ECE 4160/5160
MAE 4910/5910

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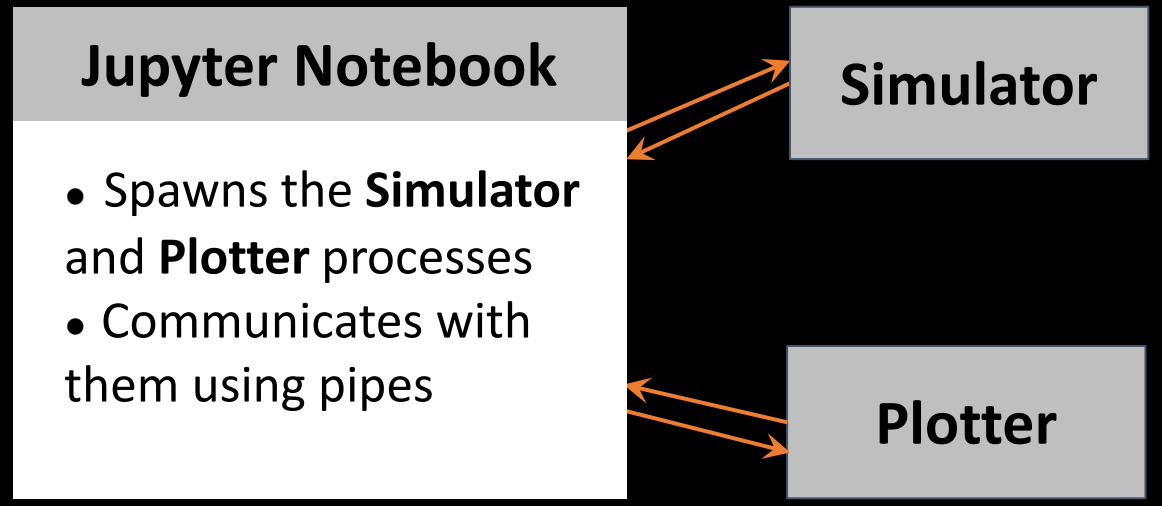
Fast Robots

Lab 10 (Flipped classroom)

Simulation Software

- Multiple processes
  - Simulator
    - Robot
      - Motion
      - Ground truth
    - YAML (map and other parameters)
  - Plotter
  - Controller
    - Get odometry pose, get and plot sensor data, move the robot, etc.



- *Why do we bother with the simulator?*
  - Helpful for debugging the Bayes Filter
  - Helpful for evaluating implication of accuracy
  - Can be used to also debug the real robot

Simulator (today)

Commander

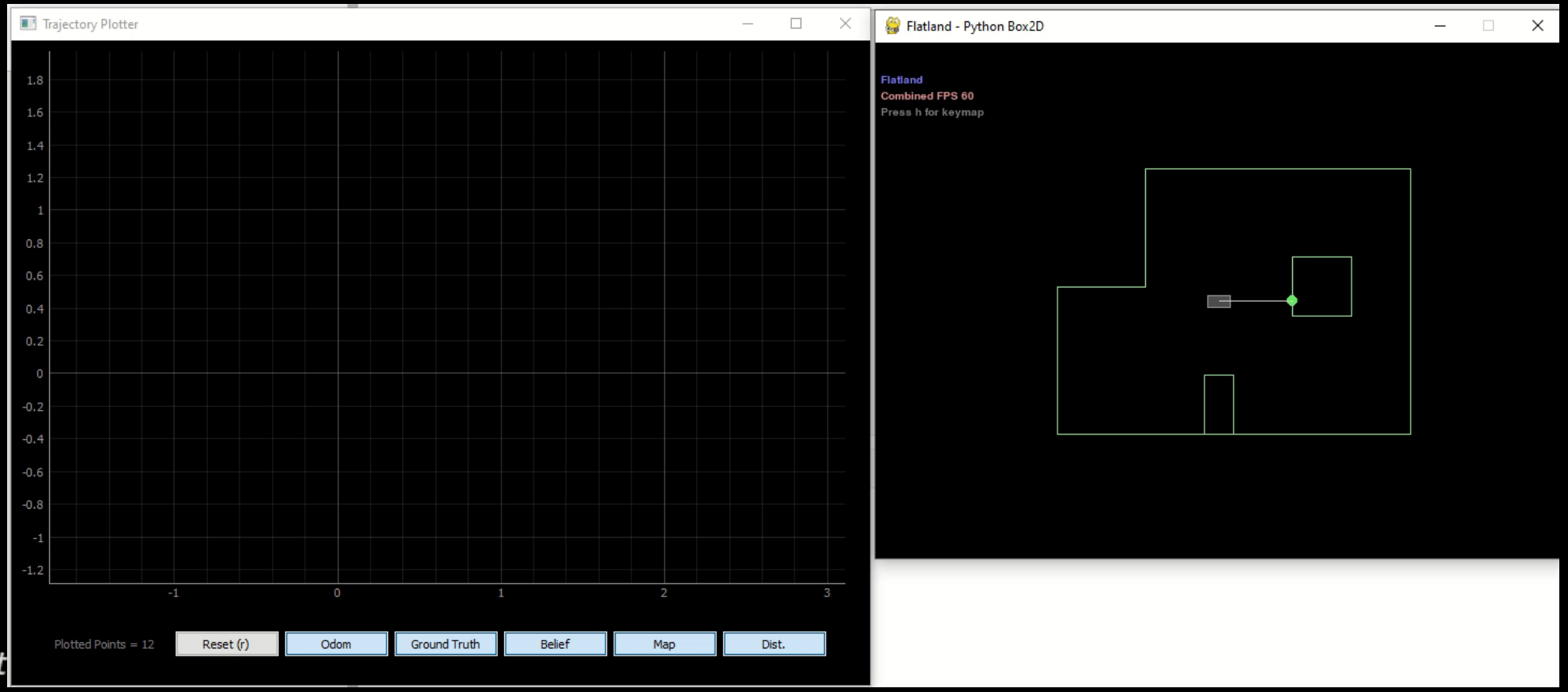
Functions to interact with the simulator and the plotter

