TIRPS
Testudo’s Informed Route Planning System

Thomas Graves tgraves@umd.edu
Juan Ramirez jramirezjr@gmail.com
Calvin Grunewald cgrunewa@gmail.com
Kenny Tang tangdkenny@gmail.com

December 2, 2008
Abstract

Commuting to the University of Maryland is an arduous task due to its location alongside the Capital Beltway, one of the most congested freeways in the United States, and an ever-continuing suburban sprawl. As a result commuter students face variable and unpredictable commute durations to and from campus. Testudo’s Informed Route Planning System, or TIRPS, is a social-networking website that aims to give commuters of the University of Maryland access to information that will assist them in planning their commute. Most importantly, TIRPS aims to create a friendly environment in which commuters may assist each other in planning an optimal route to and from the university.
Credits

Thomas Graves
- Compiled and revised Final Paper
- Designed half of the post-test questionnaire
- Wrote Introduction, Presentation of Design revision (original authors were Calvin and Juan), Report on development process (bullets one and two), Appendices, and References.

Calvin Grunewald
- Implemented a lot of the website including the backend database and front end visualization.
- Wrote the conclusion section of the paper.
- Helped in revising final paper.

Juan Ramirez
- Designed the overall layout of the TIRPS website.
- Designed the pre-test questionnaire
- Wrote subjects’ test experiences, usability testing results and analysis
- Helped in revising final paper.

Kenny Tang
- Did table of contents, Report on development process (bullets three and four), and acknowledgements.
- Helped Calvin implement website and in revising final paper.
Table of Contents

Abstract                                      i
Credits                                       ii
1. Overview of The Problem                    1
2. Discuss of Previous Work                   1
3. Overview of Approach and Solution          4
   a. Arriving at The Site                    5
   b. Experience Transitions                  5
   c. Database Organization                   6
   d. Search Experience                       7
   e. Query Parameters                        7
      i. Location Parameters                  8
      ii. Time Parameters                      8
      iii. Advance Parameters                  8
   f. Submission                              9
   g. Results                                 11
4. Experience                                 11
   a. Result Experience                       11
   b. Registration / Login Experience         12
      i. Registration                         13
      ii. Login                                13
   c. User Settings Experience                14
   d. Account Detail Information              14
   e. Routes Experience                       15
   f. Add New Route Form                      15
   g. Messages                                16
5. Report On Development Process              17
   a. Usability Testing Process               22
   b. Subjects’ Experiences                  22
      i. User 1                               22
      ii. User 2                              22
      iii. User 3                             23
      iv. User 4                              23
      v. User 5                               23
      vi. User 6                              24
      vii. User 7                             24
      viii. User 8                            25
6. Conclusions                                25
7. Acknowledgement                            27
8. References                                 28
9. Appendices                                 30
   a. Appendix A: Figure names and numbers    30
   b. Appendix B: Pre-Test Questionnaire      31
   c. Appendix C: Post-Test Questionnaire     33
   d. Appendix D: User Task Sheets            34
Overview of Problem

The University of Maryland and surrounding areas are widely known for its frequent sports events, road construction, and booming college atmosphere. As a result, commute durations during the morning and evening rush hours are variable and unpredictable. Besides often being time-consuming and stressful tasks, commutes also take their toll on the vehicle’s fuel economy; standing in bumper-to-bumper and stop-and-go traffic drastically reduce fuel economy and significantly increase carbon emissions.

Some drivers take it upon themselves to plan their commutes; they take into consideration how current weather and traffic conditions may affect their commute duration. Especially in regards to the Capital Beltway and other major roadways, commuters keep in mind that they are commuting during morning or evening rush hour. While driving to campus, commuter students may face traffic started by a special event that may have caused the closure of a certain entrance to campus or the use of a different traffic light system. If the commuter community were kept up-to-date with weather conditions, special events taking place at or near the university, such as sporting and musical events, and informed on alternate traffic routes then many commuter students would be better prepared to plan an optimal commuter route to the university. The design of a system that could offer such services, including estimated trip times that take into consideration the time taken to locate an available parking space at a certain time of day, would significantly decrease commuter trip durations as well as increase a vehicle’s fuel economy, assuming that the commuter has planned an optimal commuter route that spends the least amount of time in traffic. Most of all, it would improve commuter’s overall emotion upon arriving at their destination.

Discussion of Previous Work

Using States Preference Data For Studying the Effect of Advanced Traffic Information on Drivers’ Route Choice

The California Department of Transportation and the Partners for Advanced Transit Highways funded a research project that looked into statistical analysis of commuters’ route choice including the effect of traffic information. Data for this research paper was collected for two different route choice models via telephone interviews and mail surveys. The main purpose was to investigate the effect of advanced traveler information systems on route choice. The research found that travel time was not the dominant factor in route choice and that travel time reliability seemed to be most important to travelers.

The Value of Advanced Traveler Information Systems for Route Choice

David Levinson of the University of Minnesota, Department of Civil Engineering analyzed systems that provide drivers with the fastest path between a start and end
location where the routing was altered during the trip to route the driver around traffic or hazardous conditions. Levinson built his research on the combination of the works of many other researchers which suggested that ATIS (Advanced Traveler Information Systems) not only reduces travel time and vehicle operating costs but also the travel time of other commuters. If there are fewer vehicles trying to get through the traffic jam at the same point then overall everyone will get to their destination faster as some vehicles take alternate routes. The TIRPS system can target non-recurrent traveling conditions by allowing users to flag a trip with different attributes such as the presence of an accident. Such flagged trips can be aggregated to present a model of traffic conditions as a result of non-recurrent incidents.

Models of Commuters Information Use and Route Choice
The California Partners for Advanced Transit and Highways (PATH) built upon a study which looked into the relationship between the use of traffic information and the inclination to change routes. As a result of the original study, relationships were uncovered relating the influence that commuters’ socioeconomic characteristics and the level of traffic congestion that they face have on traffic information use and the inclination to change their route.

A Framework for Traffic Assignment with Travel Information
This article discusses the impact of traveler information on not only travelers but on the actual travel networks themselves. A driver’s choice of route could have negative consequences on the travel network in addition to their own travel time. The article then proposes a framework for “addressing traffic assignment with traffic information.” The paper demonstrates that a system like TIRPS could not only have benefits for the individual traveler, it could also have benefits for general network condition as well.

