The College of Saint Rose

Clinched Highway Mapping Project using Google Maps API

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1. The Purpose of the Project

a. The User Business or Background of the Project Effort

- We will design a website which will aid students to learn concepts of data structures and algorithms using visualizations and real-world information.
- The website will be an extension to Dr. James D. Teresco's 'Clinched Highway Mapping Data as a Pedagogical Tool'.
- Clinched Highway System is web application which functions within a web browser. This application was originally developed to provide driving directions.
- The web application provides several different views of terrain, maps and it includes view of the landscape.
- The Clinched highway systems allows users to select a current location and destination. As an output, it gives you the shortest path to reach at destination.

b. Goals of the Project

- We will create a website which help students visually understand concepts of data structures by depicting the results of data structure algorithms via pictorial depictions using real world data.
- The project extends to the bigger scope of route planning for private and public transportation. It is deemed beneficial to plan a journey using minimum time and cost.

2. The Client

The client for this system is Dr. James D. Teresco, on behalf of the College of Saint Rose.

3. Users of the Product

The users of the website include students who are interested to better understand concepts of Data Structures and algorithms, independent of present enrollment in an academic institution or location.

4. Mandated Constraints

a. Solution Constraints

Description: The product will be a website which is an extension of the Clinched Highway Mapping tool.

Rationale: The client, who is a college professor is interested to assist his students understand concepts of data structures and algorithms using visual depictions implementing real-world data.

Fit Criterion: The development team will strive to ensure that the website meets the client's requirements. This will be achieved via implementation of quality assurance testing during each stage of the website development process.

Description: The website will allow students to easily navigate the website without requiring any prior training.

Rationale: The client is interested to expand the scope of the present website, 'Clinched Highway Mapping Data as a Pedagogical Tool'. He would like to add improvise on the present user interface of the website so it proves to be more user-friendly for his students.

Fit Criterion: The development team will test the functionality of every aspect of the website to ensure that it can be used without having any prior knowledge of the website development.

b. Partner of Collaborative Applications

1. The website will use location data sourced from the Clinched Highway Mapping website.

2. The website will import Google Maps API to allow it to visually represent locations, markers, polylines and routes.

c. Schedule Constraints

The development team is scheduled to deliver the final website launch on May, 10 2016.

5. Definitions

API: Stands for application program interface. They comprise of functions and protocols used during software development for a specific operating system.

Context of the work: Context diagram that represents the work which requires research.

Database: A structured set of data held in a computer, especially one that is accessible in various ways.

Eclipse: An integrated development environment which allows development of software using several predominantly used programming languages.

Fit criterion: Is a measurement for a requirement.

Javascript: is a high-level programming language of HTML and the web.

JQuery: Is a cross-platform Javascript library which is used to simplify client-side HTML programming.

Product boundary: Use case diagram that represent the boundaries between user and the product.

PHP: is a server-side scripting language which is used primarily for web development but also for general-purpose programming.

Rationale: Set of reasons

Schedule constraints: List of specified deadlines.

Subject matter experience: User experience of the business.

Technological experience: User's technological experience.

User: include students who are interested to better understand concepts of Data Structures and algorithms.

User role: What the user is required to do.

6. Assumptions

- The students will be expected to have basic proficiency in reading English and technology skills.
- The students will be expected to have a basic computer setup and access to the Internet.
- The students will be expected to have a basic understanding of using Google Maps
- The students will be expected to have a basic understanding of data structures and algorithms using any programming language.

