

Whosball Strategy

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Summary:

Attempt a DEFENSIVE strategy first. If this is not possible, attempt an OFFENSIVE strategy next. If this is not possible, continue in a HOLDING pattern until something changes or timeout occurs.

Assumptions:

- We know where the table, foosball, and players currently are.
- The foosball can be controlled by at most one row at a time.
- We are able to move both axes (linear and rotational) of all 4 rows simultaneously.

Known Variables:

- Table
 - Boundaries (xPos, yPos) based on position of ArUco markers (1-4)
- Foosball
 - Current coordinates of foosball (xPos, yPos)
 - Current trajectory of foosball (deltaX, deltaY)
 - Projected wall position where foosball will next bounce off of (wallX, wallY)
- Foosmen
 - Current position of linear (yPos) and rotational (angle) motor for every row
 - Projected position where foosball will intersect each foosmen row (yPos)
 - Maximum speed of linear motors (yMax)
 - Which foosmen rows are capable of reaching intersecting point to block foosball
 - Which foosmen row (0-7) is closest to the foosball

Defense:

1. Ball is moving towards our goal (will change possession within next 3 frames)
 - a. For all rows in between ball and goal, calculate direct or indirect interception point
 - i. If row can intercept, move to intercept, otherwise do not move
 - b. For all other rows, move to default defensive position (see #2)
2. Opponent is in control of ball and the ball is not moving towards our goal
 - a. Goalie row moves to center position
 - b. Defense row moves just above/below center, depending on yPos of ball
 - c. Midfield row moves to block man-to-man with opponent's midfield row
 - d. Offense row
 - i. If ball is controlled by their goalie or defense, move to same yPos as ball
 - ii. If ball is controlled by their midfield or offense, move to center position

Offense:

3. Direct or indirect (bounce) angle exists between ball and opponent's goal
 - a. Kick ball at this angle towards opponent's goal
 - b. Move all rows in between ball and opponent's goal out of the way
 - c. For all other rows, move to default defensive position (see #2)
4. Direct or indirect path to opponent's goal does not and our offense is in control
 - a. Randomly select one of the following
 - i. Kick ball laterally to next foosmen on the offensive rod
 - ii. Find closest opening in opponent's defensive row, and kick ball there
 - iii. Kick ball towards opponent's goal
 - b. Midfield, defense, and goalie rows move to default defensive position (see #2)
5. Direct or indirect path to opponent's goal does not and our midfield is in control
 - a. Find closest opening in opponent's midfield row, and kick ball there
 - b. Move offense row to receive pass at intercepting point
 - c. Move defense and goalie rows to default defensive position (see #2)
6. Direct or indirect path to opponent's goal does not and our defense is in control
 - a. Find closest opening in opponent's offense row, and kick ball there
 - b. Move midfield row to receive pass at intercepting point
 - c. Move offense and goalie rows to default defensive position (see #2)
7. Direct or indirect path to opponent's goal does not and our goalie is in control
 - a. Find closest opening in opponent's offense row, and kick ball there
 - b. Move defense row out of the way
 - c. Move midfield row to receive pass at intercepting point
 - d. Move offense row to default defensive position (see #2)

Holding:

8. Neither player is in control of the ball
 - a. If timer exceeds threshold, pause game and show warning/error message
 - b. If timer does not exceed threshold, reset or increment to track number of frames