

COMP0037

Report

Learning and Planning

Group AS

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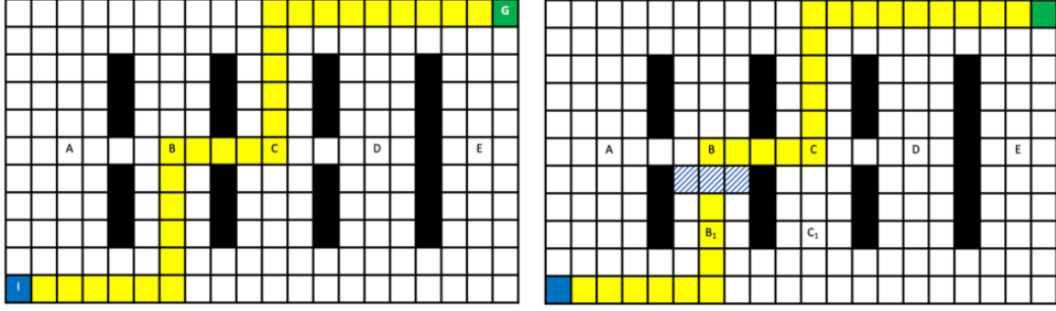
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1 Decision Re-Plan Policy

1.1 Policy Selection when Obstacle is Observed



(a) The original planned path from I to G (b) An obstacle in aisle B obstructs the going through Aisle B and C. planned path of the robot.

Figure 1: Illustration of case where robot observes an obstruction to its planned path.

The scenario that we will be analysing is the case shown in Fig. 1a. The robot is required to go from a cell I to a cell G . These cells are marked blue and green in Fig. 1a respectively. The figure also shows the original planned path that the robot computed going down aisle B. However, once the robot turns into aisle B it observes that the aisle is blocked. This observation is done at the point when the robot reaches the cell labelled B_1 . At this point the robot can either decide to wait until the obstruction clears or it can re-plan a path. Once the robot observes the obstacle, the time the robot must wait for the obstacle to clear may be represented by the expression in Eq. 1.

$$T = \frac{0.4}{\lambda_B} + \tilde{T} \quad (1)$$

The wait time is dependent on λ_B and a random variable \tilde{T} . The random variable \tilde{T} is sampled from a exponential distribution with a rate parameter of $0.5\lambda_B$. The probability density function (PDF) for \tilde{T} is shown in Eq. 2.

$$f(t) = \begin{cases} 0.5\lambda_B e^{-0.5\lambda_B t} & t \geq 0 \\ 0 & t < 0 \end{cases} \quad (2)$$

As previously mentioned, the robot has two options to choose from: to wait for the obstacle to clear, or to re-plan and execute the new path. The two are different policies the robot must choose from. We use the symbol π to denote a policy. A policy is a mapping from the world state to an action the robot can execute.

1.2 Policy Selection at Start

1.3 Considering the Probability of the Obstacle Being Present

1.4 Considering Multiple Obstacles

2 ROS Implementation

References

Appendices