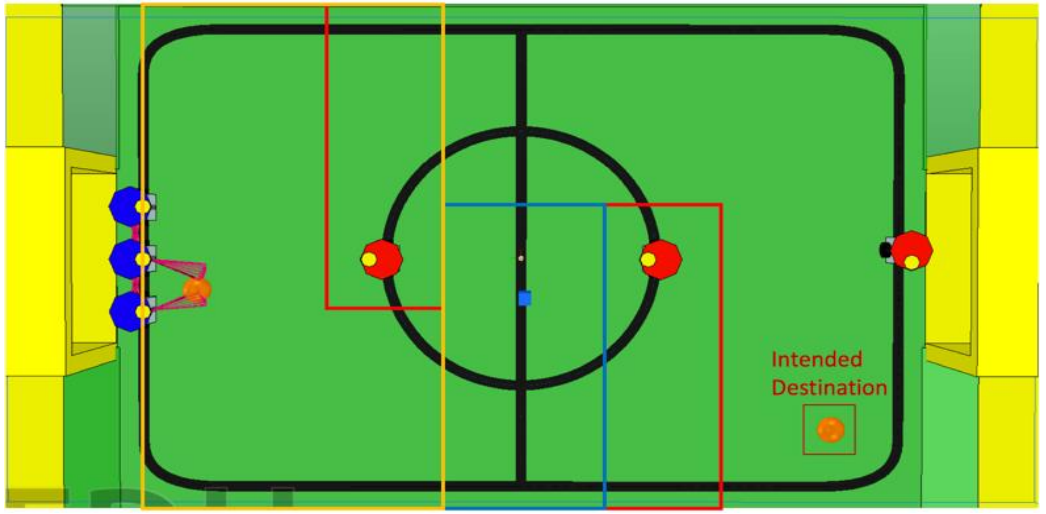




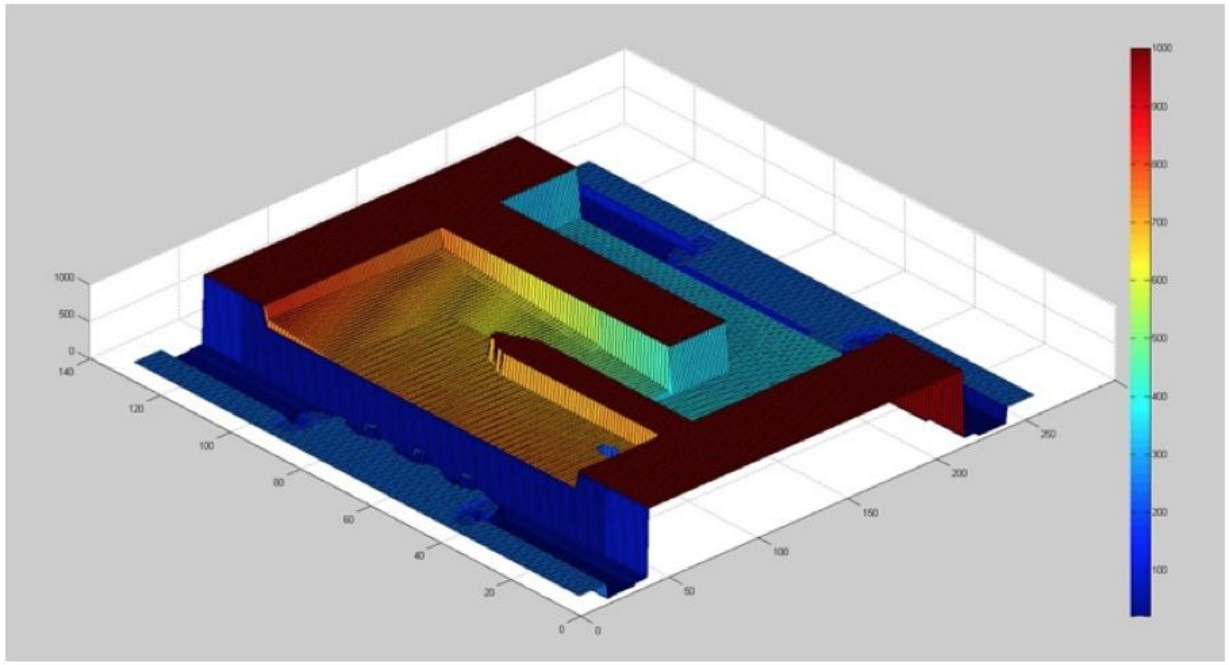
STAGE 2: DRIBBLING