Behavioral Reactions to Traffic Congestion
In this research paper the various causes of traffic congestion and their psychological effects on motorists, are investigated. The effect that traffic congestion has on activity of surrounding areas is also looked into. This paper helped establish some of the trip flags that TIRPS includes which let users choose reasons why a route may take longer than normal.

Drive Smart Not Hard, You Could Be Saving Yourself Thousands!
The author of this article wants to inform the public of various ways to reduce fuel consumption. The article is frequently updated to reflect current technologies and practices that help consumers. If commuters are aware of ways they can increase gas mileage while driving on major roads or sitting in traffic they can reduce their negative impact on the environment.

Asymmetric Competition on Commuter Routes: The Case of Gasoline Pricing
The Southern Economic Journal talks about the intensity of competition among firms depends on commuting patterns due to the fact that commuters are able to travel to any station located on their route without incurring incremental travel costs. This gives insight into our estimation of a retail gasoline price function for Lexington, Kentucky, by
treating each commuter route as a separate market. Competition in these markets, however, displays an asymmetry because all the commuters travel to the Central Business District (CBD). To accommodate this asymmetry, each market segment on in each firm is a distinct submarket and includes independent variables (number of competitors and submarket length) from each submarket. Both sets of structural variables influence gasoline prices in the expected direction, but the variables representing the submarket near the CBD have significantly stronger effects. This data might come in handy when determining which routes are generally most populated during morning commutes.

*Universities TravelSmart Resource Kit*

The TravelSmart Resource Kit discusses marketing, promotion, and information dissemination techniques that could open commuters to changing their driving habits. The kit could come in handy when TIRPS is launched and needs to be marketed to the commuters of Maryland.

*Tips to improve your Gas Mileage*

The US Environmental Protection Agency released an article that discusses tips to improve gas mileage, as well as recommends that motorists drive at 60 mph, remove excess weight and avoid excessive idling. Tips such as the ones provided could be aimed at TIRPS user so that while they are making trips they can also reduce gas mileage.

*Still Stuck in Traffic: Coping with Peak-Hour Traffic Congestion*

*Still Stuck in Traffic* focuses on psychological effects that traffic has on motorists, discusses why traffic is becoming increasingly worse and irreparable, and discusses various ways to change driving habits in order to avoid being delayed by traffic congestion. As drivers learn and take different routes to get to their destinations they decrease the congestion along the heavily used routes. With a system like TIRPS, users can learn the routes that others take and this could help them determine which route would be best or worse to take during certain times of day.

*Getting More per Gallon*

*Getting More per Gallon* offers tips on how to obtain better gas mileage with automobiles. It suggests that drivers not speed past 60 miles per hour as fuel efficiency decreases exponentially past that point. Furthermore it suggests that gas mileage is reduced by two percent for every 100 lbs. extra on a vehicle. Lastly, it claims that gas mileage is also reduced as a result of poor automobile maintenance. Tips such as the ones provided could be aimed at TIRPS user so that while they are making trips they can also reduce gas mileage.

*America's 12 Worst Traffic Traps*

Forbes.com released an article late last year that discussed the twelve worst traffic cities in America. Data was based on US Department of Transportation research. The Washington metropolitan area is one of the 12 worst areas.
Tweaks can reduce fuel consumption

*Tweaks can reduce fuel consumption* discusses various vehicle modifications and driving habits that can help increase gas mileage while driving and sitting in traffic. The ideas are proposed by Telargo, a provider of mobile asset management solutions. TIRPS users might appreciate the low cost modifications that could save a lot of money over the long run.

**Achieving High Volume Carpooling**

*Achieving High Volume Carpooling* highlights the benefits from carpooling and the amount of energy saved on a day to day basis as a result of carpooling. Data was gathered in the San Francisco area and the author presents it to show the significant benefits motorists would experience as a result of carpooling, such as a decrease in traffic. The Message Board page of TIRPS hopes to have a positive influence on carpooling.

**Usability Evaluation of Web Mapping Sites**

Four of the web’s most popular mapping sites were usability tested in this paper. Google Maps is one of the four sites tested and has better results than its competitors. The paper additionally suggests guidelines for developing online mapping software. Since the TIRPS system will utilize the Google Maps API and provide a mapping interface, such guidelines are important for its development. Additionally, the paper serves as further support that the Google Maps API is the best backbone to build the system upon.

**Public Web Mapping: Preliminary Usability Evaluation**

A usability study of different types of online mapping software was conducted in this paper. The paper gave Google Maps a favorable score in terms of a reduced task time and high success rate. This is relevant to the TIRPS system because the Google Maps API will be used as the backbone of the system.

**Alternative valuation of highway user delay costs**

*Alternative valuation of highway user delay costs* discusses how time spent in traffic is associated with an increase in aggravated driving and travel expenses; also discusses how motorists are more open to changing driving habits when the possible benefit is spending less time in traffic and reducing overall trip duration.

**Overview of Approach and Solution**

The Maryland commuting community is in dire need of a service that will aid them in better planning their daily commutes to and from campus. Testudo’s Informed Route Planning System (TIRPS) is a website designed to assist the commuter community by providing commuters with access to information that will aid them in making informed predictions about their commute durations. TIRPS users will be able to post their commuter routes to and from campus, give and receive feedback on routes. In order to emphasize a sense of community, registered users will also be able to communicate with each other by means of a moderated message board. Users can aid each other by discussing the latest traffic patterns, announcing any special circumstances that may
affect commutes or better routes to avoid traffic, and even meet other commuters from their area. TIRPS will be marketed to student, faculty, and staff commuters at the University of Maryland – College Park.

The TIRPS system contains five main user experience areas: search, search results, user login and registration, user data management, and message board. Each experience area is enumerated in more detail in the sections below; however, this section will present a high-level overview of how the system works in general.

**Arriving at the Site**
When a user first navigates to the TIRPS website, they will be presented with the home page where they are encouraged to conduct search queries. Once users become familiar with the purpose of the system, they will mostly be conducting search queries and uploading data. Since the latter experience requires the user to log-in, the former experience, since it will be a common goal of the user, should be presented at the top level, namely the home page of the website.

Presenting the user with a search form upon an initial visit could be overwhelming and unclear. To solve this problem, one of the main navigation links is to an “About” page which will present information on the intended use of the TIRPS system. It will also serve as a guide to using the system and explain the different experiences available to a TIRPS user. The “About” link will be obvious so any new user can find it and learn about the site.

System information and a user’s guide are only useful to a user the first few times they visit the TIRPS website. One could argue that this information should be presented on the home page, but as previously stated, returning users are coming back to the site to use the search experience and thus it needs to be available on the home page.