Task 1: Control and plotting

- Keyboard control of robot
  - H brings up a key-map in the plotter
- Programmatically control your robot and visualize the trajectory in the plotter
  - How to add delays
    - time.sleep(1)
    - await asyncio.sleep(1)

Task 2: Open loop control

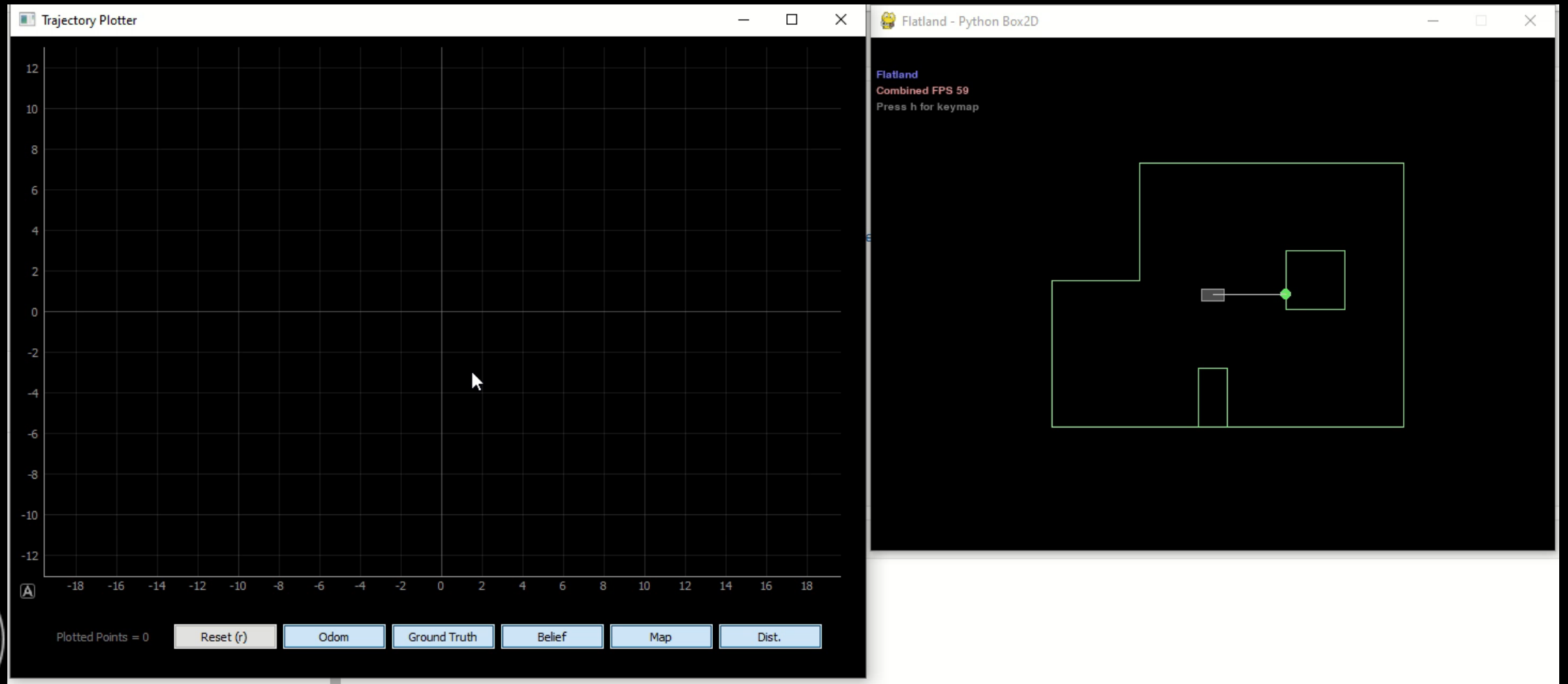
- Make your robot drive in a square loop
  - Compare ground truth and odometry
  - Compare across computers
- Why do think solutions differ across computers?
  - System's load, specs, rounding, etc.