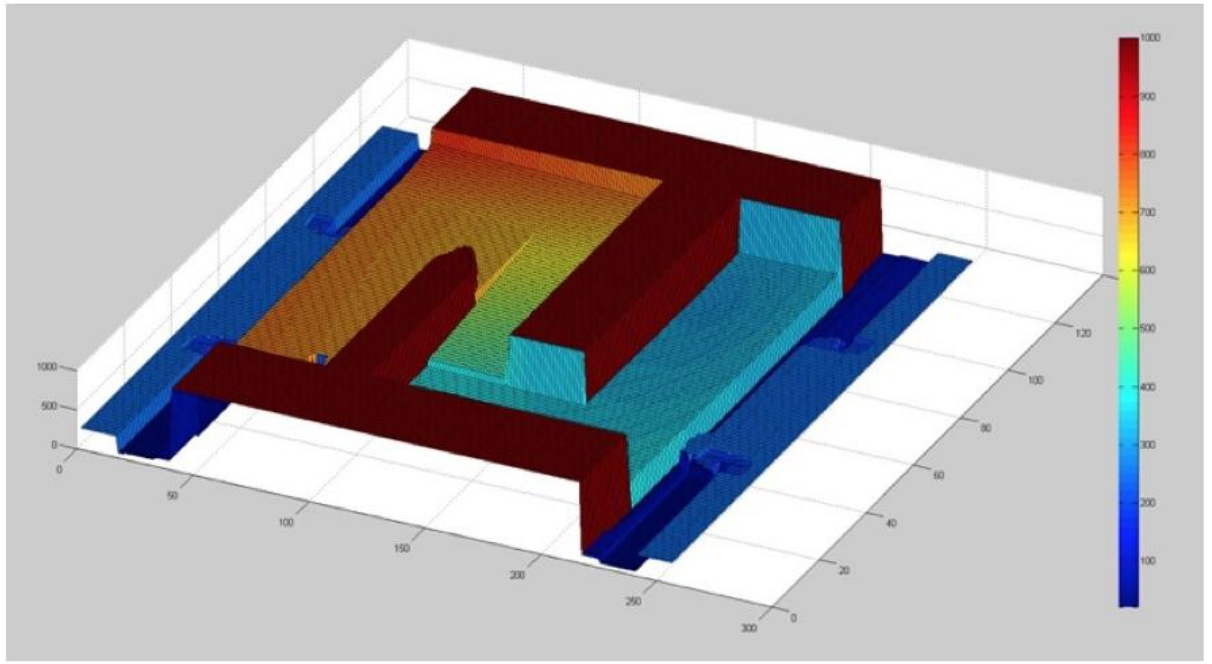
- Layers 3 and 4 of first potential field to required to solve local minima problem



