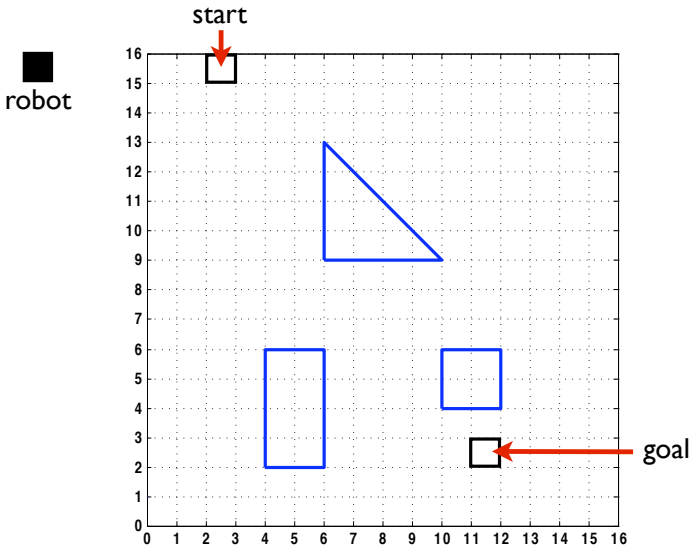
Autonomous and Mobile Robotics
Class Test no. 2

Problem 1

Consider the planar motion planning problem shown in figure. The robot is a square of unit side and can translate freely in the plane without changing its orientation.



Build the $\mathcal{C}$-obstacles and show all the steps of a solution obtained using the planning method based on approximate cell decomposition.

[*The steps should be graphically illustrated; in particular, for each step draw the current decomposition and the associated connectivity graph. Channels can be identified by visual path search. At the end, show a solution path extracted from the free channel.*]

Problem 2

Consider a rear-wheel drive car-like robot equipped with a sensor that can measure the distance between itself and a single landmark positioned at the origin of the Cartesian plane. The sensor is placed on the sagittal axis of the robot, at a distance $\ell/2$ from the midpoint of the rear wheel axis. The sensor can always see the landmark.

Build an Extended Kalman Filter for estimating the configuration of the robot.

[*The solution is obtained through the following steps (1) write a discrete-time model for the system and include noise (2) write the output equations and include noise (3) compute the linearization of the system and the output equations (4) write the EKF equations based on the obtained formulas.*]

[2 hrs]