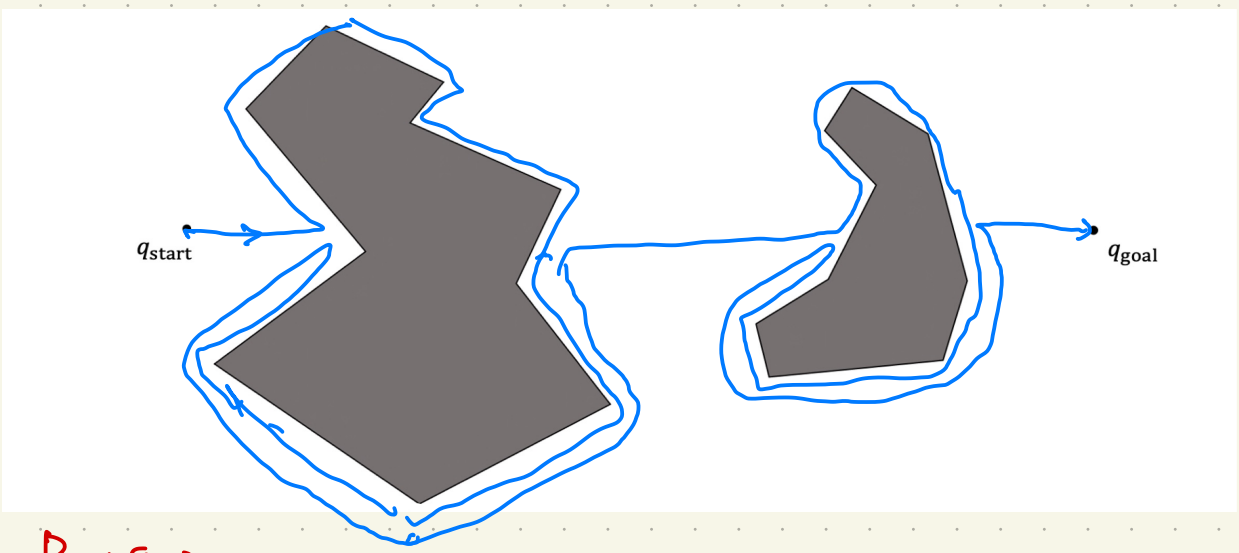
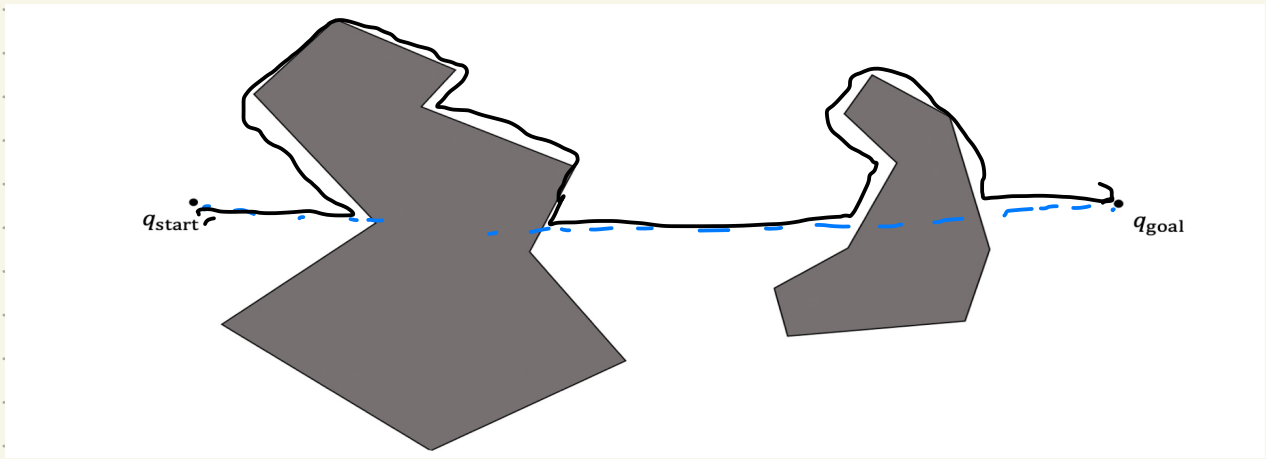
HW 1

Exercise 1. Draw the trajectories produced by Bug 1, Bug 2, and Tangent Bug (with unlimited radius) algorithms for a point robot in the workspace shown in Figure 1.

