Exercise 2.1
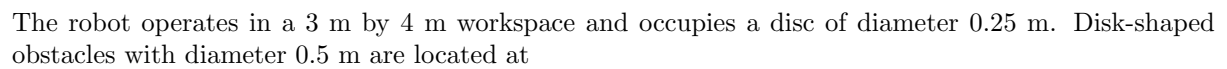
Consider the path optimization of a given path of a disc-shaped robot moving in the environment shown in the figure below.

The robot operates in a 3 m by 4 m workspace and occupies a disc of diameter 0.25 m. Disk-shaped obstacles with diameter 0.5 m are located at

$$(x, y) = (1 \text{ m}, 1.7 \text{ m}), (1.5 \text{ m}, 2.1 \text{ m}), (2.55 \text{ m}, 0.95 \text{ m}), (0.95 \text{ m}, 0.7 \text{ m}), (2.6 \text{ m}, 2.0 \text{ m})$$

A collision-free path is given with milestones (ordered list)

$(0.5, 2.7), (0.9, 2.3), (0.3, 2.1), (0.3, 1.2), (0.18, 0.75), (0.8, 1.15), (1.4, 1.25), (1.45, 1.6), (2.0, 1.7),$
$(2.0, 2.5), (3.3, 2.4), (3.35, 1.4), (2.1, 1.4), (1.75, 0.5), (1.85, 0.2), (2.65, 0.25), (3.0, 0.7), (3.5, 1.0), (3.5, 0.3)$

Find an optimized path based on the given milestones, by a) minimizing path length and b) ensuring a large clearance. Use $step = 0.1$ m.