Fast

Task 3: Closed loop control and obstacle avoidance

- *Design a simple controller in Jupyter to avoid obstacles*
  - Suggestions?



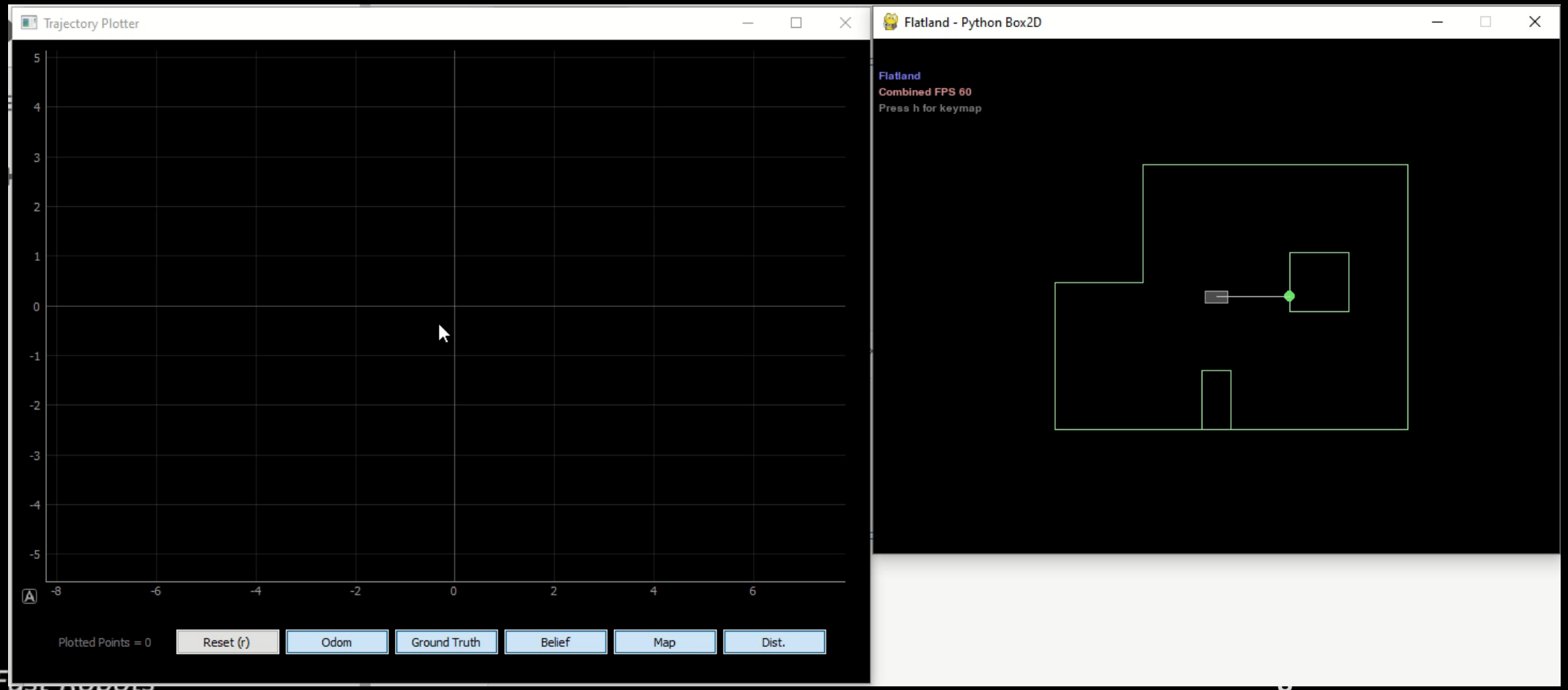
Task 3: Closed loop control and obstacle avoidance

- *Design a simple controller in Jupyter to avoid obstacles*
  - Suggestions?

