Autonomous Mobile Robotics

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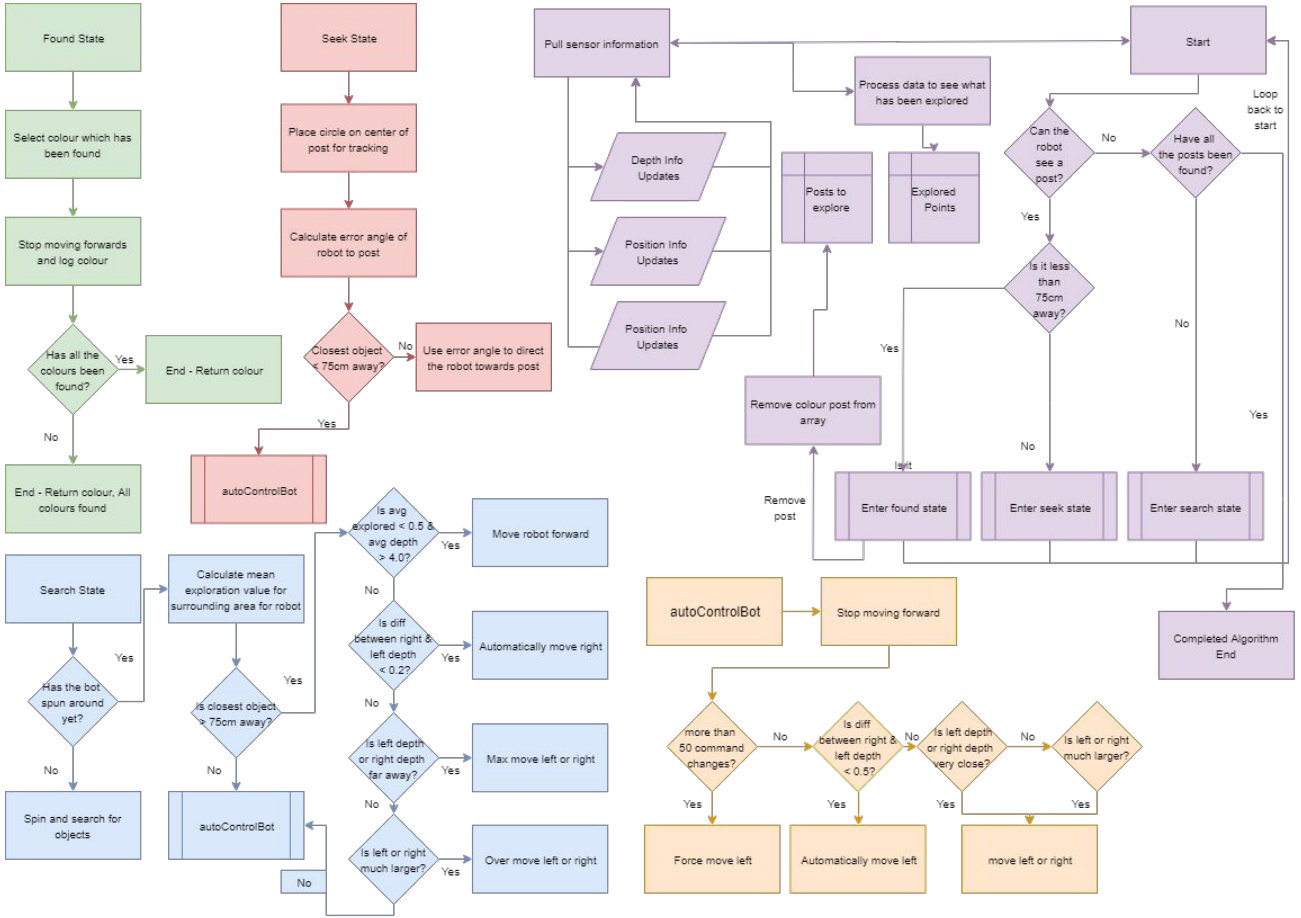
CMP3103M Assessment Item 1, Presentation

Flow Chart

Algorithm Design

The design of the algorithm utilises the creation of three states, search, seek and found. The search state, as you can see in the blue color on the diagram implements several checks, and utilises the explored area array generated by the position info updates as well as the depth. The search state is inherently attracted to longer distances and unexplored areas in its writing, and tries to navigate away from areas it has already reached. The second state, seek, shown in the flowchart as the red colour calculates the angular error to the post from the current position of the robot, and then checks if it has any obstacles in the way, if there are, it calls the generic autoControlBot. This function takes over if the robot cannot move forward, and ensures that it navigates walls and objects close to the robot. The final state, found state, identifies which post has been found, and then removes it from the mask that the algorithm is searching for.



Generated Graph Output

Algorithm Performance

The performance of the algorithm over a series of random points can vary. The starting position of the robot in most cases isn't relevant to the eventual performance of the algorithm, as the autoControlBot handles getting out of tight places, and can easily navigate places such as the table at the top of the map.
In some cases, the robot does return to places it has visited previously, as it detects that is the most likely place to find new unexplored areas. However, as the search algorithm looks for fara way distances as well, in most test cases it goes away from areas it has already visited, and only goes back if it needs to pass through.
In cases where the bot sees multiple posts, it goes for the closest one, if for example they were right next to each other, the bot would move to the middle of both of them, before picking the one that becomes closer.
Areas for improvement on the algorithm are if you see a post, and can't access it, it should record the position of the post, for future access. Additionally, a goal state if not all posts have been found, and a square has been drawn around the outside of the generated map, it should move towards the center looking for items of interest.
Overall, the algorithm has good performance, and finds most posts in any location within 5 minutes.