

Cozmo Occupancy Grid

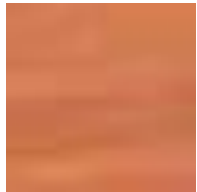
15-494/694 Cognitive Robotics

JD Parker and Megan Roche

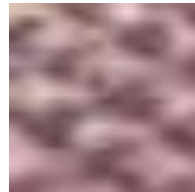


Differentiating Floor from Obstacles

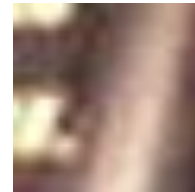
- We grab a 30x30 patch from the camera and pass it through a K-Nearest Neighbor network.
- Surfaces are stored in the KNN using histograms of the patch's saturation and hue as well as the summed value of the patch's sobel response
- Get the outputted value from the KNN and see if the KNN distance is less than the adaptive threshold.
- Return -1 if it above the threshold, which means it is probably an obstacle
- Return the predicted KNN id if is above the threshold. (The KNN id is the type of floor cozmo is on)



7: Wood Table

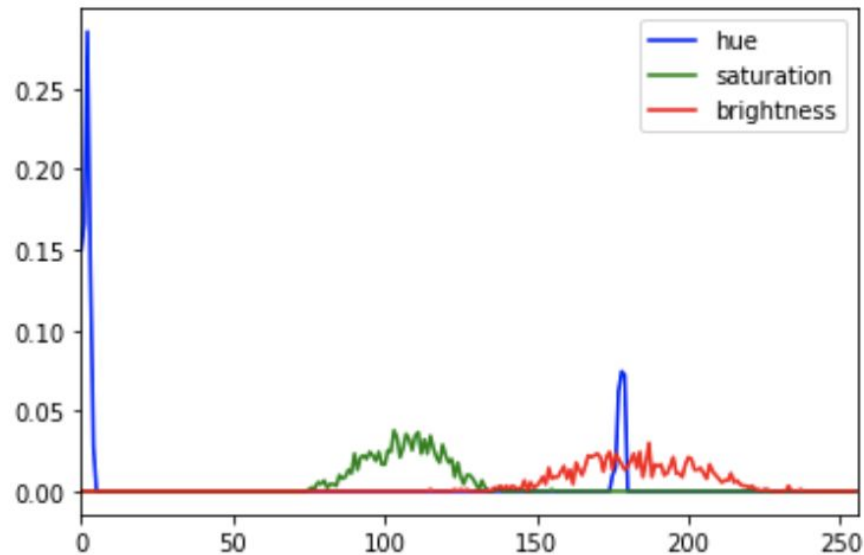
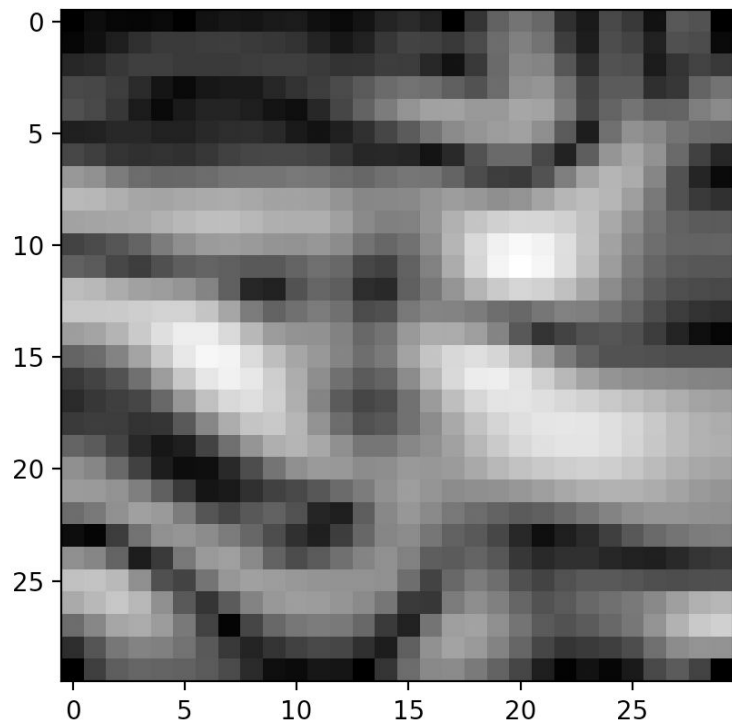