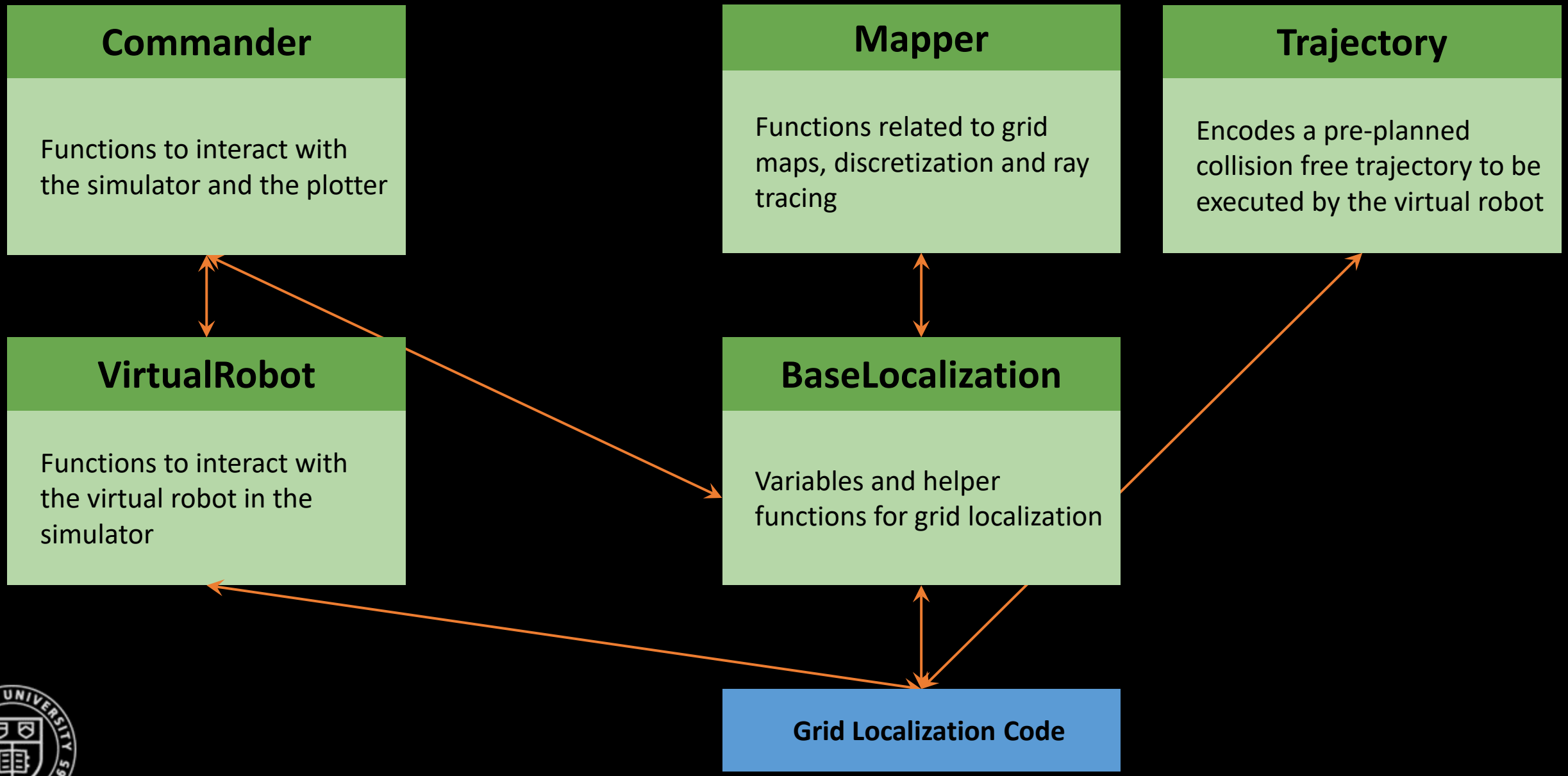
- Consider…
  - Turn size and forward speed
  - How close can the virtual robot get to an obstacle without colliding?
  - Does your obstacle avoidance code always work? If not, what can you do to minimize crashes or (maybe) prevent them completely?

