Navigation

Control of Mobile Robots: Programming & Simulation Week 7

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Overview

- This week we need to answer three questions to achieve navigation through the obstacle course:
  1. Is the robot making progress towards the goal?
  2. Should the robot follow the wall to the right or the left?
  3. If the robot is in state “A” and event “2” becomes true, then to which state should the robot switch?

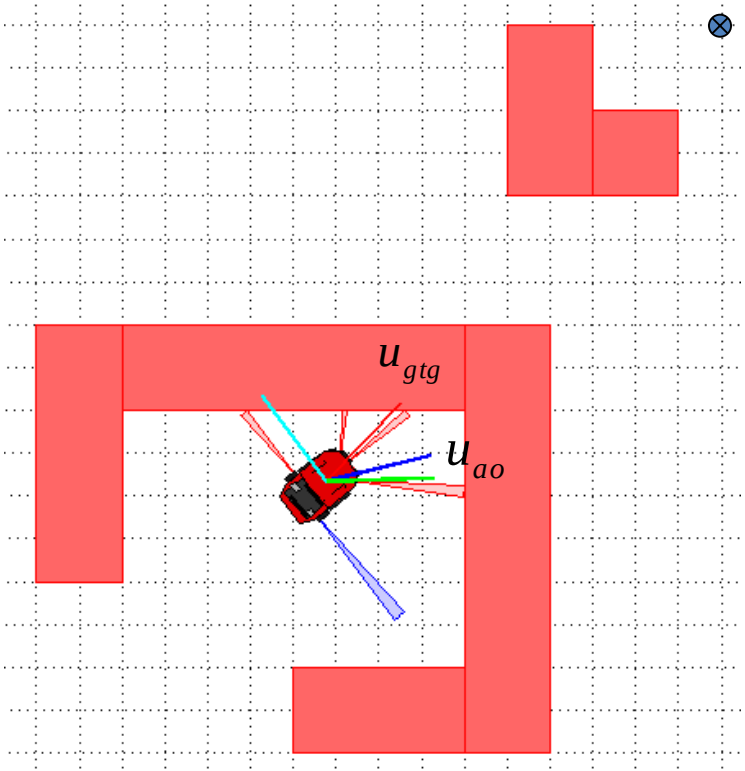
Implementation

- All parts of this week's programming assignment will be implemented in the supervisor:

  `+simiam/+controller/+quickbot/QBSupervisor.m`

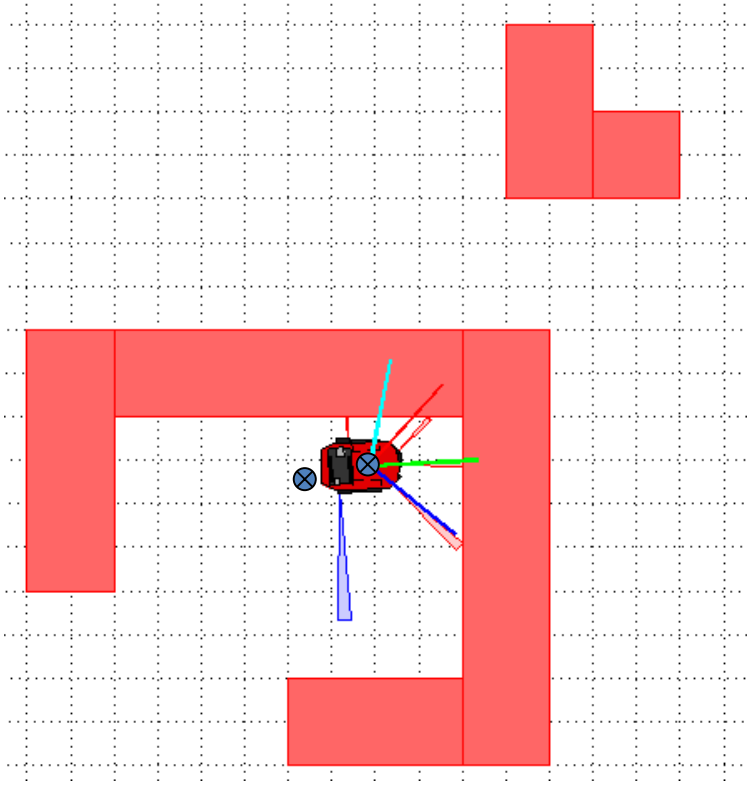
- Let's see it in action!

