

CSE360 Summer 2021 Assignment 5

John J Li

June 11, 2021

Problem 1

A group of middle school students want to create a program to help a robot navigate through a maze. There are sensors on the front, left, and right side of the robot. These sensors send two possible signals, “Y” - there is a wall in this direction and “N” - there is no wall in this direction. The sensors send these signals every three seconds and depending on the combination of signals, the robot will perform a different action.

The students decided to make the program do the following:

- If there is no wall to the front, left, and right of the robot – Move forward
- If there is no wall in front and left of the robot and there is a wall to the right of the robot – Move forward
- If there is no wall in front and right of the robot and there is a wall to the left of the robot – Move forward
- If there is no wall in front of the robot and there is a wall to the left and right of the robot – Move forward
- If there is a wall in front of the robot and there is no wall to the left and right of the robot – Turn left and move forward
- If there is a wall in front and to the right of the robot and there is no wall to the left of the robot – Turn left and move forward
- If there is a wall in front and to the left of the robot and there is no wall to the right of the robot – Turn right and move forward
- If there is wall in front, to the left, and to the right of the robot – Turn around 180° and move forward

The students need help making the decision table. Fill in the missing “???” conditions to make the decision table match the list of decisions described above.

Conditions	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8
There is a wall in front of the robot	N	N	N	N	Y	Y	Y	Y
There is a wall to the left of the robot	N	N	Y	Y	N	N	Y	Y
There is a wall to the right of the robot	N	Y	N	Y	N	Y	N	Y
Actions								
Move forward	X	X	X	X				
Turn left and move forward					X	X		
Turn right and move forward							X	
Turn around 180° and move forward								X

Problem 2

There are eight rules from problem 1. Some of the rules are redundant (see the second video at the 7:18 minute mark) since they result in the same action. Use the table below to reduce the decision table from problem 1. Use a “ - ” to represent the conditions that do not matter in the rule.

Conditions	R_1	R_2	R_3	R_4
There is a wall in front of the robot	N	Y	Y	Y
There is a wall to the left of the robot	-	N	Y	Y
There is a wall to the right of the robot	-	-	N	Y
Actions				
Move forward	X			
Turn left and move forward		X		
Turn right and move forward			X	
Turn around 180° and move forward				X

Problem 3

A client is starting up a bike rental service and has hired you to create the system to charge customers. After talking with the client, you have determined the following:

- If a customer rents the bike for less than 2 hours, they should be charged \$7.
- If a customer rents the bike for more than 2 hours, they should be charged \$25.
- If a customer rents a bike helmet, they should be charged \$5.
- If a customer rents a bike lock, they should be charged \$5.
- If a damaged bike is returned, the customer should be charged \$20.

Items (a) and (b) are considered the base price of the rental. All the other items add an extra fee onto the base price.

Create a decision table to model the conditions and actions described above. Note: the table below is a placeholder, you can add/remove rows and columns as needed.

Conditions	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8
Customer rents the bike for more than 2 hours	N	N	N	N	N	N	N	N
Customer returns damaged bike	N	N	N	N	Y	Y	Y	Y
Customer rents a bike helmet	N	N	Y	Y	N	N	Y	Y
Customer rents a bike lock	N	Y	N	Y	N	Y	N	Y
Actions								
Customer is charged \$5		X	X			X	X	
Customer is charged \$7	X	X	X	X	X	X	X	X
Customer is charged \$10				X				X
Customer is charged \$20					X	X	X	X
Customer is charged \$25								

Conditions	R_9	R_{10}	R_{11}	R_{12}	R_{13}	R_{14}	R_{15}	R_{16}
Customer rents the bike for more than 2 hours	Y	Y	Y	Y	Y	Y	Y	Y
Customer returns damaged bike	N	N	N	N	Y	Y	Y	Y
Customer rents a bike helmet	N	N	Y	Y	N	N	Y	Y
Customer rents a bike lock	N	Y	N	Y	N	Y	N	Y
Actions								
Customer is charged \$5		X	X			X	X	
Customer is charged \$7								
Customer is charged \$10				X				X
Customer is charged \$20					X	X	X	X
Customer is charged \$25	X	X	X	X	X	X	X	X