CITS 2401
Computer Analysis and Visualisation

THE UNIVERSITY OF WESTERN AUSTRALIA

Assignment 1
Microcars

Worth: 2% of the unit

Submission: Answer the questions on the quiz server.
Deadline: 13 March 2020 5pm
Late submissions: late submissions attract 5% penalty per day up to 7 days (i.e., 20 March 2020 5pm). After, the mark will be 0 (zero). Also, any plagiarised work will be marked zero.

1. Outline

Real-time Optimization, Scheduling and Logistics (ROSL) research group in the Department of Computer Science and Software Engineering (CSSE) bought Remote-controlled Zen Wheel microcars for its research (http://zenwheels.com/). Researchers developed a testbed for testing different algorithms for autonomous vehicle and the project was finalist in WAITTA awards in the category of Research and Innovation Project of the year – Postgraduate Tertiary Student[1]. While working on the project, researchers developed an interface which can execute pre-determined programs. However, it is found that movement of microcars is not perfect and will sometimes perform an incorrect action.

Researchers when testing their latest development maintain a copy of the intended program but also track what movements have actually been made externally. Each car can perform the following four movements: North, West, East and South.

Researchers have performed a series of trials where two microcars have been tested in sequence and have bundled all the data into an excel sheet "assignment1.xlsx". The file contains data in six columns having titles.

Column A	Experiment sequence number
Column B	Direction of command for the vehicle (N,E,W,S for North, East, West and South respectively)
Column C	The intended speed for microcar (cm/sec)
Column D	The respective time for microcar to move in the direction and speed mentioned in the same row (seconds)
Column E	The actual speed of the microcar 1 which researchers measured (cm/sec)
Column F	The actual speed of the microcar 2 which researchers measured (cm/sec)

Note: For each task, ensure that each results are updated as soon as the provided data is changed and solution must be generalised. When results are asked to be rounded off then do not use rounding off by formatting. Instead use round off function to round off the results. Use intelligent formatting and colour combinations to display your worksheet in an understandable manner. However, don't pimp up the worksheet.

[1]You can watch 60 seconds pitch of the project at: https://www.youtube.com/watch?v=ow3AwdkZjmE&feature=youtu.be

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2. Tasks

Task 1
Find the average speed of two microcars in column G. Round off the results to 2 decimal places and use array formula.

Task 2
Find the expected distance covered by the microcar in column H.

Task 3
Find the actual average distance covered by microcars using average speed found in Task 1 in column I. Round off the results to 2 decimal places.

Task 4
Find the error in the distance covered by the microcar using array formula and display results in column J. The error can be found by:

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Error = Expected_distance_covered - Actual_average_distance_covered
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Task 5
Find the expected horizontal and vertical position of the microcar on a two dimensional grid where North and East are considered positive while South and West are considered negative. Show the results in Columns K and L respectively. Presume that initially (before sequence 1) microcar was at origin (0, 0) or horizontal and vertical positions were zero.

Task 6
Similar to Task 5, find the actual average horizontal and vertical positions of microcars using average distance covered on a two dimensional grid and show results in Columns M and N respectively. Presume microcar was initially (before sequence 1) at origin.

Task 7
Find the difference (in terms of distance) between the expected and actual positions of microcar found in Task 5 and 6 respectively in Column O. Use Euclidean distance formula (look it up!) to calculate the distance between two points. Round off the results to 2 decimal places.

Task 8
Find the sum of the error in distances for each direction. You already found error for each sequence in Task 4. Show the absolute value of the result for each distance in the form of table in cell range P9 to Q13 (directions listed in the order of N, E, W, then S). In addition, plot the distribution of errors in each direction using a pie chart.

Task 9
Plot the distance and position errors for each experiment (already found in Task 4 and 7) using a line graph.

Task 10
Plot the expected and actual average track by microcars for first 50 experimental sequence numbers using a scatter chart with straight lines.

The sample image of worksheet is provided in Figure 1, and your solution may look similar to this. However, the data shown in the image is sample data and is not the correct result. The yellow blocks are added to the image to hide the sample data to avoid confusion.

