

Homework 2

Eduardo Miranda 95569

Rodrigo Pinto 95666

1.) a) $A = \{(D) \text{ drop garbage}, (C) \text{ collect garbage}, (MU) \text{ move up}, (MD) \text{ move down}, (ML) \text{ move left}, (MR) \text{ move right}\}$

$X = \{(R, B, C, D), (R, \neg B, C, D), (R, \neg B, \neg C, D), (R, \neg B, \neg C, \neg D), (R, B, \neg C, \neg D), (R, B, C, \neg D), (R, B, \neg C, D), (A, B, C, D), (A, \neg B, C, D), (A, \neg B, \neg C, D), (A, \neg B, \neg C, \neg D), (A, B, \neg C, \neg D), (A, B, C, \neg D), (A, B, \neg C, D), (A, B, C, D), (B, B, C, D), (B, \neg B, C, D), (B, \neg B, \neg C, D), (B, \neg B, \neg C, \neg D), (B, B, \neg C, \neg D), (B, B, C, D), (B, B, \neg C, D), (C, B, C, D), (C, \neg B, C, D), (C, \neg B, \neg C, D), (C, \neg B, \neg C, \neg D), (C, B, \neg C, \neg D), (C, B, C, D), (C, B, \neg C, D), (D, B, C, D), (D, \neg B, C, D), (D, \neg B, \neg C, D), (D, \neg B, \neg C, \neg D), (D, B, \neg C, \neg D), (D, B, C, \neg D), (D, B, C, D), (E, B, C, D), (E, \neg B, C, D), (E, \neg B, \neg C, D), (E, \neg B, \neg C, \neg D), (E, \neg B, \neg C, D), (E, B, \neg C, \neg D), (E, B, C, \neg D), (E, B, C, D), (F, B, C, D), (F, \neg B, C, D), (F, \neg B, \neg C, D), (F, \neg B, \neg C, \neg D), (F, B, \neg C, \neg D), (F, B, C, \neg D), (F, B, C, D), (R, \neg B, C, \neg D), (A, \neg B, C, \neg D), (B, \neg B, C, \neg D), (C, \neg B, C, \neg D), (D, \neg B, C, \neg D), (E, \neg B, C, \neg D), (F, \neg B, C, \neg D)\}$

b)

$$\text{Cost}(\overbrace{\text{loc}, b, c, d}^{\text{state}}, \text{action}) =$$

$$\left\{ \begin{array}{ll} 0 & \text{if } \text{loc} = R \text{ and } b=1 \text{ and } c=1 \text{ and } d=1 \text{ and action} = \text{drop garbage} \\ 10 & \text{if } ((\text{loc} = B \text{ and } b=0) \text{ or } (\text{loc} = C \text{ and } c=0) \text{ or } (\text{loc} = D \text{ and } d=0)) \\ & \text{and action} = \text{collect garbage} \\ 20 & \text{if } (\text{loc} = E \text{ and action} = MR) \text{ or } (\text{loc} = F \text{ and action} = MD) \\ 30 & \text{if } (\text{loc} = R \text{ and action} = MR) \text{ or } (\text{loc} = A \text{ and action} = ML) \\ 40 & \text{if } (\text{loc} = A \text{ and action} = MR) \text{ or } (\text{loc} = B \text{ and action} = ML) \\ 55 & \text{if } (\text{loc} = A \text{ and action} = MD) \text{ or } (\text{loc} = C \text{ and action} = ML) \text{ or} \\ & (\text{loc} = C \text{ and action} = MR) \text{ or } (\text{loc} = E \text{ and action} = ML) \\ 70 & \text{if } (\text{loc} = A \text{ and action} = MU) \text{ or } (\text{loc} = D \text{ and action} = ML) \\ & \text{or } (\text{loc} = D \text{ and action} = MR) \text{ or } (\text{loc} = F \text{ and action} = MU) \\ 80 & \text{if } (\text{loc} = B \text{ and action} = MR) \text{ or } (\text{loc} = F \text{ and action} = ML) \\ \infty & \text{else} \end{array} \right.$$

c) This statement would not be true if the truck could stay idle after successfully dropping of the garbage at the recycling plant. In this state, the optimal policy would be to remain idle and take no action, resulting in a cost of zero. But since the MDP "resets" to the initial configuration after a successful drop, the statement is true, because all the other actions that are not a successful drop have non-zero costs.