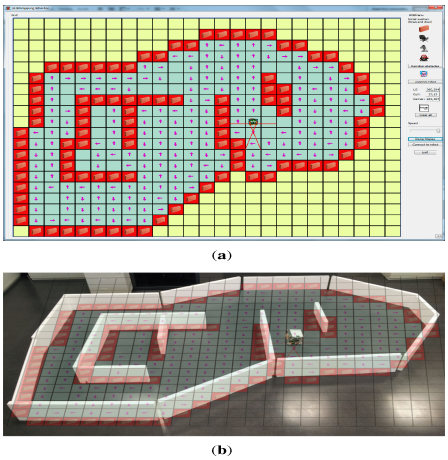
BRAC UNIVERSITY
Inspiring Excellence

Course : CSE461 (Introduction to Robotics)

Quiz-3 (Section-01)

Time: 50 minutes Marks: 20

Name: ID:



(a)

(b)

Warehouse

[CO1] You are a robotics engineer working for a logistics company that operates a large warehouse (Like the Given Figure). Your company has invested in a delivery robot that is designed to autonomously navigate through the warehouse, pick up packages from designated locations, and deliver them to different areas within the facility. The robot must navigate around obstacles such as pallets, boxes, and other equipment, while also avoiding collisions with people working in the warehouse. Your task is to design a navigation system that will enable the robot to efficiently and effectively complete its delivery tasks.

1. What techniques would you use for localizing the robot within the warehouse, and why? How would you ensure accurate localization even in situations where the robot's sensors might be obstructed? **[3 marks]**
2. What approach is taken to mapping the warehouse environment? Explain the mapping algorithm. **[3 marks]**
3. How Frontier Based Exploration helps the robot discover new areas of the warehouse that it has not yet visited? How would you balance exploration with the robot's primary task of delivering packages? **[4 marks]**

[CO2] You are working on a project to develop an autonomous drone that will be used for aerial photography. The drone will be equipped with a high-resolution camera sensor that can capture images and videos with exceptional clarity and detail. The drone will be used to capture footage of various outdoor events such as concerts, festivals, and sports matches.

The drone will be flying at different altitudes and speeds, and the camera will need to adjust to changes in lighting conditions, motion blur, and focus. Additionally, the lighting conditions at the events will vary, with some locations having bright sunlight, while others will have low light or artificial lighting.

1. How can you adjust the camera settings to capture high-quality footage in different lighting conditions? Provide examples of scenarios where you would use a high ISO setting versus a low ISO setting, and how it affects the quality of the footage. How can you use the shutter speed to control motion blur? **[5 Marks]**

2. What is the importance of the camera sensor in capturing high-quality footage? How does the sensor size affect the quality of the footage? What is the difference between rolling and global shutter mechanisms, and how does it affect the quality of the footage? **[5 Marks]**