Despite these initial assumptions about the navigational position of the search page, later developments in usability testing are causing a reconsideration of the default page for the site. After conducting several usability studies, which will be discussed in much greater detail later in this paper, it was found that presenting users with the search form upon their initial visit to the site perplexed them. From the search form and the very lax description of its purpose, users did not know what to do with the form or even more so, what the purpose of the site was. So the search page will no longer remain as the default page for the site; an informational help page will be presented instead that gives an overview of the site’s purpose and points the user in the right direction to get started.

**Experience Transitions**
The following diagram follows the process flow (sequence of expected actions) of an arbitrary user of the TIRPS site. As previously discussed, a user arriving to the homepage of the site is presented with the home page where they are pointed in the right direction to get started. The diagram will enumerate the possible actions the user may take from the home page.
A special note on notation: each state node name is a user experience. Transitions between states denote user actions. Some of the experiences are denoted with an asterisk (*). Such denoted experiences require the user to be logged in.

![Transition Diagram](image)

Figure 1. Transition Diagram.

Note that these transitions are a very high overview and show more of a process flow rather than a navigational flow. The navigational flow is much different in that the user can go to any page they want at any time. If they are not logged in, the system may require them to log in before allowing them to continue on to the desired page. Also not shown is the registration and logout process flow. Once logged in, a user may logout at any time. Additionally, if the user is not logged in, they may register for an account at any time.

**Database Organization**

The TIRPS system uses a relational database to manage both trip and user data. The specific user data that is stored is enumerated in the user login and registration experience since it is small compared to the schema for the trip data. The following pieces of data are stored for each trip:

- Trip name
- Trip description
- Trip route
  - Trip starting location
  - Trip ending location
  - Intermediary path between starting and ending location
- Trip start time
- Trip end time
- Trip duration
- Date of trip
- Weather conditions
- Special trip flags.

The diagram below presents the database schema. Note that the schema is incomplete in that it leaves out the message board related relations and tables.

Search Experience
The search experience describes the query interface. Using the query interface, a user can search for specific trip data that meets their needs. Users’ will fill in the required fields of the query form and then submit the form for processing. The server will use the information contained within the form to find a set of trips within the database that fit the user’s search parameters.

Query Parameters
There are three sets of data needed to make a trip query:
1. Location of trip
2. Time of trip
3. Advanced features of trip

The location data set describes the beginning and ending location of the trip. The time dataset includes the estimated departure time range, the day, and the predicted weather for that travel time. The advanced feature parameters include roads-to-avoid and trip flags. The advanced trip parameters require further explanation.

**Location Parameters**

The location parameters describe the beginning and ending of the trip. The query engine uses the starting and ending locations to find a set of trips that match the user’s route. The query engine does a spatial search on the beginning and ending locations within a threshold distance to find a set of similar routes. This threshold distance is specified by the user when they submit the form.

**Time Parameters**

The time parameters describe the time range the user may leave for the trip. The user specifies the beginning and ending times. The query engine matches this time range against the time range of trips returned by the location search. All trips that fit within the user specified time range are maintained while trips that fall out of the user specified time range are discarded.

The day of the trip is also specified in this set of parameters. It is important to note that trip data won’t exist for the specific day the user chooses because they day will be in the future. However, it matches the day the user picks with similar days in the past. For example, if the user picks a weekend during the fourth of July, the query engine will look at trips that occurred on a fourth of July weekend. It may also look at trips that occurred during other holidays that fell on a weekend during the summer season.

A final parameter specified in the time parameters dataset is the predicted weather. Again, this is used to find similar trip data.

**Advanced Parameters**

The roads-to-avoid parameter allows the user to specify a set of major highways around the nation’s capital to avoid. Since many of these roads are heavily bogged down with traffic during peak travel hours, a user may want to avoid them completely.

The trip flags parameter allows the user to specify a set of flags to search for within the query. These flags denote abnormal, special characteristics of a trip. When a user uploads their trip data, they may tag a trip with one of these flags. When a user goes to search for a trip, they can explicitly look for one of those flagged trips. Not specifying a trip flag will inform the query engine the user wishes to consider only normal trips; that is, trips where nothing abnormal occurred like an accident or a police road block.

The trip flags feature helps make the TIRPS system unique to University of Maryland faculty and students. By allowing users to tag trips with flags specific to the Maryland community, the very same community will derive the greatest benefit.
Submission
At the bottom of the control sits the submit and reset buttons. The reset button returns the search form to its default state, effectively clearing all the user-entered data.

The submit button does two things. First, it validates all the user entered data. Each control is equipped with a dynamic validation code to validate the user input after it is entered. The submission process does a final check to make sure the user input is valid and then posts the data to the server for processing.

Once the form is posted back to the server, the server process the user input and performs the queries necessary to acquire the needed results. Once the server gets the results, it sends them back to the client and the results experience begins.
Figure 3. Search Page
Results
The results of a query will be viewed on the results page. This experience will be described in the results experience section.

Results Experience
The Results feature will be a list of similar and closest routes from data that users enter into the database. The page layout consists of three sections: Name (left column), Starting Address (middle column), and Ending Address (right column).

<table>
<thead>
<tr>
<th>Name</th>
<th>Starting Address</th>
<th>Ending Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calvin Trip from Home to School</td>
<td>5827 Henden Wood Ln Frederick, Maryland 21703</td>
<td>4320 Knox Rd College Park, Maryland 20740</td>
</tr>
<tr>
<td>Going to Silver Spring</td>
<td>4320 Knox Rd College Park, Maryland 20740</td>
<td>8514 Fenton St Silver Spring, Maryland 20910</td>
</tr>
<tr>
<td>From Knox to Courtyards</td>
<td>4320 Knox Rd College Park, Maryland 20740</td>
<td>8000 Boteler Ln College Park, Maryland 20740</td>
</tr>
<tr>
<td>commons to home</td>
<td>4318 Knox Rd College Park, Maryland 20740</td>
<td>4113 Steads Grant Way Fort Washington, Maryland 20744</td>
</tr>
<tr>
<td>Home to Campus</td>
<td>3616 Rock Creek Church Rd NW Washington, District of Columbia 20016</td>
<td>Baltimore Ave College Park, Maryland 20742</td>
</tr>
</tbody>
</table>

Once a selection is chosen and selected, the user will be taken to a page that lists the information pertinent to their selected route. The Results page includes the name that was given to the trip, a brief description, the starting and ending addresses, the starting and ending times, and even an associated Google map with turn by turn directions including Google’s estimated time.
Registration / Login Experience
One may wonder why a login and registration experience is needed on the TIRPS system. Since the system enables users to enter data, it needs to track which users enter which data. Keeping the data submission process unlocked to the entire World Wide Web could result in erroneous data being entered by untrustworthy sources. Erroneous data would perturb the results returned by the system and cause users to lose faith in the reliability of the returned results.

