Pset 3

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3a) 2D position : $\{[x, y] \mid x, y \in Q^+, \ 0 \leq x, y \leq 360\}$

⇒ This position is not enough to represent the state of the robot for this task, it does not contain enough information about the state. A better state representation would include the direction of the robots directional components (sails, propellers, etc.), and perhaps the fuel level percentage.

3 b) Discretizing the position by a lattice decomposition will increase the amount of states due to the new state variable. This will require much more computational power for transitioning between states.

3 c) One way to approximate the value function would be to choose basis functions for the fuel level (whether a refill is needed) and an 8-value definition for direction $\{N, S, W, E, NW, SW, NE, SE\}$. This will significantly simplify the value function approximation.

$$\phi_0 = \begin{cases} 1 & \text{if fuel level} \geq 20\% \\ 0 & \text{else} \end{cases}$$

$$\phi_1 = \begin{cases} 0 & \text{for direction} = N \\ 0.125 \longrightarrow & = W \\ 0.25 \longrightarrow & = S \\ 0.375 \longrightarrow & = E \\ 0.5 \longrightarrow & = NW \\ 0.625 \longrightarrow & = SW \\ 0.750 \longrightarrow & = NE \\ 0.875 \longrightarrow & = SE \end{cases}$$

3 d) Yes