Robot Range Map

Topic Course: CS473 Computer Graphics in Java

Due:

Name_____ **I.D.** (last 4 digits)_____

Range Map (15pts).

This assignment is designed to give you a feel for writing graphics applications. As a part of this assignment, you are required to write a program for generating the "range map" of an enclosed two-dimensional work environment for a given position and orientation of a mobile robot. The mobile robot obtains such maps by using either laser sensors or ultrasonic sensors. For a mobile robot with N sensors, the range map consists of N radial line segments at angular increments of $2\pi/N$. The initial line segment is in the direction of robot heading or orientation. These radial segments are drawn outwards from the robot's position. Each segment terminates when it hits a wall. Some examples of range maps are shown below.

Input: The input to your program should consists of the followings:

1. The map of the room. It should be specified in terms of number of corners in the room and their respective x-y coordinates. (Use a polygon to represent a room).
2. The position of the robot in the room.
3. The heading direction of the robot. It should be specified as an angle measured in clock-wise direction from the horizontal axis.
4. The number of sensors, N, on the robot.

Output: The output of the program should display:

1. The map of the room in the form of a polygon.
2. The position and the orientation of the robot in the form of a small circle with a clock-hand type line to indicate the robot heading.

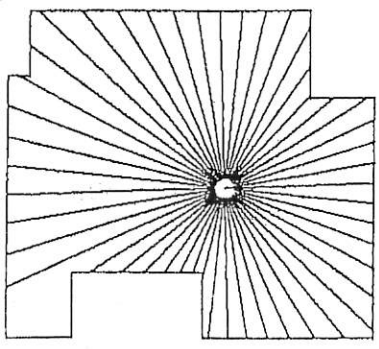
Partners

You are allowed to work with a partner on this project. Be sure to include both of your names on the program that you turn in.

Hand in

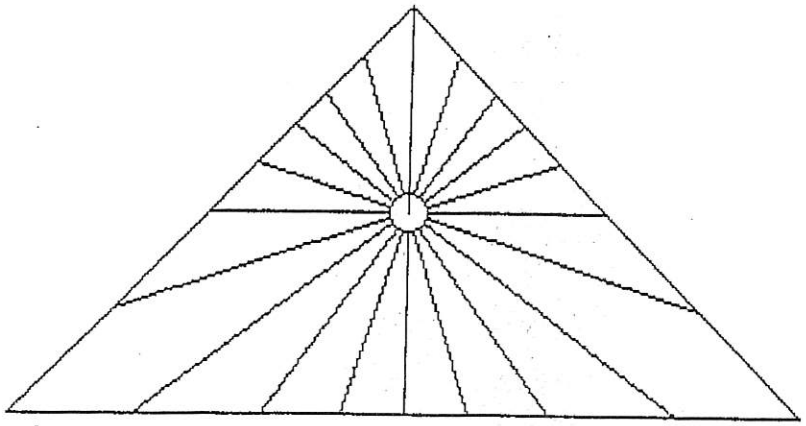
1. A printout of your program with ample comments, and make sure your names are included in the comments.
2. The sets of data which you use to test your program;
3. A disk which contains your source code and the executable program.

Output Examples: (More on next page)



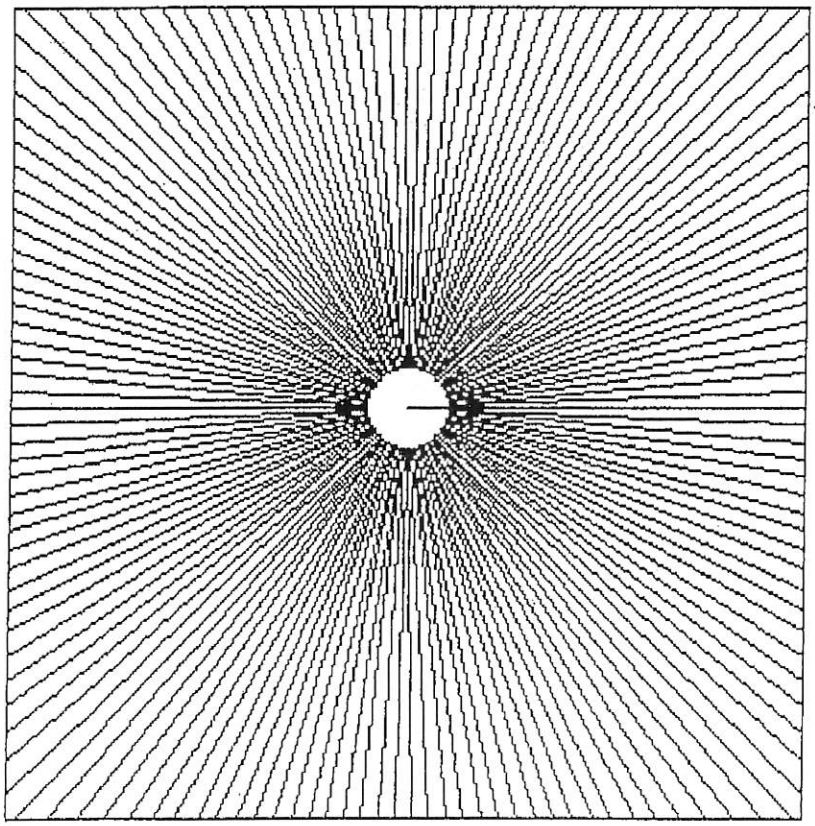
The testing data of the following output graph

(X[0],Y[0])=(0, 0)	(X[1],Y[1])=(300, 0)	(X[2],Y[2])=(150,150)
# of sensor line= 20	robot location=(150,75)	Heading direction= 90