The solution to this problem is a login and registration experience. The TIRPS system allows users to search the database and get results from queries without requiring them to
be logged in. However, if a user wishes to submit data to the database, the TIRPS system requires them to register a user account and then log into the system.

**Registration**
The registration page includes a form to collect user data and persist it to the database. The following information will be collected from the user:

- Password
- Email address
- Full name
- City
- State
- Zip code
- IP Address

The TIRPS system and its developers are very aware of the privacy concerns of many users of the World Wide Web. No personal information will be displayed to other users. The creator of a specific trip is kept entirely private; no trip result viewer will be able to tell who posted that trip.

Additional privacy constraints have been conceived but not yet implemented. One concern is users will be entering trip data that begins at their home. These users may not want other’s viewing their home address. One conceived solution to this problem is to scramble the starting and ending locations by either providing only the street name (and no specific residence address) or by finding the nearest major intersection to the entered address and beginning the trip from this intersection.

Once the user is fully registered, they will be able to log in using their email address and password.

**Login**
Once a user is registered, they can log into the system. Every page features a login control enabling the user to log in at the time he or she finds most convenient. Logging in is as easy as just typing one’s username and password into the username and password fields respectively.

---

Figure 6. TIRPS Banner Generic.
The user then clicks the “Login” button and validation is performed on the username and password. If the user is a valid user, he or she receives a session key from the server and is now logged into the system.

Once a user is logged into the system, they have access to the Routes, Message Board, and User Settings experiences. If a user not logged into the system attempts to access one of these two pages, they will be redirected to a login form. These experiences require the user to be logged in since they involve data manipulation.

When a user is finished using the TIRPS system, they may logout at any time. Additionally, if they navigate away from the page, their session key will expire after a fixed time and they must once again login. The logout experience is as simple as clicking a button.

User Settings Experience
On the left side of the page floats a box with the user’s personal information. The displayed personal information includes:
- Display Name
- First Name
- Last Name
- Email address
- Total number of submissions

Displaying to a user their personal information makes the User Settings experience feel more customized. All of the user’s information, including the information with which they registered, should be made accessible via the User Settings experience.

Account Detail Information
Users will be able to edit their contact information such as screen names which may be visible to other users with Edit Contact Info, or modify information such as email address or passwords with the Account and Password buttons. Users can also choose to disallow other TIRPS users from sending them messages through Edit Privacy Settings. Lastly, users can deactivate their account if they find that they no longer have any need for TIRPS using the Account button.
A user knows his or her specific route into and out of the Washington Metropolitan area better than any other TIRPS user. In posting their trip information, a user does not just make it accessible to every other user of the TIRPS system; he or she saves it for him or herself. Having easy access to past trip information on the route one travels every single day enables him or her to track the time of his or her trip over an extended period of time. Inside the Routes section lies the recently submitted trips feature which gives users access to their trip data so they can draw their own conclusions about their specific trip circumstances over a period of time.

Finally, the user has the option to view the trip information in detail. By first selecting one of the trips in the list box and then clicking on the view selected link, the user can view the past trip in detail using the results experience.

**Add New Route Form**

The last main feature of the Routes experience is the ability to input data for a new trip. The style of this form directly descends from the style of the search experience form with a few additions.

The most notable addition is another form section, the basic information section. The basic information section enables the user to give the trip a name. The name should be
descriptive and key other users in to the particulars of the trip. The basic information section also includes an optional description field. The user can enter a description or any notes they wish to share about the trip in this field.

When the user submits this form, it is validated dynamically and upon successful validation, posted back to the server for processing. The server enters the data in the database and redirects the user to the results experience to view their newly entered trip.

**Messages**

Registered TIRPS users may use this feature to keep track of their communication with other TIRPS users. Messages are displayed as hyperlinks to the original message sent.

Each message is identified by:

(Date message was sent) Message Subject – Sender username

This feature of the website has not been implemented due to time constraints.

![Figure 9. TIRPS Routes Page](image)
Report on Developmental Process

Before TIRPS was coded up, the group sat down and debated over what system would be the best to market towards the commuting community. The group started by brainstorming and listing all the features of a website that would appeal to commuters. Some of the main causes of traffic near campus are bad weather, sporting events, or construction; the group decided that users of TIRPS should be able to flag their trips with these types of events. More advanced users, who are more familiar with some of the traffic patterns near campus, would enjoy a feature that allowed them to avoid major routes in the DC/MD/VA area. A google map and a message board were also noted as key features that the group wanted TIRPS to include. The group split up and picked two parts of TIRPS to make a mock design of, then collaborated and decided which features of the different designs would best align themselves with the HCI principles and user interests.

The default page a user used to be directed to upon navigating to TIRPS, the Search page, was the first page designed. Two different low fidelity prototypes were sampled in order to arrive at the high fidelity page. Through analyzing the two different prototypes, the group determined that each of the prototypes had features that would be good for the final design. Prototype 1 incorporated colors that stood out to the user and were visually appealing. Prototype 2 spread the features of the search out in a manner that is more manageable for users. Prototype 2’s search was broken into multiple steps and spaced out efficiently. The group decided to use the text layout of Prototype 2 and the color scheme of Prototype 1 for the high fidelity Search Page. After usability testing, the group decided to implement a home page which users would navigate to first. The Home page briefly touches on some different thing that TIRPS can do and from there users can clink on a link directing them to the Search page.
Figure 10. Search Page Prototype 1
The My Data page, where the user would post routes and edit personal information, was the next page to be designed. The team used two different low fidelity prototypes to arrive at the high fidelity page. Prototype 3 incorporated all the necessary information needed to post a trip but did not incorporate any options to edit personal settings such as password or contact information. Prototype 4 did a good job incorporating options that would allow the user to view routes they’ve submitted, personalize their settings, and even read messages which would allow them to feel more in control while using TIRPS. The team decided to use the layout of Prototype 3 but also added some of the buttons and colors from Prototype 4. The “Enter New Trip Data” section of Prototype 3 was also moved to it’s own subsection of My Data in order to reduce clutter of the page.
After usability testing, the group decided to move a TIRPS user’s personal information into its own section known as “User Settings”. The buttons to add new routes, view previously submitted routes, and view/send messages were also moved to a new section known as “Routes”. Both of the previous two moves were made in accordance to what testing users implied they would be most comfortable with.

