CiberRato

Robótica Móvel e Inteligente

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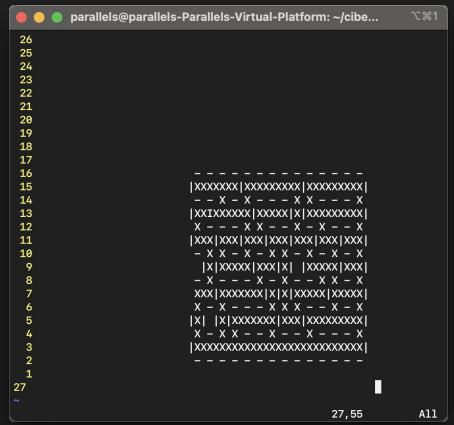
Challenge 1: Control

```
If relatively close to wall in front:
    If closer to wall on the left than right:
        If really close to left wall:
            Agressive turn
        Else:
            Rotation
Else if away from front wall and close to left wall:
    Turn
Else:
    Move forward
```

Challenge 2: Mapping

Method to store all the walls and passages: Quadruple matrix

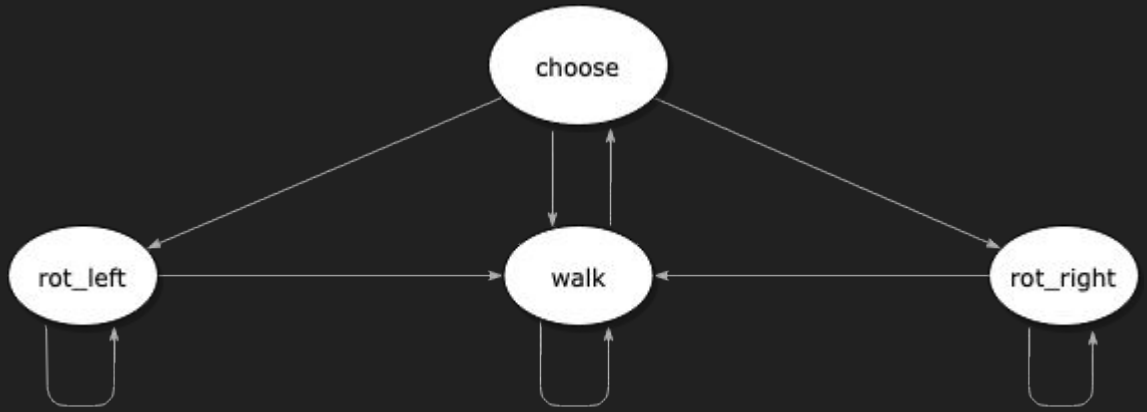
- `MAPPINGCOLS = (((CELLCOLS*2)-1)*2)+1`
- `MAPPINGROWS = (((CELLROWS*2)-1)*2)+1`
- Agent's starting position: `(MAPPINGROWS/2, MAPPINGCOLS/2)`



Challenge 2: Mapping

State machine:

- choose
- walk
- rot_left
- rot_right



Choose

Choose next cell based on:

1. If there's a unexplored cell right on its front
2. Or a unexplored cell on its left
3. Or a unexplored cell on its right
4. Default: Euclidean distance from the current cell

Choose

Computing the shortest path:

- A* Search Algorithm
  - Path selecting based on the current cost of the path + heuristic
  - Never overestimates the cost (estimates the cost of the cheapest path)
- Other algorithms that were considered:
  - Depth search: falls often into infinite loops, picks the deepest node first
  - Greedy algorithm: Does not store the cost, no significant improvements

Walk

Only walks forward

Checks direction to know which coordinates will change

Walks forward until the current position is equal to position before the moviment plus 2

Uses PDControl

Uses left and right sensors to auxiliate the moviment

Rotation

Checks position to know when to stop

Same in both left and right, except the rotation capabilities, 90º to the left, 90º and 180º to the right

Rotates fast until around 20º close to the goal

Rotates slowly to stop on the goal, with a 3º range

Walks after rotation is completed

Challenge 3: Planning

Similar logic to challenge 2

When all Beacons are found, changes state

Calculates best path from beacon i to beacon i+1 with A* algorithm

Finds best global path between the beacons