Mark as done

Leaderboards

Running leaderboard

Your task is to write a bot that will participate in a multiplayer car racing environment.

Environment description

The environment models a racetrack that is discretized in a (rectangular) grid, consisting of *cells*. Some of the cells are marked as goal cells, and the task of the agents is to reach one of the goal the goal cells in as few steps as possible. One or more agents can participate in a race, and initially they are randomly placed in one of the start positions. The winner is the one who reaches one of the goal positions in the lowest number of steps (or, equivalently, in the lowest number of iterations), the distance travelled by the agent is not relevant. Agents take steps one after the other in a fixed order, which remains the same throughout the race.

There are cells marked as "wall" cells, which are impenetrable (and there is a penalty for trying to move there, see below).

The agents have velocity, and can only accelerate or decelerate by a small amount. Formally, the acceleration is added to the velocity of the agent, and that will be its new velocity. The new velocity vector is then added to its position, resulting in its new position:

$$v_{t+1} = v_t + a_t$$
$$x_{t+1} = x_t + v_{t+1},$$

where x, v and a are the position, velocity and acceleration vectors, respectively ($x, v, a \in \mathbb{R}^2$), and

$$a_t = \left(a_t^{(r)}, a_t^{(c)}\right), \quad a_t^{(r)}, a_t^{(c)} \in -1, 0, 1,$$

that is, acceleration can be at most 1 in either direction. At the start of the race, velocity is zero.

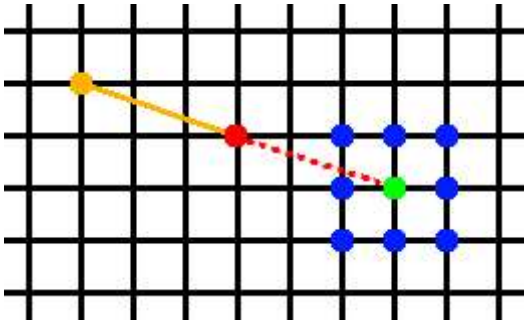

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Figure 1: Visualization of a step. The orange and the red dots mark the previous and the current positions, respectively. The agent can move to the green dot or to one of its neighbors, marked by blue dots.

If an agent takes a step that would move it onto a wall cell, or outside the map, or to a position occupied by another agent, it is blocked for five rounds, after which it is restarted from its last valid position with zero speed. The agent innocent in a collision continues without any penalty.

Similar to Tier 2, the agent only sees a limited area around it. More specifically, there is a visibility radius $R \in \mathbb{N}^+$, and on its turn, the agent observes only cells that are at a distance of at most R from its location (measured in Euclidian distance). All other cells in the observation will be marked as not visible.

To go with this, the visualization script can now visualize this limited visibility (as a fog over the rest of the map). To use this, pass the argument `--visibility_radius <R>` to the script, where `<R>` is the visibility radius value. The fog can then be disabled and re-enabled by pressing the "F" key.

New to Tier 3 is the introduction of two new cell types: *oil* and *sand*. When the cell the agent is standing on is one of these special types, the bot acceleration input is discarded (it still needs to be a valid answer) and special acceleration rules apply.

On oil, the acceleration of the agent is chosen uniformly randomly from the $\{-1, 0, 1\}^2$ set. On sand, the acceleration is chosen from a subset of $\{-1, 0, 1\}^2$ in a way that will *decelerate* the agent. Specifically, the possible acceleration values are ordered according to the distances of the corresponding next positions from the current position, and the new position is chosen from the three closest possible positions, along with the corresponding acceleration value.

Note that this modified acceleration does not take into account the walls or the other agents, so agents should take extra care near oil or sand fills. The replay file contains the modified acceleration values.

Communication protocol

Upon startup, the bot must output the line "READY" via the standard output (including the line terminal) when it finished initializing. After this the bot should read the global environment parameters from the standard input. The first line contains the height H and the width W of the map, the number of players N and the visibility radius R, in that order, separated by spaces.

On its turn, the bot receives the current observation on its standard input. The first line contains four integers separated by spaces: the location and the velocity of the bot, respectively (both are pairs of numbers: row and column coordinates, in that order). The next N lines contain 2-2 integers separated by spaces: the (row and column) coordinates for all the players.[1] The order of the players are the same throughout the task.

The last $2R + 1$ lines of an observation represent the area of the map currently visible to the agent. Each line contains $2R + 1$ integers, separated by spaces; these represent the cells, as follows:

- 0: empty cell,
- -1: wall cell (everything outside the map is considered to be wall),
- 1: start cell,
- 3: cell is not visible,
- 91: oil cell,

- 92: sand cell,
- 100: goal cell.

On its turn, the bot must output two integers separated by a space (and terminated by an end of line): the acceleration in the row and column directions, respectively. The acceleration values must be one of -1, 0 or 1.

At the end of the race, the bot receives the string "~~~END~~~" instead of an observation. Upon receiving this line, the bot should exit gracefully.

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1. Note that since no two agents can be on the same cell, agents can identify their own line by comparing its own location to the list of locations received.↩

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