The testing data of the following output graph

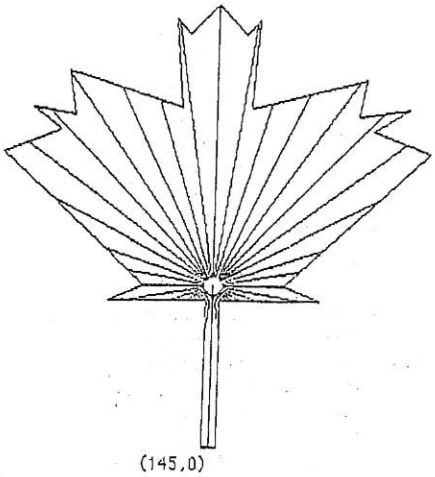
(X[0],Y[0])=(0, 0)	(X[1],Y[1])=(300, 0)	(X[2],Y[2])=(300,300)
(X[3],Y[3])=(0,300)		
# of sensor line=150	robot location=(150,150)	Heading direction= 0



The testing data of the following output graph

(X[0],Y[0])=(145, 0)	(X[1],Y[1])=(155, 0)	(X[2],Y[2])=(155,100)
(X[3],Y[3])=(225,100)	(X[4],Y[4])=(200,110)	(X[5],Y[5])=(300,200)
(X[6],Y[6])=(260,215)	(X[7],Y[7])=(285,230)	(X[8],Y[8])=(250,225)
(X[9],Y[9])=(255,250)	(X[10],Y[10])=(175,230)	(X[11],Y[11])=(180,290)
(X[12],Y[12])=(170,280)	(X[13],Y[13])=(150,300)	(X[14],Y[14])=(130,280)
(X[15],Y[15])=(120,290)	(X[16],Y[16])=(125,230)	(X[17],Y[17])=(45,255)
(X[18],Y[18])=(50,225)	(X[19],Y[19])=(20,230)	(X[20],Y[20])=(40,215)
(X[21],Y[21])=(0,200)	(X[22],Y[22])=(100,110)	(X[23],Y[23])=(75,100)
(X[24],Y[24])=(145,100)		

# of sensor line= 40	robot location=(150,110)	Heading direction=270

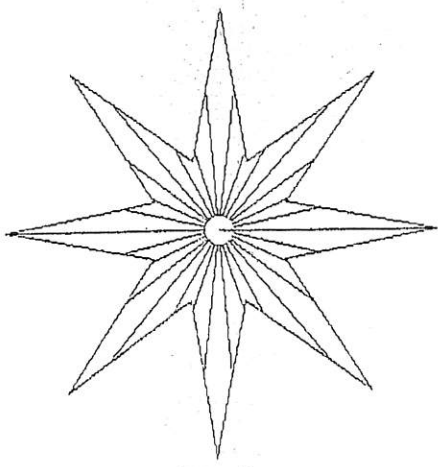


(145,0)

The testing data of the following output graph

(X[0],Y[0])=(150, 0)	(X[1],Y[1])=(169,103)	(X[2],Y[2])=(256, 44)
(X[3],Y[3])=(196,131)	(X[4],Y[4])=(300,150)	(X[5],Y[5])=(196,169)
(X[6],Y[6])=(256,256)	(X[7],Y[7])=(169,196)	(X[8],Y[8])=(150,300)
(X[9],Y[9])=(131,196)	(X[10],Y[10])=(44,256)	(X[11],Y[11])=(104,169)
(X[12],Y[12])=(0,150)	(X[13],Y[13])=(104,131)	(X[14],Y[14])=(44, 44)
(X[15],Y[15])=(131,103)		

# of sensor line= 30	robot location=(150,150)	Heading direction= 0



(150, 0)

The testing data of the following output graph

(X[0],Y[0])=(18, 65)	(X[1],Y[1])=(28, 63)	(X[2],Y[2])=(38, 48)
(X[3],Y[3])=(68, 32)	(X[4],Y[4])=(76, 36)	(X[5],Y[5])=(94, 18)
(X[6],Y[6])=(114, 20)	(X[7],Y[7])=(136, 0)	(X[8],Y[8])=(136, 5)
(X[9],Y[9])=(152, 26)	(X[10],Y[10])=(183, 26)	(X[11],Y[11])=(182, 34)
(X[12],Y[12])=(212, 36)	(X[13],Y[13])=(227, 4)	(X[14],Y[14])=(238, 10)
(X[15],Y[15])=(224, 46)	(X[16],Y[16])=(227, 68)	(X[17],Y[17])=(245, 98)
(X[18],Y[18])=(240,116)	(X[19],Y[19])=(250,132)	(X[20],Y[20])=(248,135)
(X[21],Y[21])=(251,165)	(X[22],Y[22])=(252,172)	(X[23],Y[23])=(270,187)
(X[24],Y[24])=(260,198)	(X[25],Y[25])=(252,186)	(X[26],Y[26])=(232,185)
(X[27],Y[27])=(200,155)	(X[28],Y[28])=(205,153)	(X[29],Y[29])=(192,142)
(X[30],Y[30])=(190,162)	(X[31],Y[31])=(180,153)	(X[32],Y[32])=(187,177)
(X[33],Y[33])=(152,185)	(X[34],Y[34])=(132,184)	(X[35],Y[35])=(115,186)
(X[36],Y[36])=(53,184)	(X[37],Y[37])=(8,192)	(X[38],Y[38])=(0,100)
(X[39],Y[39])=(15, 80)		

# of sensor line= 30	robot location=(220,120)	Heading direction= 30