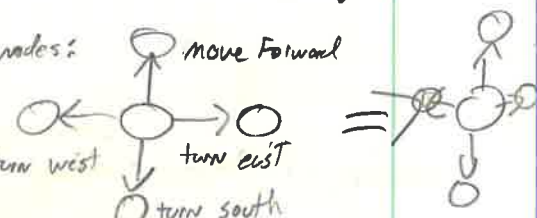
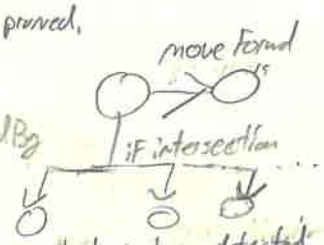
Peter Schacz | AI - Homework

3.7 A. As defined on page 67, the initial state, actions, and transition model implicitly define the space state.

States: The orientation and position of robot. graph can be represented by nodes:
initial state: center of maze with northward orientation
possible actions: orient Robot new direction, move Forward
transitional model: orient robot turns a robot one of four possible directions and move Forward advances the position of robot.
the successor for orient Robot returns a new robot orientation state and mov robot returns a new robot position
goal test: check if robot has exited the maze. Path cost: 1 or more per action



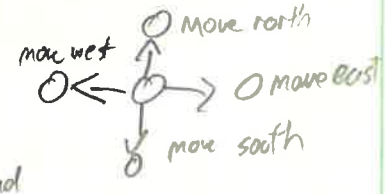
- the graph of possible states a agent can take 5 possible actions (one action is redundant) - you can orient towards the same direction. Thus without pruning these actions the space that is infinitely large because of loopy graphs. If the graph is pruned of looping paths, each action will reveal 4 possible subset of actions. therefore 4N node will be generated for each action performed will navigating the maze. the unique paths generated, P, covers all nodes from N0 to Ni therefore the space state is the sum of all P which can be infinite unless pruned.



B) States: the orientation and position of the robot, the graph can be represented by
initial State: center of maze, pointing north
Actions: move Forward, if at intersect ≥ 2 corridors turn become available
transition model: the robot moves Forward in the current orientation until a wall has been detected; if a wall or intersection exists, a turn action becomes possible.
goal test: check if robot has left the maze
Path cost: 1 or more per action

- Similar to A the space state is infinite due to loopy paths that can be generated. If the loopy branches are pruned then the space state is less than or equal to 4N per node

C) States: the position of the Robot whose graph is represented by:
initial: center of maze
Action: move in 1 of 4 directions
transition model: move a direction until a turning point has been found
goal test: is robot out of the maze
Path cost: 1 or more per action



- the space state is infinite with loopy paths, the space state per action is less than A or B due to single movement and turn actions being reduced. the robots orientation is no longer needed since any of the 4 possible directions can be traveled.

d) the robots sensors needed to determine direction
the robot physically moves in the maze
the maze passages are straight and only allow for unidirectional travel