Progression Towards The Goal



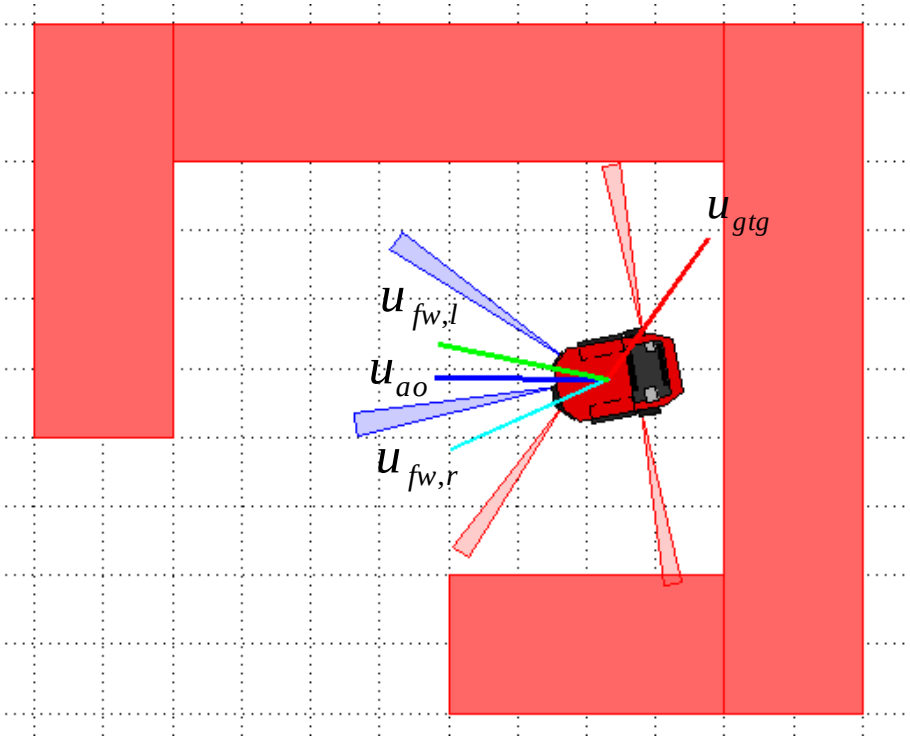
- Robot first attempts to approach the goal while avoiding obstacles as before.

Progression Towards The Goal



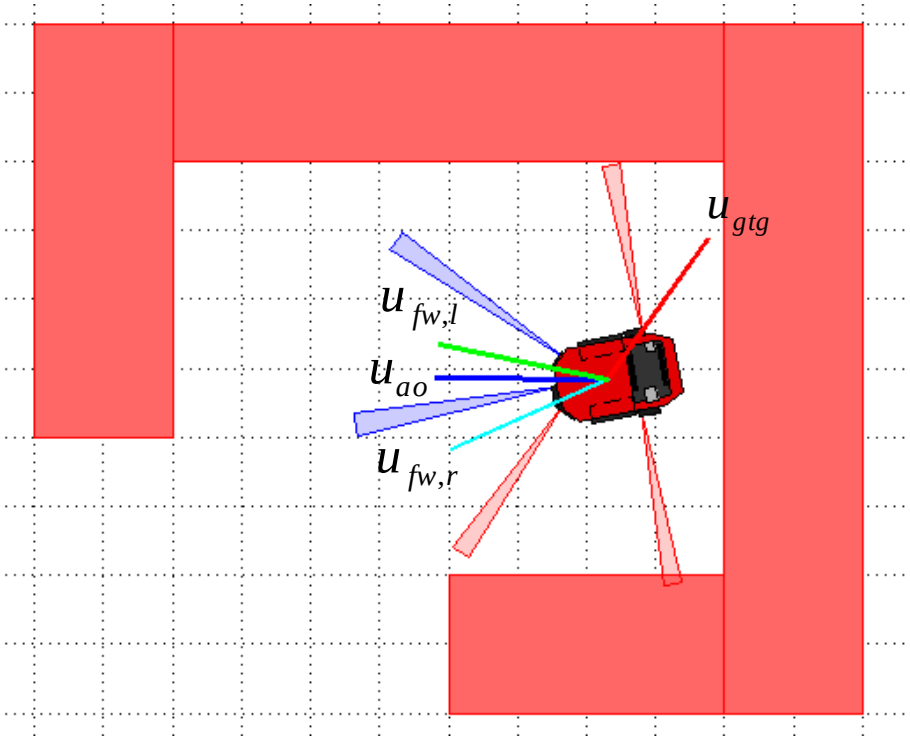
- Update progress with `set_progress_point` and check with `progress_made` event.