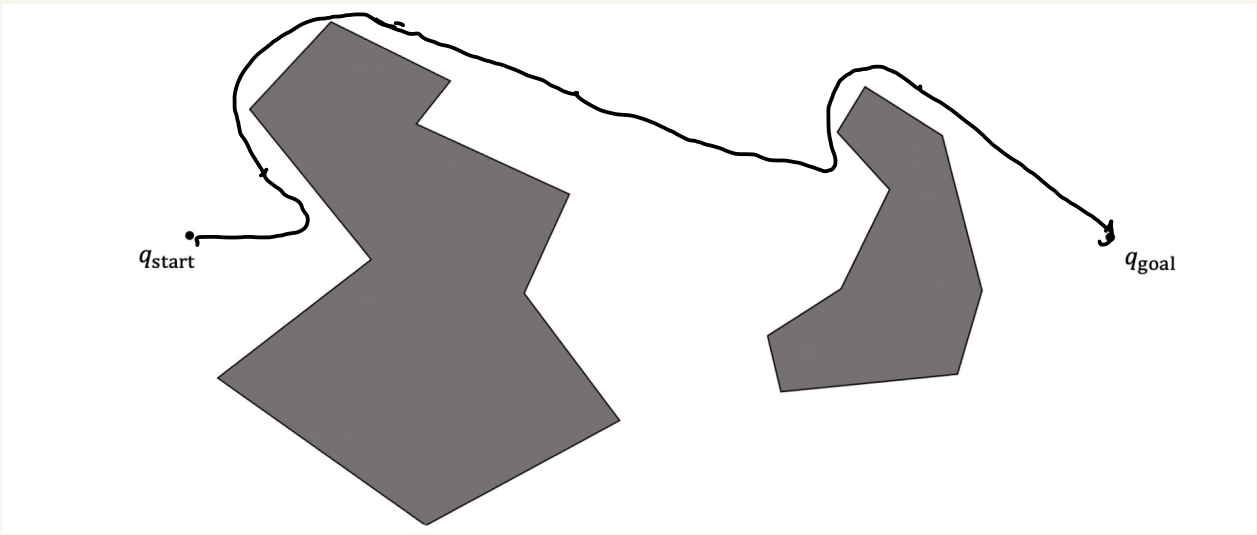
Bug 1



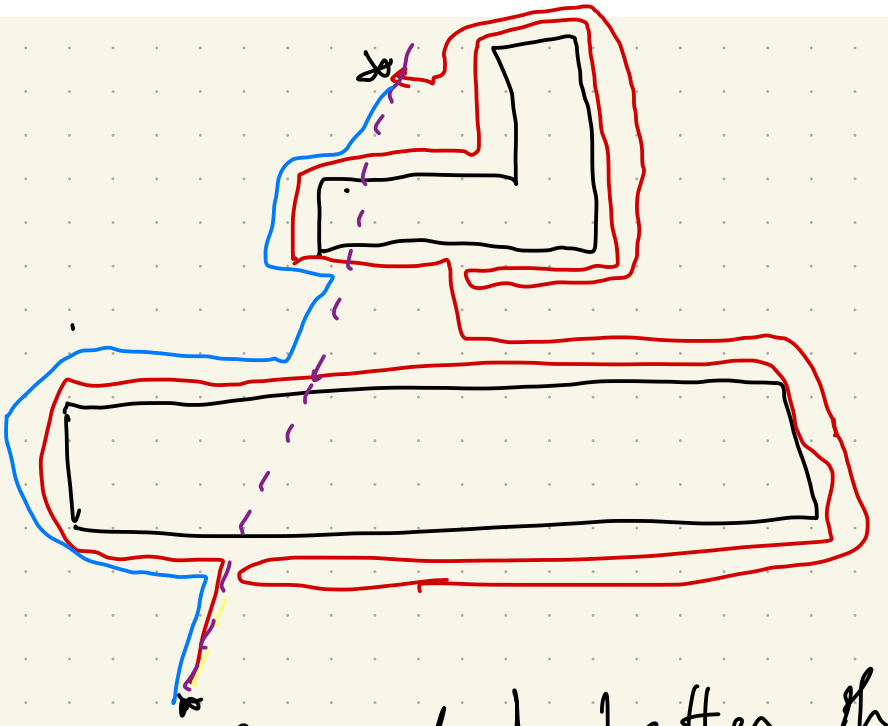
Bug 2



Tangent Bug



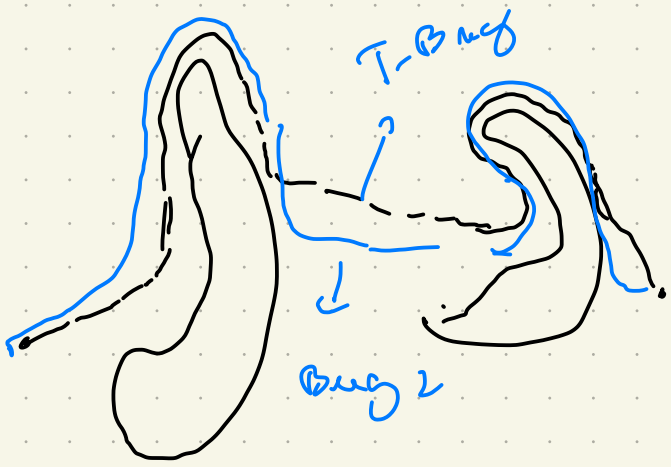
Exercise 2. Construct an example for which the upper bound of the traveled path for Bug 1 is obtained. How does Bug 2 perform in this example?



bug2 in blue did better than bug

Exercise 3. What is the difference between the Tangent Bug algorithm with zero range detector and Bug 2? Draw examples.

The different between Tangent Bug with zero range turn toward obstacle when heuristic can be increase vs bug2 move toward obstacle when meet straigh line distance :



Exercise 5. Is the the Tangent Bug algorithm complete? Show a counter example or a proof.

It is complete but sometimes not
or not always

Exercise 4. Consider a point robot at q_{start} with the goal of reaching q_{goal} in workspace W which consists of a set of obstacles $WO = \bigcup_{i=1}^{n} WO_i$, where WO_i for all $i \in \{1, 2, \ldots, m\}$ $(m < n)$ is within the radius of $d(q_{\text{start}}, q_{\text{goal}})$ from q_{goal} and the rest of the obstacles are outside of this radius. What is the maximum number of obstacles the robot will encounter if it uses BUG 1 algorithm? Justify your answer.

the maximum amount of obstacle that the robot can encounter is equal to the amount of obstacle within the radius of $d(q_{start}, q_{goal})$

Justify:

Bug 1 algorithm always search the shortest distance from goal to obstacle. If all other obstacle is beyond radius d, therefore no obstacle extend over d. Thus the robot will always stay toward the goal within d until traveling

Exercise 6. Consider a robot equipped with a laser rangefinder that has a field of view of 270 degrees. Write an algorithm that guarantees to take this robot from q_{start} to q_{goal}. (Hint: adapt Tangent Bug algorithm)

While $q_i = q_g$

If no obstacle:
move toward q_g
If obstacle within range:
Follow Tagent

end.

(7)

(a) Plot the paths generated by Bug 1 and Bug 2 algorithms.

(b) What are the lengths of the paths generated by Bug 1 and Bug 2 algorithms?

(c) Would you expect the same path lengths if the robot were right turning?

1.) See code

2.) ran code.

3: No the Path length would have been different. especially for the workspace 1