Figure 12. My Data Page Prototype 3
Figure 13. My Data Page Prototype 4
Usability Testing Process

The “Random testing” method was used for the usability testing. The name of technique refers to the fact that the testers are random people who live across campus and come from different backgrounds.

1. The testers were briefed on the current model and its purposes. Then, they were asked to complete pre-test questionnaires (Appendix B).
2. They were asked to complete at least 5 tasks. The task lists include register for an account, login/logout, add a route, viewing the submitted route, perform search to find submitted route and view it from the Search Results list, change your password, and make your email public. Testers would respond to each task by rating the difficulty of each task from scale 1 to 10 (1 is the easiest and 10 is the most difficult). Testers also could respond to each task with comments and suggestions. (Each Users Task Sheet is listed in Appendix D)
3. After completing their tasks, testers would finish the usability testing by answering the post-test questionnaires (Appendix C)

Subjects’ Experiences

User 1:
A female UMD undergraduate student in her 3rd year and a Knox Apartment resident; while she does not commute daily to campus, she does drive to areas outside of the College Park area and expressed interest in learning better routes to get there.

*Tester’s experience:* The idea is very good, especially the name. Fey is not a commuter but she goes home a few times a month and can see how this would be helpful. She says that, because the website is tailored specifically for College Park students, it creates a very personal feeling for her. She added that the idea of adding the Trip Flags was one aspect that created that personal feeling. She added that she could see not only University of Maryland students using the website but also people who drive to the university to visit her and other students and those who complain about the traffic.

User 2:
A male UMD undergraduate student in his 3rd year and a South Campus Commons resident; while he does not commute daily to campus, he expressed interest in the system for the possibility of finding better routes to go from and into the university.

*Tester’s experience:* He expressed doubt with respect to the purpose of the TIRPS system and did not know why someone would want to use it. According to him, the most potential it has is the ability to search for routes within a radius. He said that when he came to Maryland for the first time, he wanted to know interesting places to visit and “hot spots” for college students. He said that he would use the TIRPS system if it mapped out major attractions and college “hot spots.” He suggested that the Search engine be refined so that routes that fit the search criteria the most are displayed more recently (He was disappointed that his route was not first in the Search Results list, especially since
addresses matched). Furthermore, he liked the idea that driving directions would not be automatically generated after the user has specified Start and End addresses but would instead display upon clicking the Get Directions button. He said that it would function as a confirmation to the user.

User 3:
A male 23 year-old UMD undergraduate student, double-majoring in Aerospace and Electrical Engineering; a commuter student who drives to campus during the week and seldom on weekends.

The user became irritated when the screen would reload after he changed the time to either AM or PM and when he’s click on a day using the Calendar because he would have to proceed to navigate back down the page to where he was before the screen reloaded. He did not like the null pointer exceptions that were thrown when trying to submit a search and especially the fact that their cause was not mentioned. He suggested that a separate Search page be created rather than being automatically placed on the Home page. He also requested that the system not automatically reload while the form fields are being populated. If the screen has to be reloaded then at least reposition the page to where the user was at the time the reload occurred. Nevertheless, he liked that the system saved the data that he had typed in so that if errors occurred and he would return, the information would already be in the fields. He agreed that TIRPS would be a hit among the university’s commuter community.

User 4:
A female 25 year-old UMD Electrical Engineering PhD student who commutes to campus daily, including weekends.

She expressed concern when she saw that her user information was displayed only on the Submitted Routes page but not on any of the other MyData sections but instead displayed Calvin’s user information. She was also annoyed by the screen reload when selecting AM or PM and clicking days on the Calendar. She also requested that the Search be made into its own page. She liked the integration of the Google Maps API and the fact that the user may request for driving directions to be displayed.

User 5:
A female 21 year-old UMD undergraduate commuter student from Bowie, MD; expressed interest in the TIRPS website, saying that “it would be nice to find a better route to school other than the typical 1 hour per day traffic route that I take.”

Her comments are “This is easy. I have done this before”. Even though she was aware that she was not working with a fully functional prototype she expressed concern for important features such as Registration (“The Register button is not visible enough. I have hard time searching for it.”), Privacy Options (she had to search through every page of the MyData section to find it). She stated that “A lot of the buttons are not descriptive,” and requested that an FAQ section be created for confused users. With respect to the exceptions thrown by the Google Maps API as a result of incorrect address
formatting, she said that the system should at least handle the exceptions. Lastly, she suggested that the website offer feedback when users finished a task, for every possible task available. She said this after noticing that she was not notified if her password had been successfully changed.

User 6:
A female 19 year-old UMD undergraduate commuter student from Silver Spring, MD; she also commutes to work in Bethesda, MD after classes; she expressed interest in the TIRPS website, stating that she may be able to find a better route to work from school and to home from work that would reduce her 1-2 hour commutes.

While she had no problem completing 80% of the tasks, she did so very meticulously. She read each field and tried to predict the format in which the system wanted her responses. Therefore, it is the least to say that the TIRPS system needs both better semantics and needs to specify response formats to the user so they do not have to predict its behavior so much, but rather expect that it will take their answer. She said that the way in which the sections are divided will most likely confuse the user and they will end up visiting every page of the website, trying to find the feature for which they are looking. Therefore, she suggested that the two most important things that the team fix in regards to the TIRPS functionality is to, first, design better semantics for the system and make sure that each link, button, and title clearly indicate where it will take the user or what it does; secondly, she suggested that messages be placed to inform the user of specific formats that the user is to use when entering data and also success messages that inform the user that any changes that they have saved were actually completed successfully.

User 7:
A male 24 year-old UMD graduate student from Washington, DC studying Graphic Design; he alternates his commute to campus between driving and using the metro system.