Switching to Follow Wall



- When no more progress is made, try to switch to following the wall.
- What should `obj.fw_direction` be?

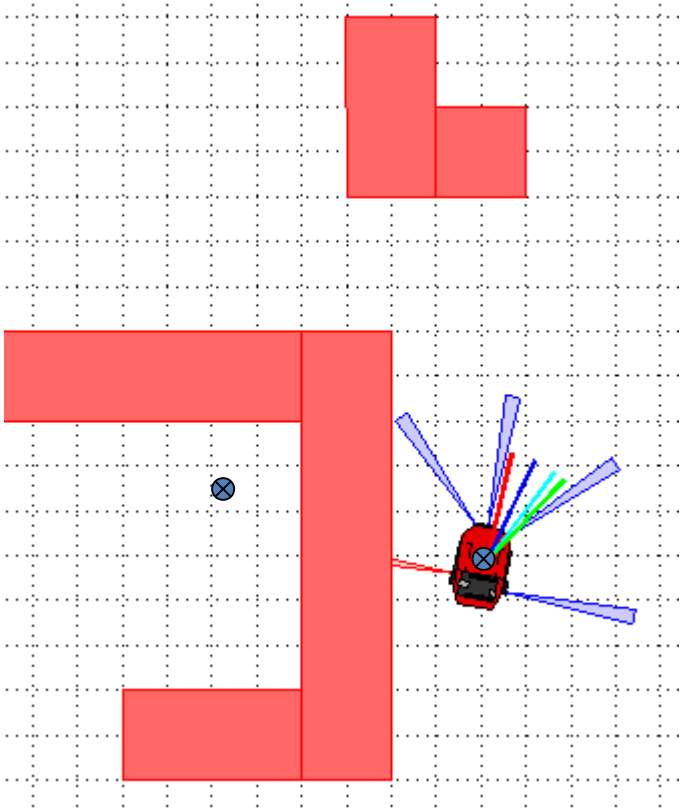
Switching to Follow Wall



- Is `u_fw` is between `u_ao` and `u_gtg`?
- Let's use a little bit of linear algebra:

$$\begin{bmatrix} u_{gtg} & u_{ao} \end{bmatrix} \begin{bmatrix} \sigma_1 \\ \sigma_2 \end{bmatrix} = u_{fw,l}$$

New Progress



- `progress_made` and `~sliding_left`, so let's switch back to `go_to_goal`.

Finite State Machine

- A few pointers for the navigation FSM:
  1. If `at_goal`, then `stop`.
  2. If `unsafe`, then switch to `avoid_obstacles`.
  3. If `go_to_goal` and `~progress_made`, then switch to `follow_wall` if `sliding_left` or `sliding_right`.
  4. If `progress_made` while `follow_wall` and `~sliding_left` or `~sliding_right`, then switch to `go_to_goal`.

Tips

- Refer to the section for Week 7 in the manual for more details!
- Draw out the FSM on paper, step through it, and then implement and test it.

What's Next?

- The simulator and its documentation will be available outside of this course: http://gritslab.gatech.edu/projects/robot-simulator
- Contribute your improvements, new robots, new sensors, and anything else on GitHub.
- Thank you for your hard work!