Description
The Simple Grid Soccer environment first proposed by Littman [1] has been used extensively as a test bed for many Multiagent Learning algorithms. The game is played on a 6x9 grid as depicted in the above Figure. The two players, say Blue and Red, occupy distinct squares of the grid and can choose one of 5 actions on each turn: N, S, E, W, and Hold (Stand). Once both players have selected their actions, the two moves are executed in random order. The x sign in the figure on player Blue represents the “ball”. When the player with the ball steps into the appropriate goal (left for Red, right for Blue), that player scores a point and the board is reset to the configuration shown in the figure. Possession of the ball goes to one or the other player at random. When a player executes an action that would take it to the square occupied by the other player, possession of the ball goes to the stationary player and the move does not take place.

Your Assignment
In this assignment you should design the Decision-Making structure of an agent based on RL methods to play well in the environment just described. It is not necessary to implement a ‘Multiagent Learning’ algorithm for your agent, however it is recommended to become familiar with such algorithms. A Client-Server system for this environment has been developed. This system is somehow similar to the Soccer Simulation Server. But it is of course simpler. In fact there is a Soccer Server which receives commands from both players, performs their
commands and updates the environment and returns the state of the world (players’ positions, current time, scores, etc.) to players. There is also a monitor to watch the game. Some kind of Log Player will also be developed for debugging purposes and watching games offline. The Server, Monitor, Log Player and a simple client will be available on the course web page in a couple of days. The format of messages and other details will also be available with the server.

**The Tournament**
After the deadline of this assignment your agent will participate in a tournament to compete against the agents of your classmates. Each match consists of 10000 cycles (simultaneous moves) and (of course you know that) the winner of the game is the player that scores more.

**Grading Policy**
In addition to the program, you must also submit a well-established document summarizing the approach taken by your program. There are no restrictions on your approach or techniques, except that your approach must be based on RL methods. Grades will be assigned based on the document and the agent’s overall performance. A well described program that performs poorly in the tournament with high probability will receive poor marks. Likewise, the champion program with no associated document will also receive poor marks.

**Questions**
If you have any questions, please send an email to afkanpour@ce.sharif.edu.

**Reference**