4: Blue Yoga Mat



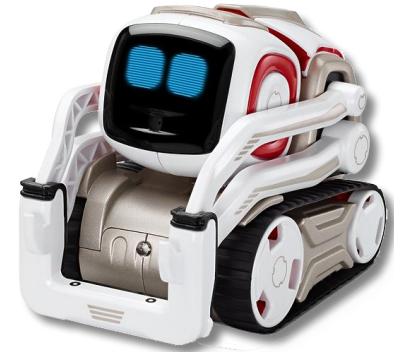
-1: Obstacle

Pictures of sobel response and HSV histograms



Creating the Occupancy Grid

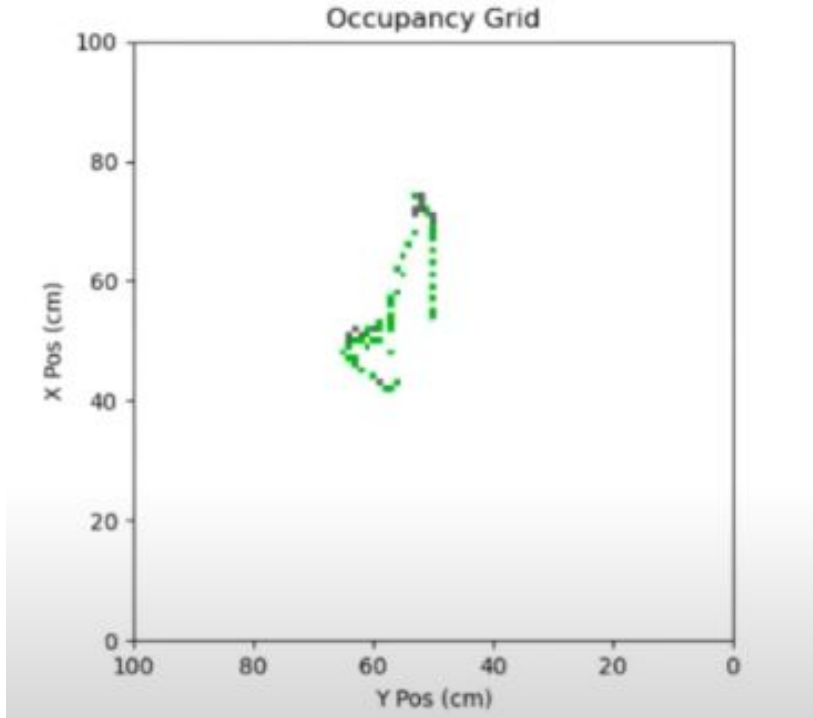
- Grab a 30x30 image patch and pass it through KNN to get id value
- Get the position of the patch using ProjectToGround(), convert to world coordinates, and then convert to $[i, j]$ indices for our 2D occupancy grid
- Set value at $[i, j]$ to the id value of the patch and display updated grid



Picture of Occupancy Grid



Grid is 1m x 1m
Each pixel is 1 cm²



Obstacle



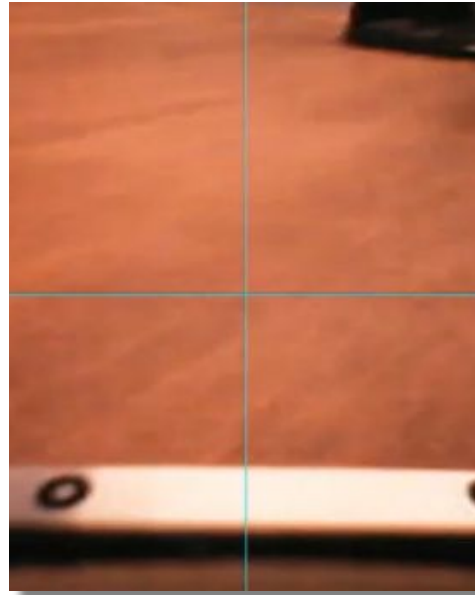
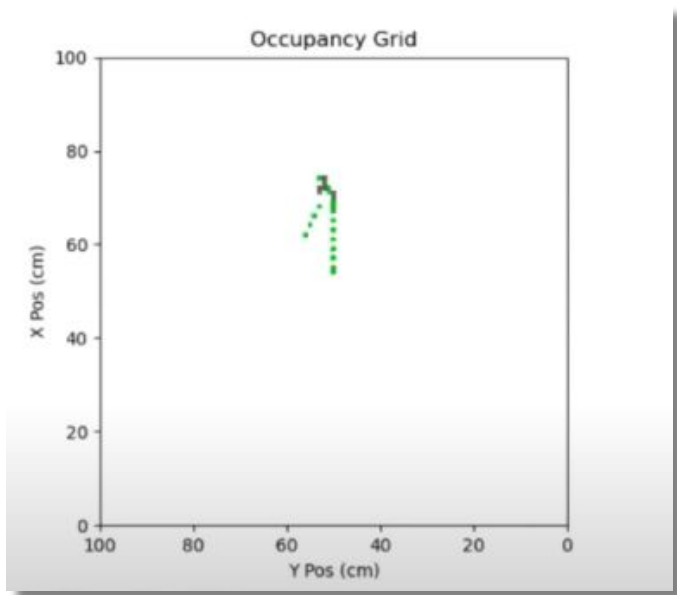
Wood Table (Free)



