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Sec-3

Q1

For the given environment, ~~bug based~~ occupancy grid mapping can be suitable. It roam around the environment and maps the location by identifying obstacles & free paths. The mapping algorithm is:

i. Initialize the grid: At first the 2D matrix needs to be initialize and as value all will set to 2, as unknown value.

ii. Update the grids: The robot will randomly set on a place and that position will be located as free space/ unoccupied. if it see any obstacle nearby then at will set as occupied and inbetween spaces will set as unoccupied. Then the robot will chang its position. Pick a next move

iii. Move to next position: The robot will shift or change its position to another

unoccupied position of the environment. Here robot can use any graph technique or, Ai algorithms like A* etc.

iv. Loop forever: After completing above steps it will again ~~from~~ start from the 2nd step.

Q2.

Frontier based exploration helps a robot to find the optimal and efficient approach to cover the environment in most effieient way, otherwise it might get time consumming.

In such approach, the robot visit a position that is ~~unoccupied and~~ unknown position and next to it there is a free space. By doing so the robot directly goes to the desired unknown position. As a result the steps of the robot doesnot get redundent. By finding an

unknown position and reaching towards there in order to get the environment known helps to explore the area more efficiently.

The balance exploration with robot's primary task :

1. First it will get know the goal position.
2. Then it will move to the forward position as it is unoccupied.
3. If it finds any obstacle / occupied place, ~~than~~ the robot will turn and will start moving by the nearby obstacle.
4. To get the optimal move, the ~~deli~~ robot will find ~~opt~~ shortest or, safest path.
5. As, object are moving. So, if there is any new obstacle, it will occupied that and after a while again check that during delivering.

Q.3 .

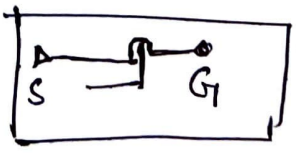
Dead reckoning technique can be applied for localization, if no known landmark is present.

When a robot moves, it rotates the actuators and takes steps. In dead reckoning, the initial position of the robot is known. If it takes any step or, rotate any actuator then according to that the new position is calculated. Depending on pace, motion and potation the calculated position gets updated. That is how we can locate the current position of that robot.

Q4

Bug based path planning can be applied for such situation. As, the goal and directions are known.

In bug based technique, it uses two sensors. One for locating the goal which is like a compare and to avoid obstacles it uses ultrasonic sensors. The robot moves towards the goal position untill it finds any obstacles. If obstacle is found then it moves towards to the boundary of that obstacle and again it is to the position towards the goal then again starts moving to it. and this continuses.



Demostration.

So, by moving towards the goal and avoiding the obstacle like a bug it plans the path.