

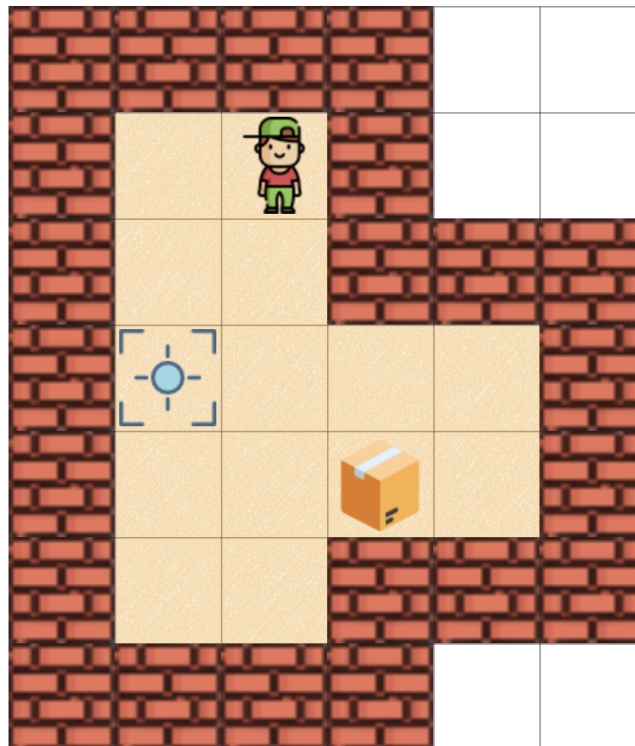
# DSE 314: Reinforcement Learning

## Assignment-2

### Question 1: Warehouse Agent Environment

(25 marks)

The task in this assignment is to create an environment that will be used later to implement Classic RL and Deep RL algorithms. You are required to create a grid world-based environment same as the image provided below with the necessary state-action dynamics:



The game is played on a board of squares, where each square is a floor or a wall. Some floor squares contain boxes, and some floor squares are marked as storage locations. The task is to make the warehouse agent push the box to reach its intended destination.

The warehouse agent is confined to the board and may move horizontally or vertically onto empty squares (never through walls or boxes). The agent can move a box by walking up to it and pushing it to the square beyond. Boxes cannot be pulled, and they cannot be pushed to squares with walls or other boxes. The number of boxes equals the number of storage locations. The puzzle is solved when all boxes are placed at storage locations.

(Refer to [https://en.wikipedia.org/wiki/Sokoban#/media/File:Sokoban\\_ani.gif](https://en.wikipedia.org/wiki/Sokoban#/media/File:Sokoban_ani.gif) to get a clear understanding)

## Details of the environment:

- Dimension: The grid world has a dimension of size 6 x 7
- State Space: Each row-column cell in the grid denotes the state of that cell  
[For eg, the agent in the image is located at row no. 2 and col no. 3 which translates to state (1,2)]
- Action Space: The agent can move in four directions: UP, DOWN, LEFT, RIGHT. It can only push boxes forward and can't move them in any other direction. If the agent pushes the box to the edge of the wall, then it can not push the box out of it - certain actions are irreversible
- Reward: Agent gets a reward of -1 when the box is not at the storage location. The agent receives a reward of 0 when the box is at the goal location.
- Terminating conditions: If either the box reaches the goal location or it gets stuck at a place where it cannot get out.

The warehouse agent environment (skeletal class - you are required to make all the changes) can be found at: [https://github.com/manavmishra96/reinforcement-learning/tree/main/Assignment\\_2](https://github.com/manavmishra96/reinforcement-learning/tree/main/Assignment_2)

## RELATED TUTORIAL LINKS:

You may take a look at the following articles to get familiar with gym environments:

1. <https://blog.paperspace.com/getting-started-with-openai-gym/>
2. <https://reinforcement-learning4.fun/2019/06/16/gym-tutorial-frozen-lake/>