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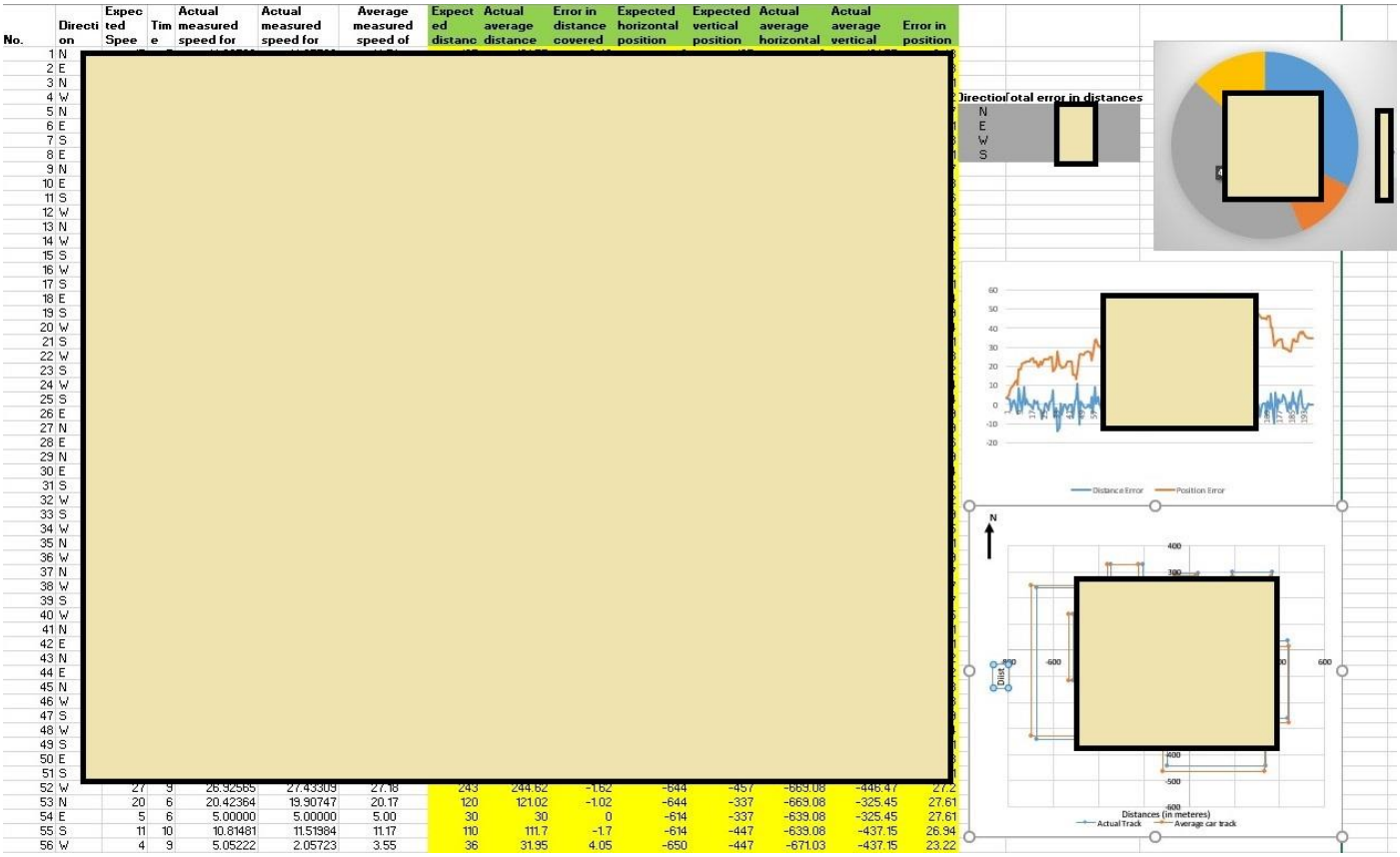

Figure 1. Sample image of the solution structure

3. Submission

You should answer the questions related to the tasks above on the quiz server by the due date - 13 March 2020 5pm (drop dead due date 20 March 2020 with 5% penalty per day).