HW3: Individual Assignment
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I built a total of 5 nodes for this assignment. A Bayesian mapper, a global planner, a map saver, a map loader, and a path follower. The Bayesian mapper uses Bayes rule and Bresenham's algorithm to fill and update the values of an Occupancy grid. I used a teleop node to move the robot around to update the occupancy grid, and a map saver node to convert the occupancy grid into a PNG, PGM, and a YAML description. Once the map is created, a goal has to be set on RVIZ, and then I run the global planner node to apply A* on a thresholded grid that only includes the free cells from the occupancy grid. The plan is then generated from the robot's current position to the goal. Once the plan is created, I break it into five waypoints and run the VFH Follower from homework 2 to follow the path.

At first, my Bayesian mapper was throttling the entire ROS networking due to how frequently the map was being published. I had to throttle it so it only publishes every second. Additionally, I settled on using the odds formulation of the Bayes rule. This allowed me to do the updates through the addition of log odds instead of multiplying the probabilities. For the planner I applied A*, I found that it sometimes found paths between occupied pixels that were not mapped properly. This wasn't too much after I improved the maps by doing multiple passes using the teleop. Another issue with the planning was that it always selected paths that were very close to obstacles. Fortunately, the VFH follower is robust enough to reach the waypoint within a tolerance radius and not crash. Finally, the biggest problem I had was dealing with the transforms from the generated path to the actual waypoint following. I had to make sure that the waypoints were related to the map frame and then transform them to the odom frame for the path follower. I found this assignment to be more challenging than the previous one since more algorithms are working together this time around, and getting them to all work nicely with each other took a lot of time. All in all, I enjoyed it since it gets us one step closer to the complete robot navigation pipeline.