Shared Ride: Transportation, Carbon Footprint and Ridesharing

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ABSTRACT

The focus of this research project was to analyze and collect travel trajectories to calculate carbon footprints under different travel modes and identify ways to reduce it. We collected trajectory data using GPS from RET participants and translated it into energy consumption to determine if shared ride modes were available and the corresponding amount of reduced carbon footprints. We also researched issues associated with ridesharing such as coordination of routes, safety concerns, time costs, and social discomfort. Ridesharing is a possible solution to help reduce increasing amount of carbon emissions in our growing communities.

Introduction

While our society struggles with congestion, pollution, energy efficiencies and intensive economies, many private and public vehicles are still barely occupied. Several factors are thought to impede the use of ridesharing, including lack of trust amongst co-passengers, loss of flexibility, safety risks, and the availability of dynamic route matching algorithms to minimize queues and total travel time. Lessons concerning our environment and awareness of our carbon footprint are designed to engage students to calculate their own emissions and develop possible transportation solutions, creating awareness of the need for emission reduction through ridesharing modes.

Carbon Footprint

Everyday people travel extra miles in our vehicles running errands, going to and from work and school, or vacations. Nearly 51% of our yearly CO2 emissions come from transportation modes. The average vehicle in the US contains 1.6 persons per vehicle mile and travels almost 35 miles per day. Every mile you travel can be converted into energy consumption which alters the carbon footprint of individuals, our country, and our planet. Our vehicles emit 19 pounds of CO2 for each gallon of gas consumed. Below is a table provided by the US Department of Energy showing how fuel economy is tied to yearly CO2 emissions.

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<th>Fuel Economy (MPG)</th>
<th>CO2 Emissions (lbs/gallon)</th>
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Through the lessons, students will be given the opportunity to calculate and explore ways to reduce carbon footprints as individuals and as a part of a global community.

Application of GPS Trajectories to Determine Rideshare Opportunities

GPS stands for Global Positioning System; it refers to a system of 24 satellites that orbit the Earth sending signals to receivers. Our data was collected utilizing the GT-31 and BGT-31 data loggers setup to log data points every 2 seconds and travelling at a rate greater than 35mph. Trajectories were collected and converted to .gpx format using GPSBabel. The RET Rideshare team provided other RET team members with GPS tracking devices for a 5 week period and recorded their daily travel trajectories. The data was imported into a GIS, Geographical Information System, to visualize similar routes.

Figure 1 depicts a rideshare opportunity on a RET fieldtrip to the Water Research Station near Denton, Texas. The purple color shows the route taken to the station. Fourteen people were transported to the research station in 4 different vehicles. We emitted only about 40 pounds of CO2 instead of the 140 pounds of CO2 that could have been expended had everyone taken individual vehicles.

Figure 2 portrays the possibility of 6 member's potential to rideshare for a 20 mile stretch. More than 196 pounds of CO2 could be saved daily if 2 vehicles were driven, a 77% reduction for the group. It is apparent from the data collected over the 5 week period, that there could be considerable savings to our energy resources on a daily basis if we begin to look for these patterns in our own communities.

The student lesson will focus on why it important to rideshare, how GPS technology works and how we can ride share to and from school, work, sports practices, and after-school activities. Students will be able to calculate their energy usage converted from their miles travelled ridesharing. Students will then develop a model and plan to reduce the carbon footprint from transportation and promote ridesharing in their school and community. Within this project are lessons utilizing and interpreting data sets through a remote control vehicle data collection activity with vector analysis.

Social Issues

Social barriers many times overshadow the benefit to our environment when considering ridesharing as an option.

We conducted post RET Rideshare experience surveys over some of the social issues involved in our project:

- 90% felt that having a GPS changed their driving habits.
- 67% were uncomfortable with their GPS being used to view their driving habits.
- 83% were willing to rideshare to RET.
- 50% would be willing to rideshare the first day, 33% felt they would wait till they knew the participants better.
- 50% were willing to rideshare if their districts were to offer incentives like free or preferred parking spots.

Future Implications

Through the advent of better and more sophisticated smart technologies, real-time ridesharing applications present a growing opportunity for true change. Communities could substantially reduce their carbon footprints and slow the depletion of world resources through programs and incentives to encourage ridesharing and public transportation modes.

Ridesharing for 15 days saved over 200 pounds of CO2!!

Students will have the opportunity to develop a community or school plan to encourage participation and publicize rideshare modes. Our projects provide students an opportunity to generate new ideas and change the culture of our society for the future. Based upon our research, in order for future implementation of ridesharing programs in this country to be successful there must be a huge paradigm shift.