He thought that while the functionality of the TIRPS system was clear, its purpose is unclear. He suggested that the Home page, rather than being the Search form, include an abbreviated overview of the system, its purpose and features. Under the overview there should be two buttons, he said, one that takes the user to the Search form and another one that takes the user to a Help section that further answers anything left unclear or unexplained by the overview. He suggested the Search form be made its own page and included among the MyData links. He also felt that the idea of “MyData” was unclear and should actually be split into two sections: User Routes and Personal Settings. He said that splitting the pages into sections whose purpose were obvious by the headings is more “user friendly” than aggregating them into one “clump” called MyData. He suggested that if it were impossible to prevent the screen from reloading automatically, then to have the page reload and reposition itself to where it was previously before it reloaded so that it is less disorienting for the user. Lastly, he pointed out the necessity in being able to differentiate good and bad routes. Overall he liked the idea of an online community for commuter students centered around their commuter routes to and from campus.
User 8:
A male 21 year-old UMD Computer Science major and commuter student from Beltsville, MD; He commutes to campus every day and seldom on weekends. The user thought that the idea of the TIRPS system was great but that there is no way for a user to know what the system does without someone telling them. He suggested that an overview be placed as the homepage, that the Search form be made its own page, and that more success messages be added to confirm to the user that their changes were indeed saved. He suggested more consistency with respect to the numbering of search results, asked for a more effective Search engine that listed results according to their relevancy to the Search criteria given by the user. He liked the idea of receiving driving directions for a route that he liked. Lastly, he suggested that the user be given the option to directly modify their route on the Google Map, when adding the route, but the user should not be able to modify it when viewing the route, in terms of the Search form.

He said that the navigation was pretty easy, and that things became more difficult on the Search form. He suggested that the exception errors and bugs be fixed because those were what made tasks the most difficult to complete. He also wants the system to display the correct information, as in the user information. He also asked if the system would include a Hotspot Destinations feature that would list places around campus that people submit and rate that include restaurants, “chill” places, study places, etc.

Conclusions

Various studies have shown that informed route planning systems benefit commuters by providing them useful information with regards to trip timing and traffic conditions along the proposed route. The beginning goal of this project was to design an informed route planning system targeted towards the University of Maryland community. Both faculty and students could use such a system to plan and share trips from home to school. This sharing of information would realize the actual benefits of an informed route planning system: by enabling both faculty and students to share the most efficient trips to and from the University of Maryland campus, those using less efficient routes could benefit from the knowledge of other’s about commuting around the Washington Metropolitan area. Many features were discussed in the beginning stages of the project. Such topics under investigation included which data to store on a trip, how to manage the users of the site, how to build a large community within the site, which user interface constructs would best aid the user in submitting and searching for a specific trip. What developed out of these discussions was a long list of features to put into such a system. Many of them did get incorporated into the final system; however, many of the advanced and what would be dubbed “neat” features were cut because of time considerations.

Ultimately, the design stages gave rise to the current version of Testudo’s Informed Route Planning System which is hosted live at http://www.calvingrunewald.com. The main components of the system have been discussed earlier in the paper and all these components work together to provide the basis of an informed route planning system centered on information sharing through a centralized community.
To the extent of achieving this goal, the TIRPS system is widely successful. The route search and submission experiences form the basis of the TIRPS system. They integrate with the backend database to persist the data so that other user’s can benefit from it. The results viewing experiences provide an elegant means to view other user’s data. These three experiences satisfy the requirement for the project to be an informed route planning system. The community is created between the users who post their trip data and the users who search for other’s trip data. The trip data is supplied by those very same users; users who have firsthand experience with the actual routes and trip times they submit to the system. One user’s information pertaining to a specific route informs another user.

While the system sitting online right now is fully functioning in that users can create accounts, post trip data, and perform searches on pre-existing trip data, many of the more advanced features were not implemented due to severe time constraints.

One of the most notable features that was left un-implemented is the layer between a user submitting a trip search and the system returning a set of trips that match the search. As of right now, the system returns all the trips that have been entered from the launch of the system. The statement written above, “one user’s information pertaining to a specific route informs another user,” isn’t precise. It should be more along the lines of “one user’s information pertaining to a specific route informs all other users.” The underlying logic to match trips based on search criterion has been conceived but not implemented.

To implement this feature, the idea of path matching has been designed. Given a spatial path of latitude and longitude coordinates, the path will be parameterized based on distance. The search path will also be parameterized according to distance. Then, at discreet steps along the path, a range check will be done to see if the potential resultant path lies within a certain threshold of the search path. Additionally, comparisons will be made on the temporal data to further refine results.

The other major feature of the system that went unimplemented was the route interface itself. Initially, it was planned to build the interface on top of the Google Maps API. Users would have been able to drag out the exact route they took using the API. Additionally, they would be able to mark points of interest along the route and make comments on these points. When the data was submitted to the database, both the spatial coordinates of the route and all metadata associated with the route would be persisted to the database. This feature was cut because of time constraints. Instead, the basic directions API was used from Google that returns a path based on the starting and ending addresses.

Not so much a major component to the route planning system itself but more so a feature to build and foster the community of TIRPS is the message board. Again, because of a lack of time, this feature was not implemented. However, a navigational stub does exist because this is included in the list of important site features. TIRPS users should be able to communicate with one another. This would enable them to set up car pools or discuss
trips in general. Additionally, each trip itself should have a thread attached to it to allow
people to directly comment on the trip itself.
The last topic for concern in constructing an informed route planning system is not an
implementation detail and is actually something that all designers of informed route
planning systems must consider: participation. One problem continually discussed is how
to get people to participate in the TIRPS system. In order for it to be successful, a large
community of members who post their trip data on a regular basis must be built. The
difficulty arises in providing them an incentive to take the time to post their trip
information.

In several usability tests conducted, the question as to whether or not the participant
could see themselves and others posting their trip data to the system. A number of
participants did see the benefits of the system and said that they would be willing to post
their data. Several expressed enthusiasm upon noting that they could use TIRPS to
receive advice from other users on how to change their commute in order to optimize it.
But despite this positive feedback, that doesn’t mean they would actually take the time to
post their data. One participant suggested that we implement a ranking system that
increased each users rank as they posted more trips. A ranking system might give
dedicated users a sense of achievement as they use TIRPS.
For any type of informed route planning system that is dependent upon the participation
of the private sector (as opposed to a publicly operated informed route planning system)
proper motivation for getting people to use the system needs to be considered in depth.
Without willing participants, any informed route planning system cannot succeed.
It is difficult to predict whether or not the current version of the TIRPS system would
succeed if the public were made aware of its existence. To guarantee its success, the
advanced features mentioned above need to be implemented. Otherwise, people could
become frustrated with the system.

Despite these potential complications because of features not being implemented, the
system as it stands now is a great success because it demonstrates that an informed route
planning system can be constructed to benefit the University of Maryland community and
the response of usability testers shows that there is a great interest in such a system.

