ECE 4960

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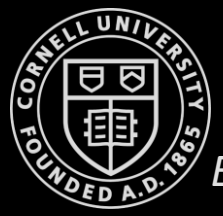
Fast Robots
Lab 9

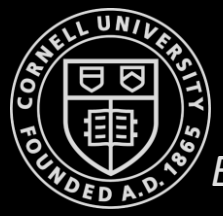


Lab 9

Objective: (Online) Localize your real robot in the world setup during Lab 7

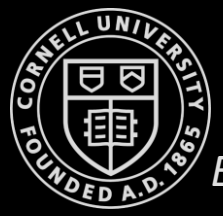
(1) Using a uniform prior on the pose, run (only) the update step on the measurement data to localize

(2) Try a sequence of localization - motion - localization and include the odometry data into the prediction step



Barebone Implementation of (1) – Offline Localization

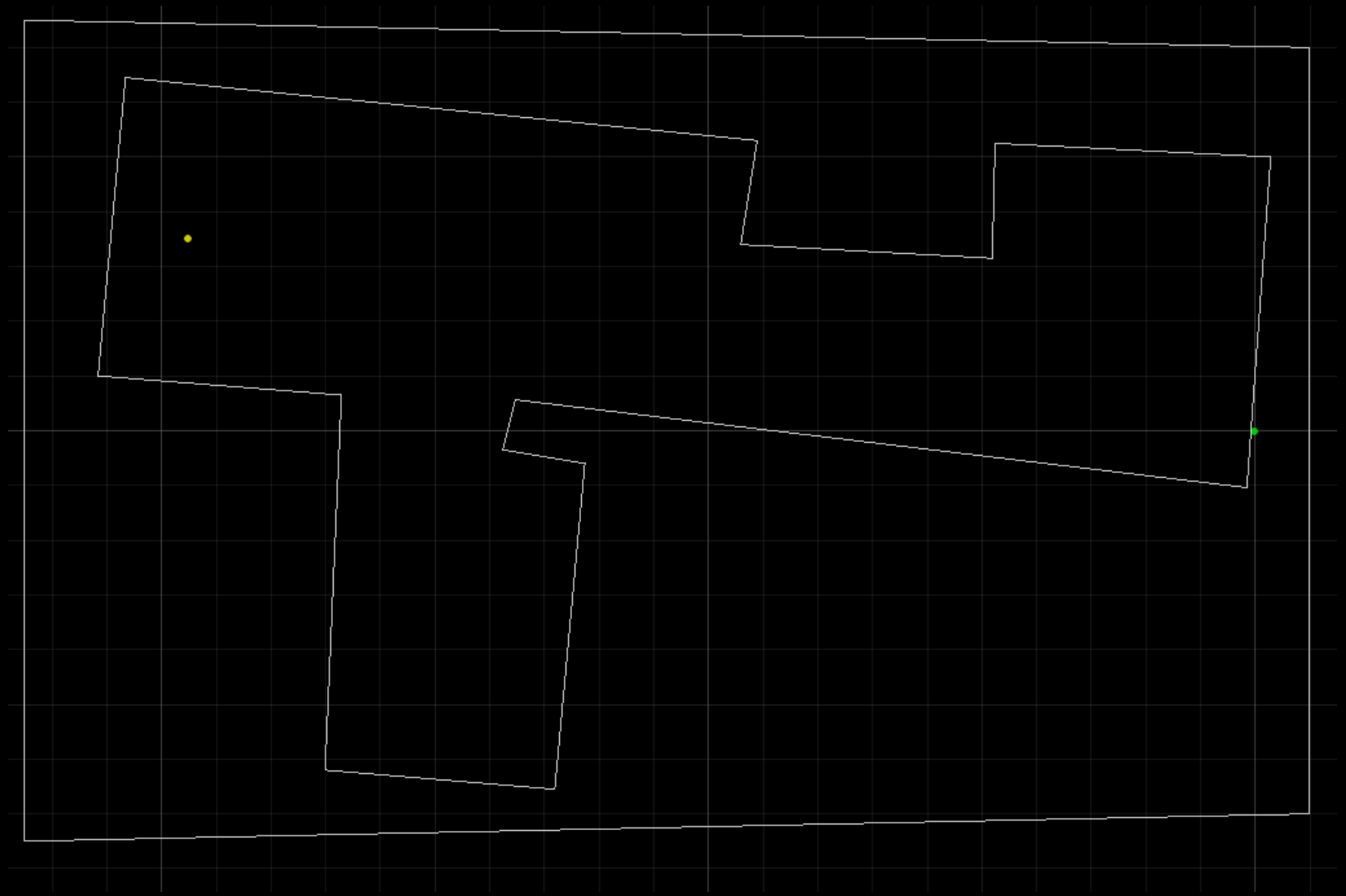
1. Measurement readings (Lab 7)
   - Bluetooth Module (Lab 2)
   - PID Controlled Motion (Lab 6)
2. Extract 18 Measurement readings such that they are approximately equidistant in the angular space (~ 20 degrees apart)
3. Feed the measurement data into the Localization module to complete an offline version of Lab Procedure (1)
   - Load the map
   - Change the Mapper parameters accordingly
   - Replace the `loc.obs_range_data` with the measurement data



Offline Localization Example - 1

Measurement data:

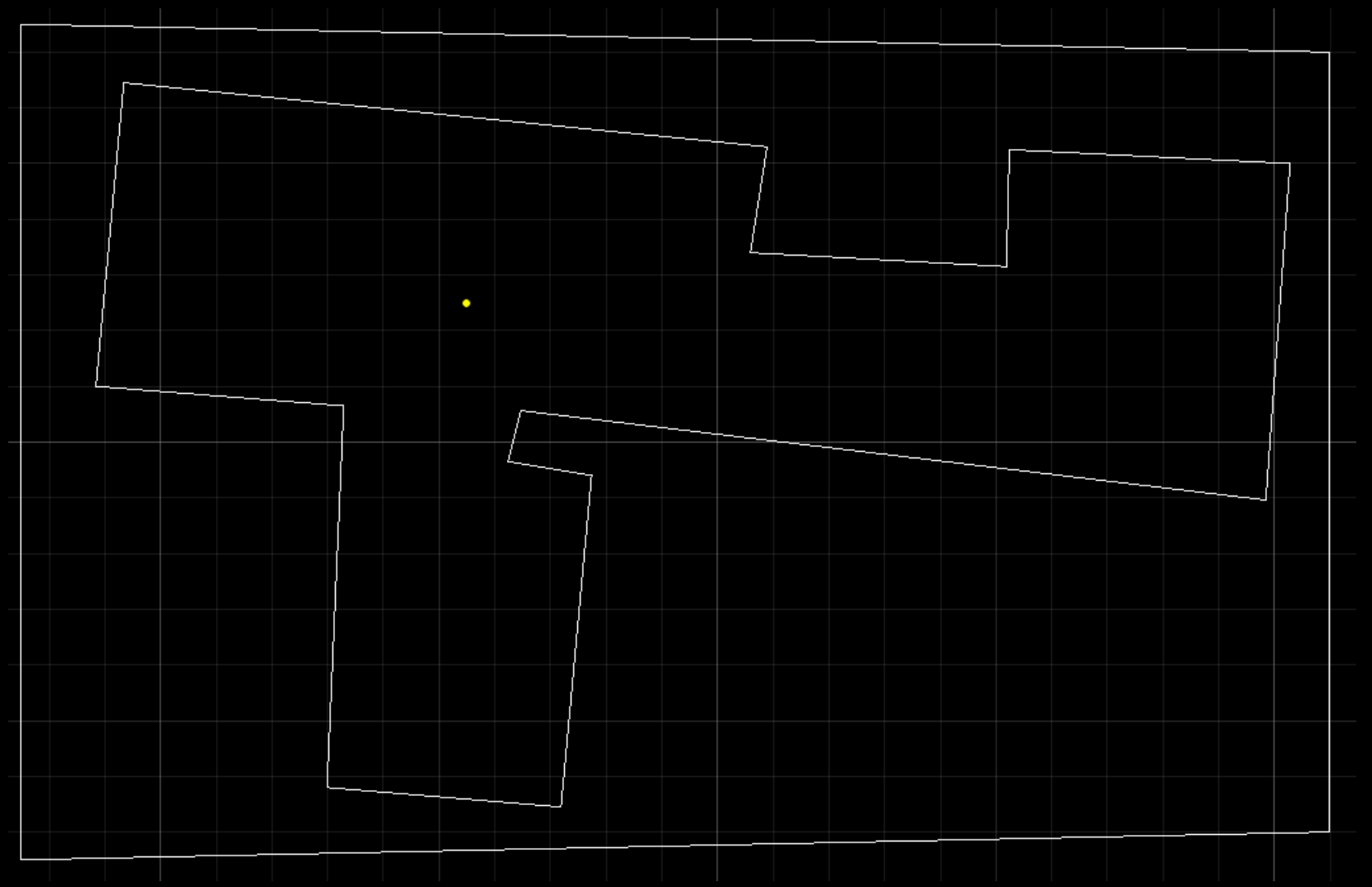
(1.922, 0.917, 0.697, 0.588, 0.557, 0.574, 0.55, 0.413, 0.376, 0.41, 0.433, 0.566, 0.524, 0.509, 0.58, 0.745, 1.578, 3.825)



Offline Localization Example - 2

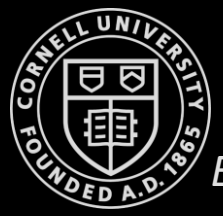
Measurement data:

(1.975, 0.943, 0.67, 0.545, 0.521, 0.577, 0.749, 1.364, 1.45, 1.407, 0.73, 0.723, 1.559, 1.817, 0.488, 0.61, 0.962, 2.727)



Online Localization

- The VirtualRobot class in the Localization module allows you to interact with the virtual robot
- Define a new RealRobot class to interact with the real robot
  - Odometry pose data (`get_pose`)
  - Observation data (`perform_observation_loop`)
  - Move your robot (`set_vel`)
- In the Localization module, replace the VirtualRobot class with your RealRobot class



RealRobot Class

- Odometry pose data (`get_pose`)
  - Integrate accelerometer data w.r.t time
- Observation data (`perform_observation_loop`)
  - Wrap the Bluetooth command from Lab 7
  - Bluetooth module should be running in the VM!
- Move your robot (`set_vel`)
  - Some way to move the robot between each iteration of the Bayes Filter
  - Check out the *Implementation Tips* section!