Mission in Progress

Tracking the robot with time helps you to analyze the robot action in a time sequence based on location. This activity focuses on the analysis of time series data and the use of Microsoft Excel software to plot it.



Explorer's Guide

Before You Start

Your instructor or your leader will walk across the room from point A to point B without any guidance, avoiding any obstacles on the way. All of you get to draw the path of the leader on a piece of paper. Now your leader will take the same path from point B to point A at a faster rate. Draw the path of your leader now. Is there any difference in the two paths? What happens when you consider time?

Learning by Doing

1. Place GPS data logger on the robot.
2. Open the GPS Plot software as shown below. It shows GPS receiver output in real time. Record geographic position, travel speed and direction of the data logger.
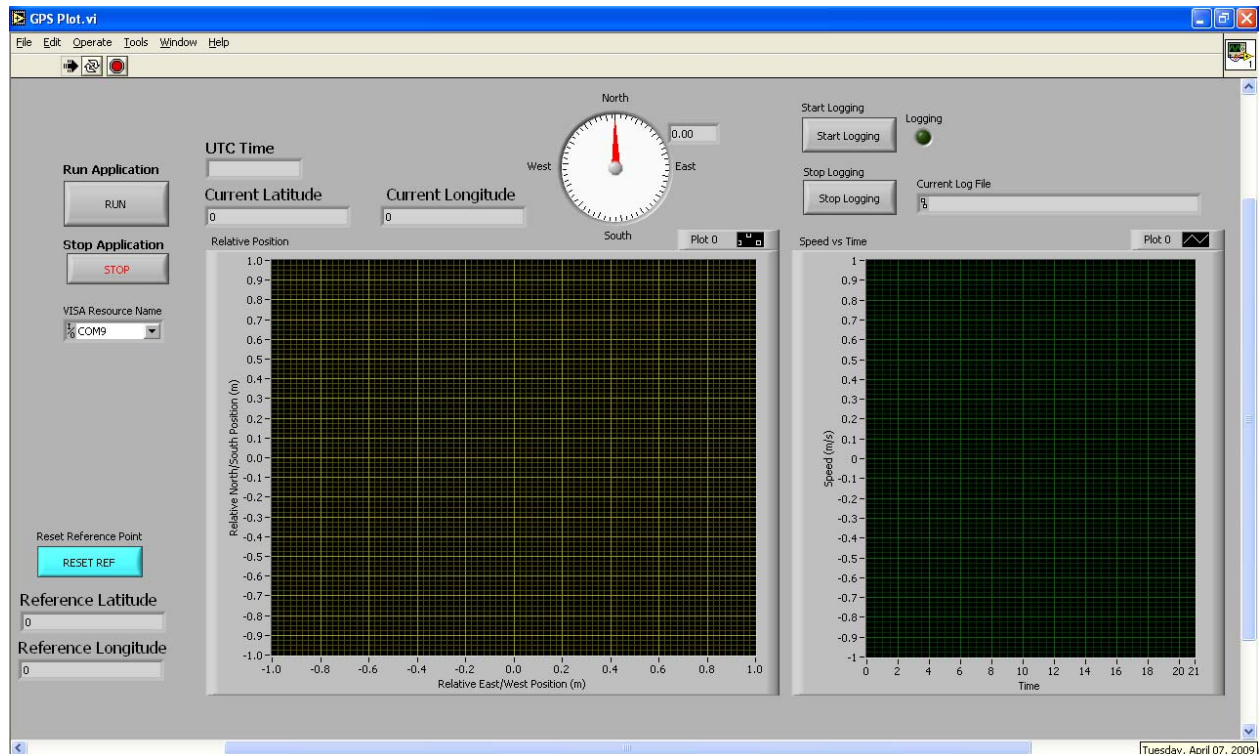
3. Navigate the robot around a 50x50 ft area. Give directions to the robot to go straight couple of steps and then turn right and so on.
4. Record travel speed and direction of the data logger.
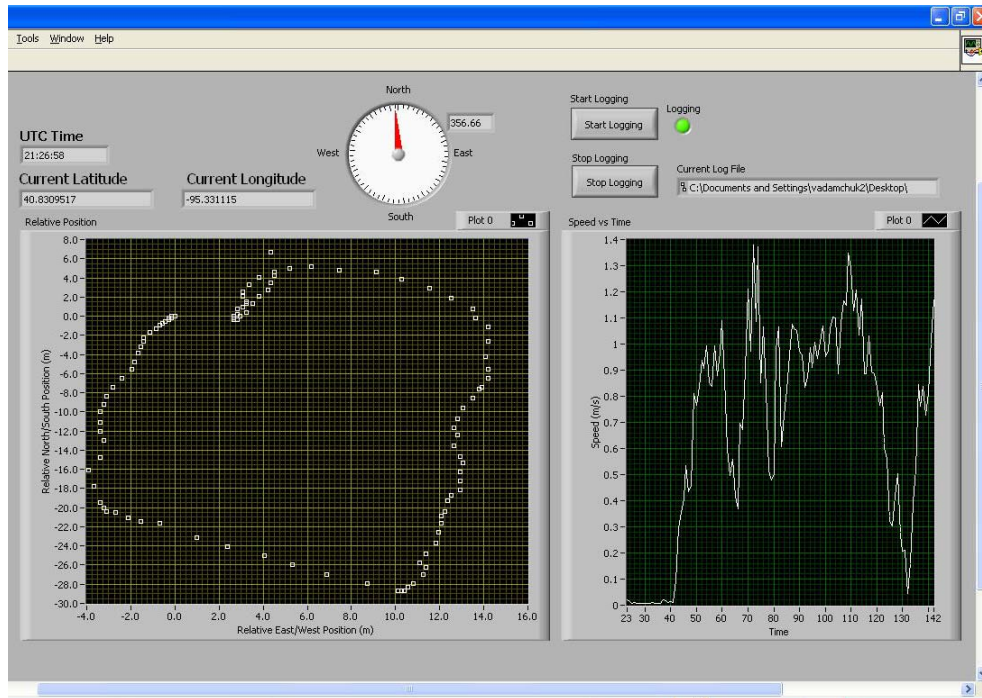
5. Plot the recorded track as well as how travel velocity changes with time. Open Microsoft Excel software and create a plot of X vs. Y, Speed vs. Time and Heading vs. Time. Refer activity 31 for help with plotting in Excel. Comment on your observations.
6. You can use file "GPSData" in case weather conditions and/or technical malfunctioning did not allow you to collect the data.