Unexplored

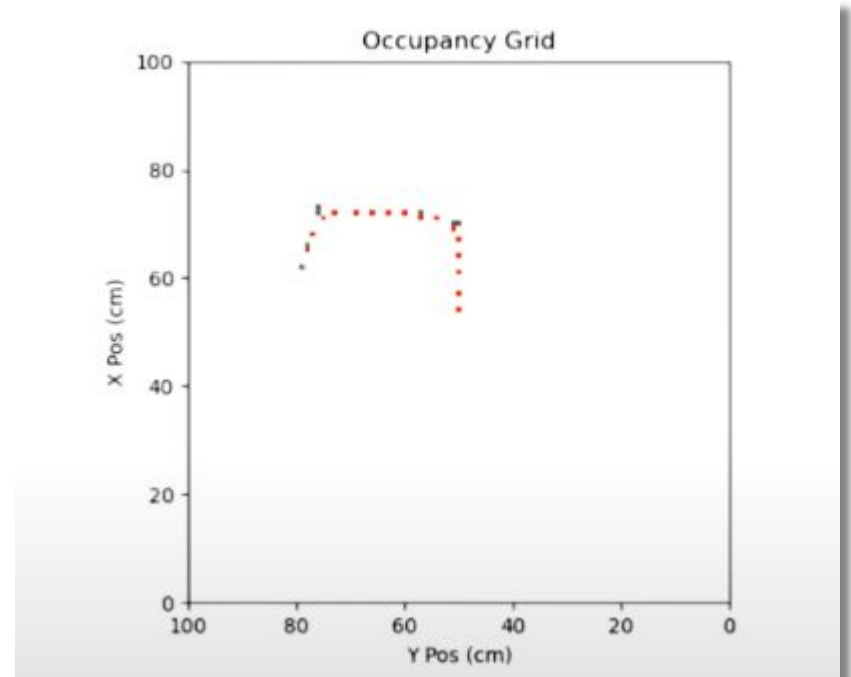
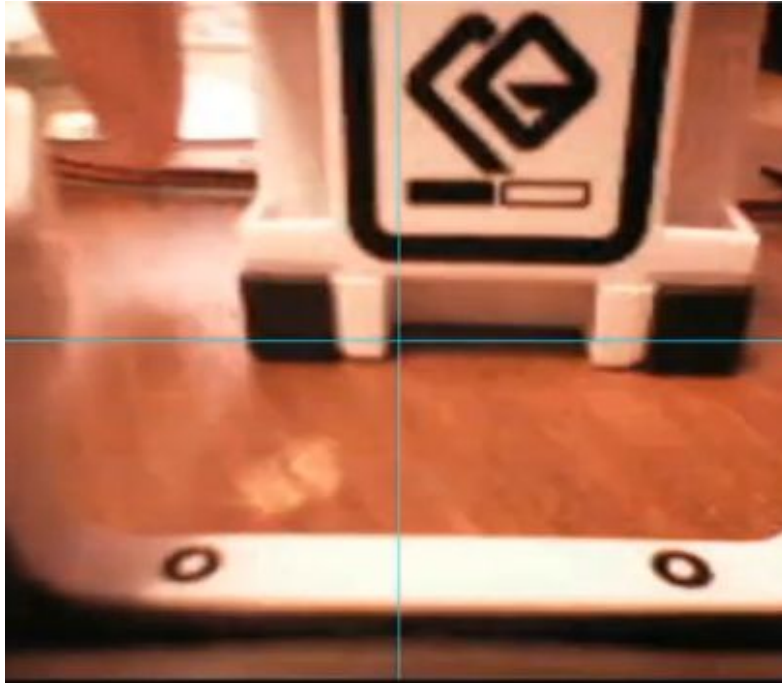
DriveKNN

Use Particle Viewer to drive Cozmo around workspace as it continuously updates its occupancy grid.



RoamKNN

Cozmo roams around the 1m x 1m area and will turn away from obstacles and do a U-Turn when it reaches the edge of its workspace



Video Demonstration