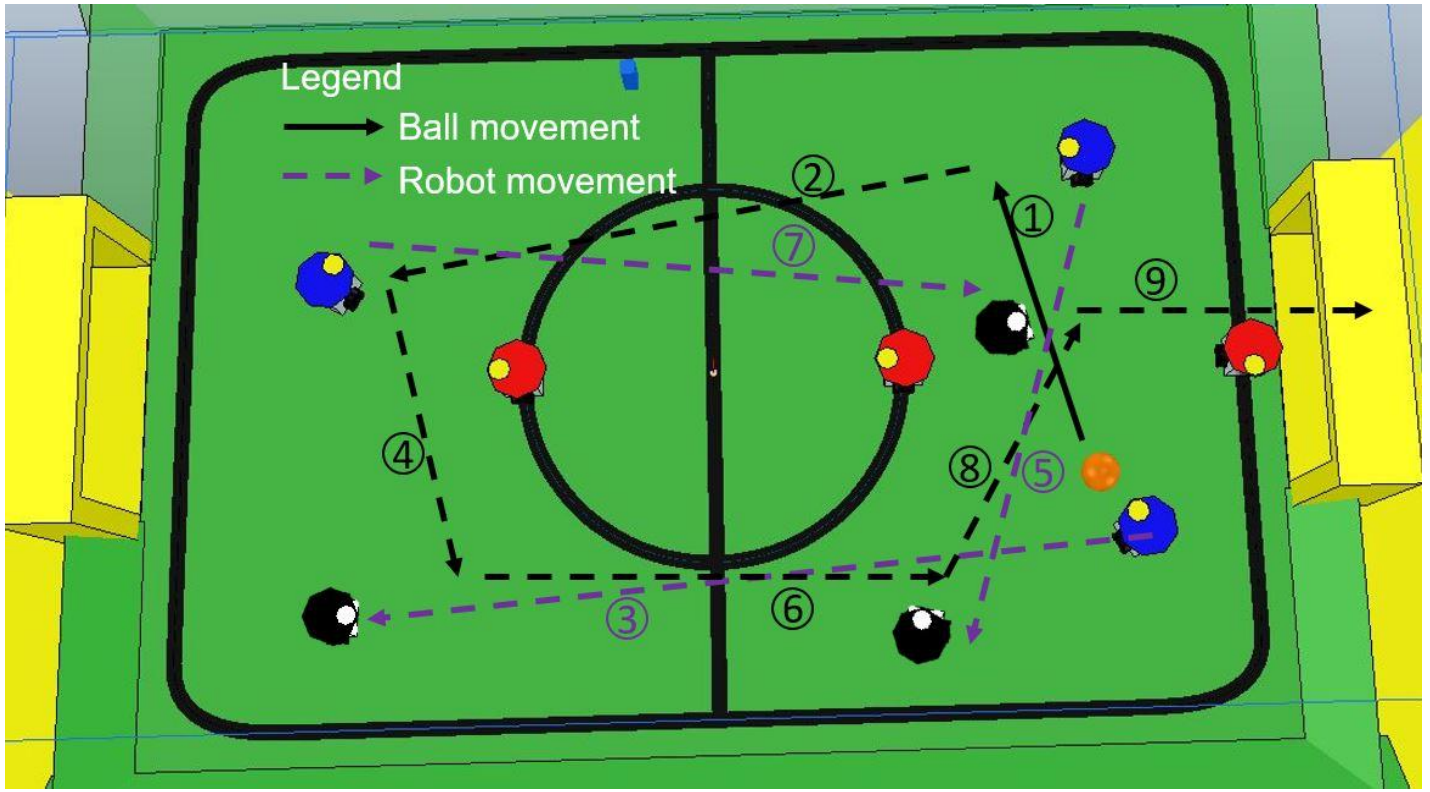


STAGE 2: DRIBBLING





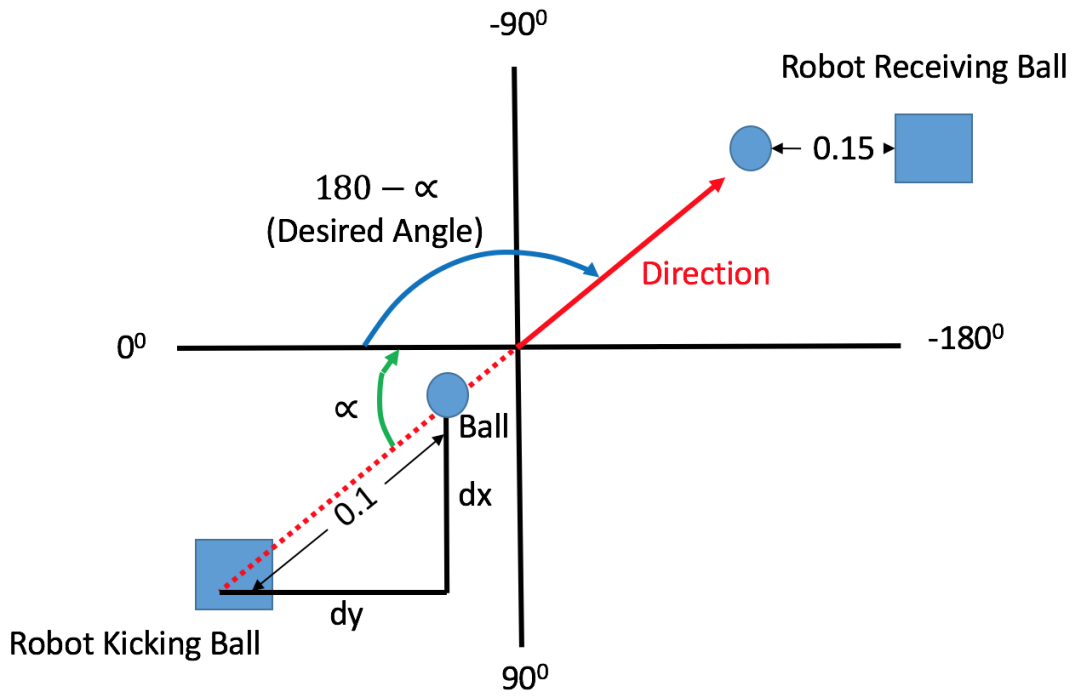
STAGE 2: PASSING



VIDEO

STAGE 2: PASSING

- PID control for robot movement to reach to the ball
- $v = 30d - 2$
- Euclidean distance of 0.1
- Ideal end position 1.5 away from receiving robot position



STAGE 3: COMPETITION

- Player and ball tracking function
- 2 Strategies
  - Passive defensive
  - Extremely passive defense

Thank you