How Does It Work

The path of a combine harvester plotted in Excel is shown below. GPS device is mounted on the combine harvester. Fig. A shows the X Y (longitude latitude) plot of the GPS data. In this plot, the distance between the lines is not same because antenna was not in the center of the combine harvester.
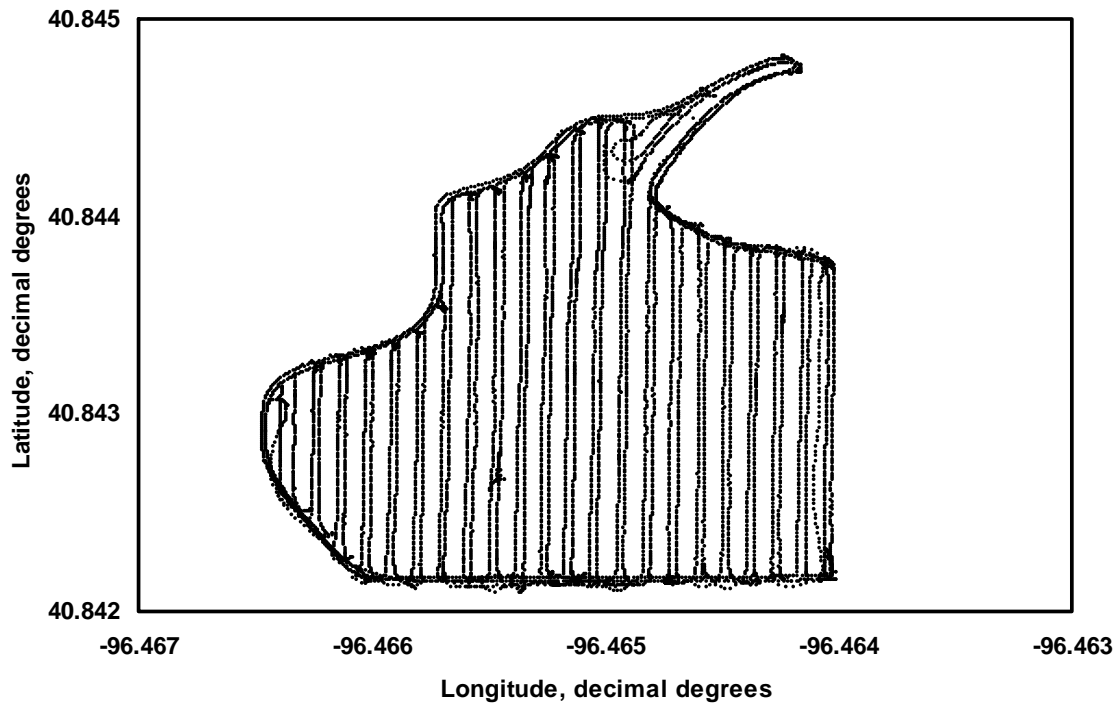
Figure A

Fig B shows a plot of Travel Speed vs. Time. Note how the travel speed of the combine harvester slows down while taking turns.
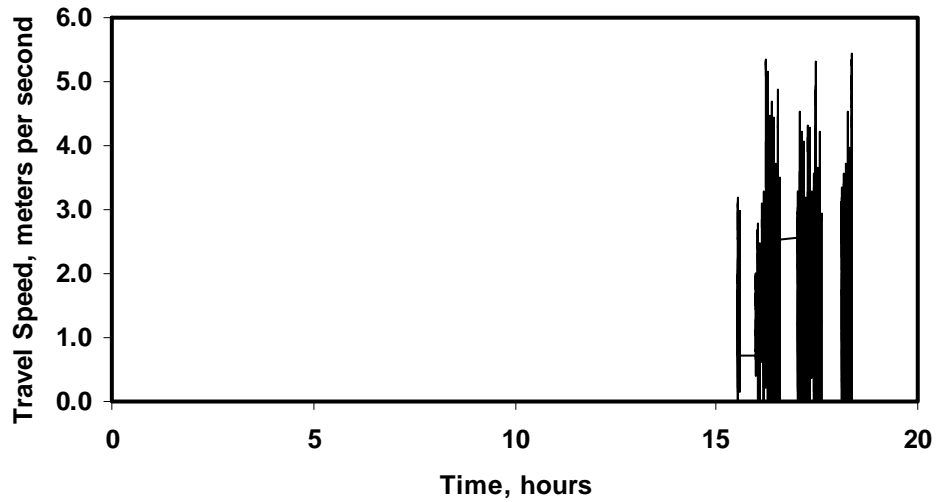

Figure B

Additional Challenge

Collect and plot a sensor data while tracking robot position.

<u>Vocabulary</u>

Speed: *Rate of motion or the distance travelled per unit time.*
Velocity: *Rate of change of position.*
Displacement: *Difference between the final and the initial position of an object.*
Scalar quantity: *Quantities described by a magnitude.*
Vector quantity: *Quantities described by a magnitude and a direction.*
Direction *or* ***Heading*** *is the information contained in the relative position of one point with respect to another point expressed in words (cardinal and intercardinal directions) or angular measurements (degrees).*

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