Acknowledgments

We, team TIRPS, owe our sincere gratitude to many people for help of various kinds with
this project. To begin with, we thank Dr. Ben Shneiderman for sharing his valuable
insights into the syntactic aspects of the work. He keeps pushing and encouraging us to
make this project possible. We’d like to thank Nir Peer, our TA, for providing advices
and resources we needed. Our thanks also to Mark Stewart at Department of
Environmental Safety for insightful comments on our early point of departure, which
paved the way for a successful initial proposal.
References


Appendix A: Figure names and numbers.

Figure 1. Transition Diagram
Figure 2. Database schema
Figure 3. Search Page
Figure 4. Search Results List
Figure 5. Search Data
Figure 6. TIRPS Banner Generic
Figure 7. TIRPS Banner Logged In
Figure 8. TIRPS User Settings
Figure 9. TIRPS Routes Page
Figure 10. Search Page Prototype 1
Figure 11. Search Page Prototype 2
Figure 12. My Data Page Prototype 3
Figure 13. My Data Page Prototype 4
Appendix B: Pre-Test Questionnaire.

Pre-Test Questionnaire

Section I. General Information

Age:
- [ ] 18-20
- [ ] 21-30
- [ ] 31-40
- [ ] 41-50
- [ ] 51-60
- [ ] Over 60

Gender:
- [ ] Male
- [ ] Female

Your relationship with University of Maryland – College Park:
- [ ] Undergraduate student
- [ ] Graduate student - coursework
- [ ] University faculty
- [ ] University staff

Are you an international student?
- [ ] Yes
- [ ] No

How long have you worked/studied at UMCP?

________________________________________________________________________

Section II. Internet Experience

On average, how many hours per week do you spend using the internet?
- [ ] None
- [ ] less than 5 hours
- [ ] 6-15 hours
- [ ] 15-30 hours
- [ ] 30+ hours

Please indicate the frequency of your use of the following internet services

Email
- [ ] Daily
- [ ] Weekly
- [ ] Monthly
- [ ] Rarely/Never
Web [ ] Daily [ ] Weekly [ ] Monthly [ ] Rarely/Never

Are you an active member of an online community?
[ ] Yes
[ ] No

If Yes, how many hours a week do you devote to the online community?
[ ] 1-2 hours
[ ] 3-5 hours
[ ] 6-8 hours
[ ] 9-11 hours
[ ] 12+ hours

Section III. Commuter Experience

What is the average time of your commute to campus?
[ ] 0-15 minutes
[ ] 16-30 minutes
[ ] 31-45 minutes
[ ] 45-60 minutes
[ ] 60+ minutes

How many routes do you take to commute to campus?
[ ] 1
[ ] 2
[ ] 3
[ ] 4 or more

Which do you use to decide when to depart to campus? (Select all that apply)
[ ] Television
[ ] Radio
[ ] Internet

Which of the following influence your commute route to campus?
1: Never, 3: Sometimes, 5: Always
Trip Duration [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5
Rush-hour traffic [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5
Weather Conditions [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5
School Bus traffic [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5
Number of traffic lights on a given route [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5
Special events (e.g. sports, concerts, etc.) [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5
Appendix C: Post Test Questionnaire

**TIRPS Questions (subjective)**
How easy was TIRPS to use and navigate overall?

Were you able to complete your user task without incident?

Is there a functionality that you would like to see added to TIRPS?

What was the best part of TIRPS you noticed while interacting with it?

Do you think TIRPS could be a hit amongst the commuting community?

**Semantically anchored questions (objective)**
How many times have you used TIRPS in the past week?
- 0-2
- 3-5
- 6-10
- More than 10

Is TIRPS user-friendly?
- Yes
- No

If yes, please tell one thing you like about it.

If no, please tell one thing you do not like about it.

After registering for an account, you will be directed to
- Thank you page
- Home page
- Yahoo home page
- Search page

Rate from 1 to 5, how easy can you use the interface? (5 is the easiest)
- 1
- 2
- 3
- 4
- 5

Does the interface direct you to where you want?
- Yes
- No
Appendix D: User Task Sheets

User 1:

Register an account
- Found the register button with relative ease.
- Completed very easily.

Login
- Logging in using the control in the upper right corner of the page.
- Done quickly and with no complaints.

Add a route
- Didn't know where to go to post trip after logging into the system.
- Once she gets to MyData section, she can see Add New Route link.
- MyData section structure confused her.
- **BUG**: Starting address -700 Hawkshead Road; Ending address - 4250 Knox Road
  - Upon clicking the Get Directions button, a dialog box popped up with some error, closed it out.
  - **Solution**: User entered the full addresses with proper punctuation.
- Completed the form and hit submit.
  - **Problem**: No feedback to tell her that she successfully submitted the trip. It looks like an error occurred because all the form fields are still filled in.

Viewing the submitted route
- She found the link easily and she sees the trip.

Perform search to find submitted route and view it from the Search Results list
- She tries to view the result from the Submitted Routes page.
  - Double clicked and nothing happened.
  - Clicked on View Selected buttons and nothing happened.
  - Confusion over task plus expectations for the interface.
- She irritatingly retypes all the information back into the fields of the proper Search page.
  - When she clicked on Get Directions button, the Google Maps API returned an error saying that the directions.getStatus method is undefined.
- Completes the search.
- Upon seeing the Search Results list, she asks if these are other users’ trips.
- She clicks on the trip that she submitted to view it.
- She continues to view other routes in the Search Results list.
  - Upon viewing one, after clicking the Get Directions button a Google Maps API exception pop-up appears.
- **Complaint**: User asked why there was no option to select which routes to avoid in the Add New Route form.

Concepts that confused her were:
- Entering address before being able to search for the route.
- Also helpful to see the resulting directions written out.
User 2:

Register an account
- Found the register button very easily.

Login
- Used control in the upper right hand corner of the screen.

Add a route
- Confused as to where to go to post a trip.
- Found the MyData page and then found the add a new route page.
- Entered full street addresses without direction.
- Suggestion: To make the address fields more normalized as in separate fields for different components of the addresses.
- Encountered an error when clicking Get Directions button.
  - Fixed by removing University of Maryland from the ending address field.
  - Successfully submitted the form.

Viewing the submitted route
- Double clicked on the name of the trip expecting it to do something. It doesn't.