Task 3: Closed loop control and obstacle avoidance

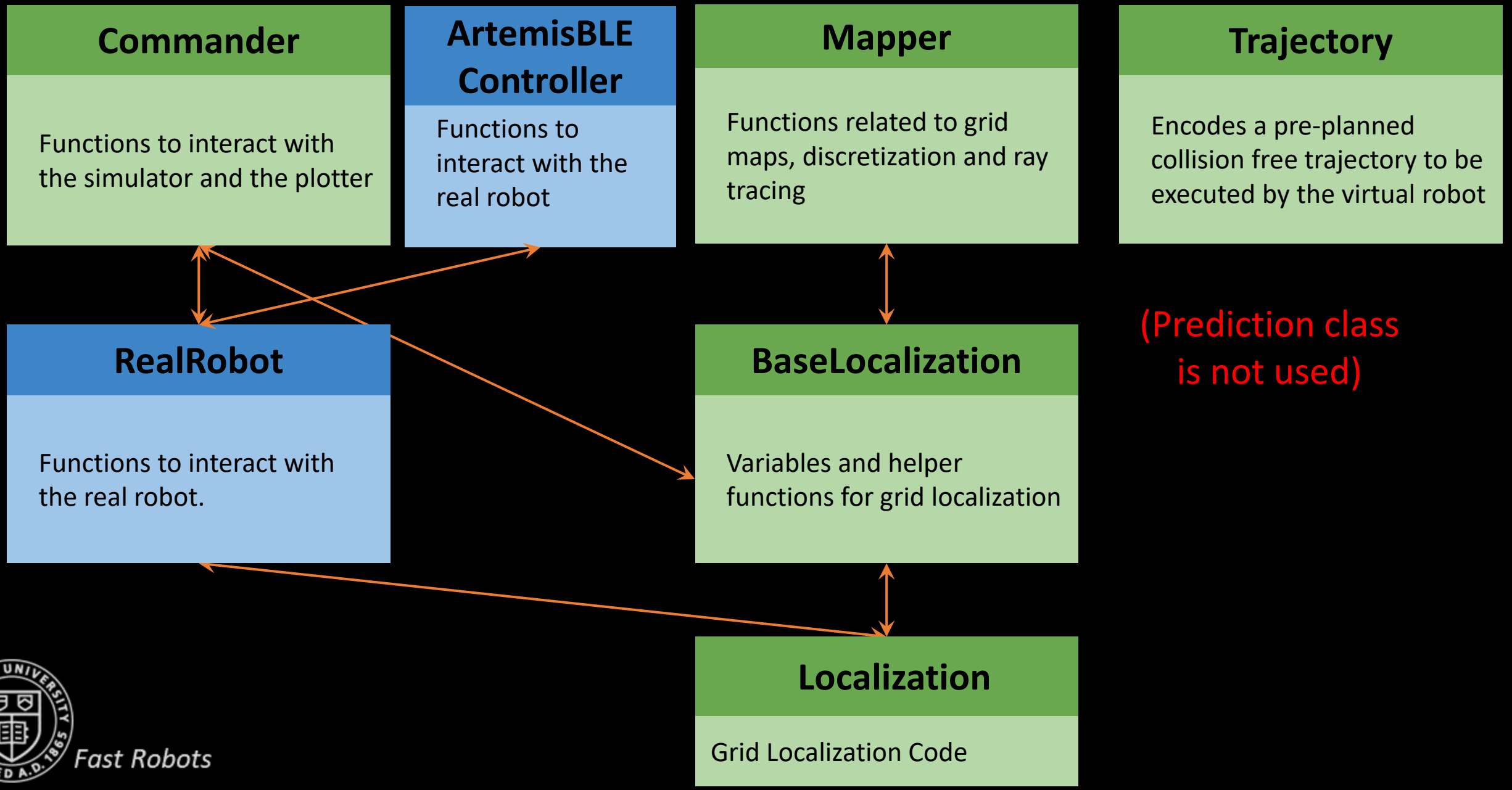
- *Design a simple controller in Jupyter to avoid obstacles*
  - Suggestions?



