CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
J1312

Project Title
What's My Vector? Finding My Way in this Digital World

Abstract

Objectives/Goals
Evaluation of the vector formed using the odometer and compass traveled in each of the eight cardinal directions compared to GPS locations of start to finish point. My hypothesis is that the vector formed by the accumulated directions shown on the compass will match the GPS locations of start to finish.

Methods/Materials
Materials: Toyota Sienna Odometer and digital compass, GPS device # Mio Digiwalker C230.
Method: 1. Record the starting location readings from the GPS; 2. Set the car#s trip odometer to zero; 3. Travel to destination. As the direction changes record total distance traveled. Repeat until destination is reached; 4. Calculate distance in each direction. These represent the individual vectors. Reduce vectors by: N-S, NE-SW, E-W, SE-NW. Compute cardinal directions for NE, SE, SW, NW by using pythagorean theorem. 5. Calculate distance N, E, S, W from GPS by subtracting the starting location from the destination location; 6. Compare distances traveled and direction from GPS to summary cardinal vectors calculated from the car#s compass.

Results
My hypothesis was supported. The vector from my starting and ending GPS readings was close to summary vector calculated from the car#s compass. I evaluated the variation of distance and direction.

Conclusions/Discussion
Conclusion: Although the GPS readings and compass vectors were close, I was disappointed they weren#t closer. I have tried to understand some of the reasons they weren#t the same.
Discussion
Variance of compass direction: There are eight compass directions in 360° / 8 = 45° per direction. That means I could be 45° / 2 = 22.5° right or left from any of the eight compass readings without changing compass direction
Declination of compass in the car: Correcting magnetic north isn't always true north everywhere on earth. Here in Sacramento the declination (variance from magnetic north to true north) is currently 14 degrees, 38#. I found information in the owner#s manual on correcting for this delineation, or variation.
Difference in Longitude calibration: I did a calibration of latitude and longitude by traveling a specific distance S to N and E to W. As you go south towards the equator one unit of Longitude (East to West) is bigger # think of an apple slice. This could explain why longitude varied the most.

Summary Statement
Evaluation of vector formed by car's odometer and digital compass compare to GPS locations (longitude and latitude) of start to finish point.

Help Received
I appreciate the support of my Math Teacher, Ms. Yamamoto. My mom and sister assisted in collecting the GPS, compass and odometer data. My father assisted me in summarizing the data in Excel. I also appreciate my parents paying for the gas!