Perform search to find submitted route and view it from the Search Results list
- Confused as to where to go to perform a search
- Clicked around the MyData section a bit.
- Found the search page.
- Expected the trip search to be like Google (based on keyword recognition)
  - Did not expect the spatial search and having to re-enter addresses.
  - Got the same Gdirections error.
- Confused about what search radius is and what it was used for.
- Bug: When he entered the time for the start departure, the route went away.
  - Confused about why the route disappeared.
- Successfully submitted search query.
- Found his submitted route in the Search Results and clicked on it.

User 3:

Register an account
- Bug: Upon entering information to register account and clicking submit a null pointer error occurred.
- The participant clicked on the back button and continued
- Liked the fact that all his information was still saved except for the password.

Login
- User logged in flawlessly.

Add a route
- User initially did not know where to go to Post a trip but after some searching figured out that it was in the MyData section.
- When PM was changed to AM the screen reloaded confusing the user.
- When a date on the calendar was selected the screen reloaded again which irritated the user causing them to sigh.
- User liked the Trip Flags. He thought it was an original idea.
- Bug: User received a null pointer error when clicking the Submit button.
User then clicked the Back button of the browser. He then returned and changed the destination address and re-clicked submit and it worked.

**View the submitted route**
- User clicked on *Submitted Routes* then proceeded to spam click on their trip title expecting it to open up.

**Perform search to find submitted route and view it from the Search Results list**
- User clicked around to figure out where to go to search for a trip.
- After finding the Search page, he searched for trip and found it successfully.

**User 4:**

**Register an account**
- Registered without flaw

**Login**
- Logged in without flaw

**Add a route**
- Took a while for participant to figure out that they needed to go to MyData to post a trip.
- **Bug:** Participant saw someone else’s username, name, email when they clicked on MyData so they were confused.
  - I told her to disregard it.
- Participant made a negative comment about the address being all on one line and not divided into individual fields.
- Screen reloaded when participant changed PM to AM causing her to temporarily become confused.
- When participant clicked on Submit to submit her trip it was unclear whether or not it went through successfully.

**View the submitted route**
- **Bug:** User located their submitted route and clicked on it then began to click on *View Selected* in hopes that it would open up.
  - I informed them that they had to search for it manually

**Perform search to find submitted route and view it from the Search Results list**
- Search performed without flaw.

**User 5:**

**Register an account**
- Rated easy by user
- **Suggestion:** User complained that the Register link is not visible enough
  - Perhaps make the text bold.

**Login**
- Rated easy by user
- User completed the login easily.

**Add a route**
- Rated moderately difficult by user
- User complained that the Google Maps API generated exception errors after she typed in Starting and Ending addresses in the incorrect format.
  - She suggested better exception handling.
Change your password
- Rated easy by user

Make your email public
- Rated very difficult by user
- She complained that she received no success message after changing her password so she was not sure if the password had been changed. After logging out and logging back in with the new password, she was annoyed that the password change did not take effect.

User 6:
Register an account
- Rated easy by user
- She commented that there were too many data requirements just for the registration.
- She also asked to mark which fields are truly required upon registration, and which can be left blank and filled later.

Login
- Rated easy by user
- Completed quickly

Add a route
- Rated easy by user
- Completed quickly

View the submitted route
- Rated easy by user

Make your email public
- Rated moderately difficult by user
- She had difficulty finding the right link to click in order to find the email visibility option.

User 7:
Register an account
- User found the registration to be easy.
- **Problem:** User entered a password that did not meet the password requirements.
  - He complained that the registration page did not specify any password requirements
  - Suggested that the password requirements be displayed to the user

Login
- User found the login box relatively easy
- Completed the task very quickly.
- He said that the positioning of the login box on the screen was where users typically expect it to be.

Add a route
- User took a long while to complete task; he found it difficult
- User complained about the Address fields being one text field
- **Suggestion**: that both addresses be split into subfields including Street, City, State, Zip
- User pointed out that either the Start Address or End Address have to be automatically populated by the system if we want to ensure that routes either start or end at the university.
- He asked for more explanation on the criteria, such as Weather and Trip Flags.
- User took much time adding the route because he did not understand what the criteria meant.
- He complained about the page reloading after he clicked on the Calendar or when he selected either AM or PM for the times.

**View the submitted route**
- User found this task easy to complete
- User quickly found the route he submitted by clicking the My Submitted Routes link
- He also was confused on why the route was numbered [6] rather than [1] since it was the only one that he had submitted.
- He clicked incessantly on his route, expecting it to open
  - **Suggestion**: Let user preview the submitted route if the user clicks on it from the data grid.

**Perform search to find submitted route and view it from the Search Results list**
- User found this task relatively difficult to complete
- User complained that he was confused on which search criteria were required and which were optional.
- He complained that he was not able to select more than one weather condition
- He complained that if he was not able to unselect a weather condition after selecting one.
- He requested that the “Submit” button in the Search form be changed to “Search” instead.

**User 8**

**Register an account**
- Rating: easy
- Requested that the password requirements be made explicit so that the user enters a correct password on the first try.

**Login**
- Rating: easy
- No complaints; completed with ease

**Add a route**
- Rating: semi-difficult (7 on a 1-10 scale)
- He asked which fields were required to be populated.
- He complained about the Start and End addresses only being one line rather than divided into subparts
- He ran into several Google Maps exceptions thrown as a result of incorrect address format
- SQL exceptions thrown when he did not select a date on the Calendar
- He did not like that no success message appeared to confirm that his route was submitted successfully.

View the submitted route
- Rating: easy
- He found his route on the data grid easily but did not like that clicking on it did not result in anything.

Perform search to find submitted route and view it from the Search Results list
- Rating: easy
- He requested that required and optional fields be distinguished.
- After completing the Search and seeing his result at the bottom of the list, he was disappointed and stated “My route should have been at the top especially after filling out all the fields.”

Change your password
- Rating: hard
- While the process was simple for him, he considered it difficult because he received no success message to tell him that his password was indeed changed.
- He logged out and tried to log back in with the new password and noticed that the password change did not occur.

Make e-mail address public
- Rating: hard
- He said that there was no way to tell that his email was indeed made public other than by a success message.
- He complained that there was no success message to notify him that his change was saved.

Change display name
- Rating: hard
- He was confused on why his account information was not being displayed, but rather someone else’s account information.
- He complained about the lack of a success message and no way to check that his display name had indeed been changed.
- He recommended that the display name be shown in the User Information box on the left of the screen along with the rest of the user’s information.