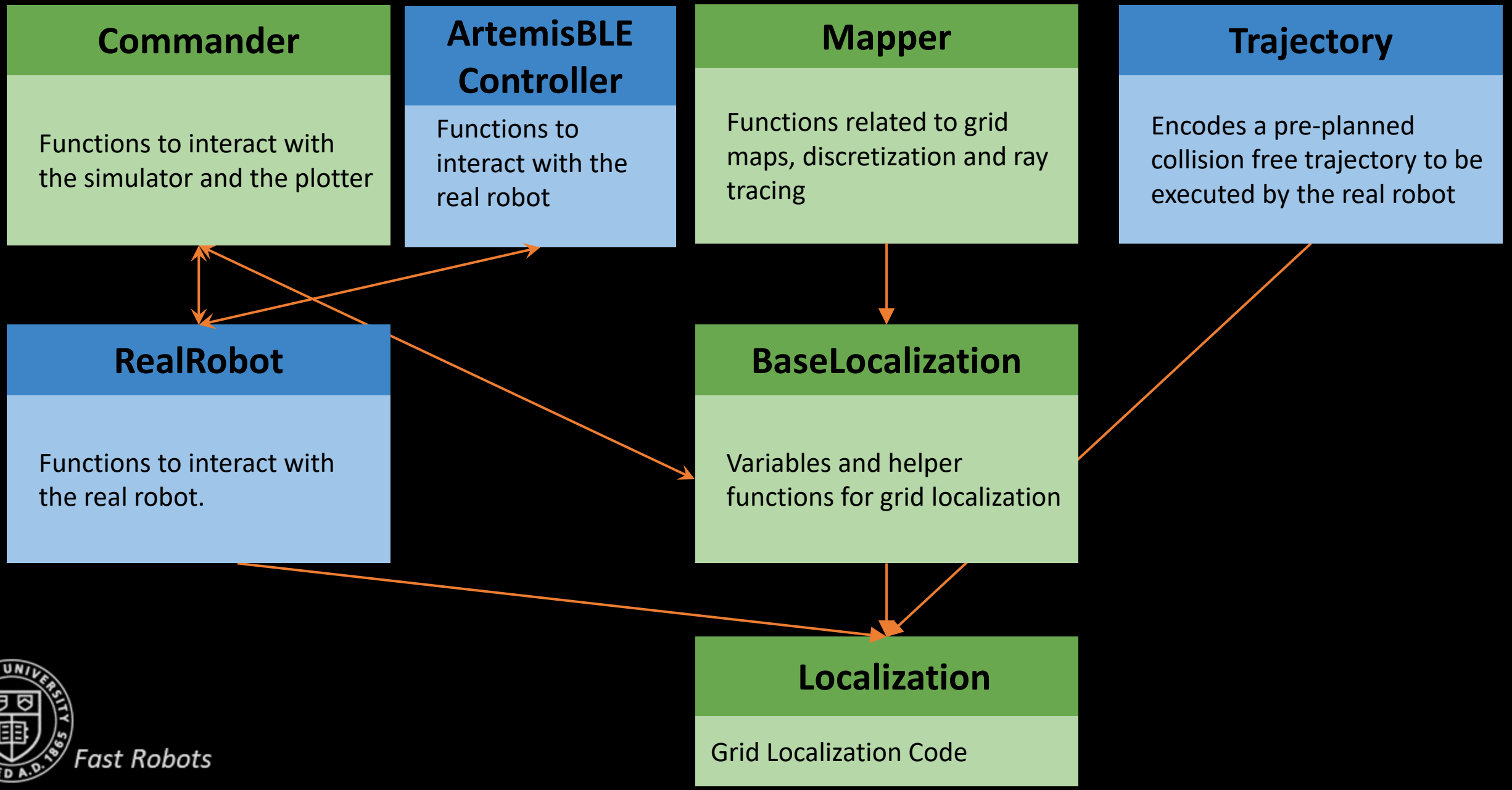
Lab 10 - Localization on the virtual robot



Lab 11 - Pure localization on the virtual robot



Lab 12 - Localization and planning on the virtual robot



Logistics

- **Lab 8 – Stunts**
  - Voting can start ~~today~~ Friday
  - Please submit your votes by Friday April 22nd
    - https://tinyurl.com/vp5wrten
    - 10 points for best stunt
    - 1 point for best blooper
- **Lab 9 – *Catch up now!***
- **Lab 10 – Localization**
  - Get a head start on the Lab 10 documentation!