7. The Scope of the Work

a. The Current Situation

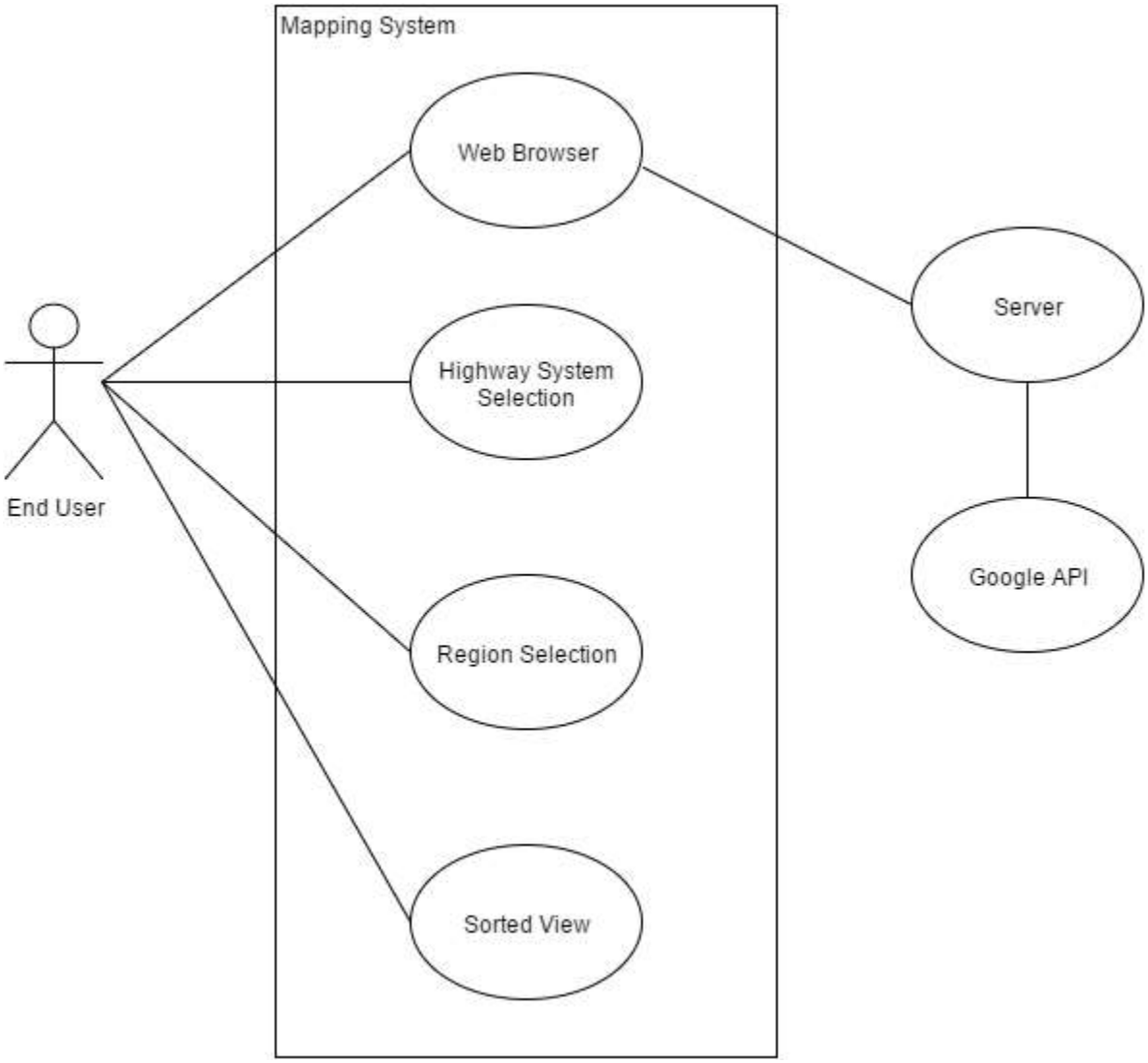
Use case diagram decides the boundaries of the actors. Here, actor stands for the end user of the mapping system. Use case diagram decides the limitations of the end user. Which includes, the role of user, what activities and operation it can perform. In this mapping system user can select the highway system. For example; Nova Scotia collector routs, Yukon territorial highways and Poland express way.

b. The Context of the Work

User has two more selection boxes in the system. He can select sorting method and region. Here, system includes various regions such as some North American region and European regions. For example; Georgia, Mexico, Russia, Poland, Germany etcetera. Or a user can select All Region option, too.

c. Work Partitioning

This system includes the server and Google API functionality. Google API invokes every time, when end user hits on search. This is method of the search criteria which resides in to the server.



8. The Scope of the Product

a. Product Boundary

The current system shows several things like Traveler Stats, Highway browser, Updates in existing project, get starter link and forum of the web site. The current situation of the system needs to be improved. In order to improvements, business analysis is necessary.

9. Functional and Data Requirements

a. Functional Requirements

A specification for each functional requirement:

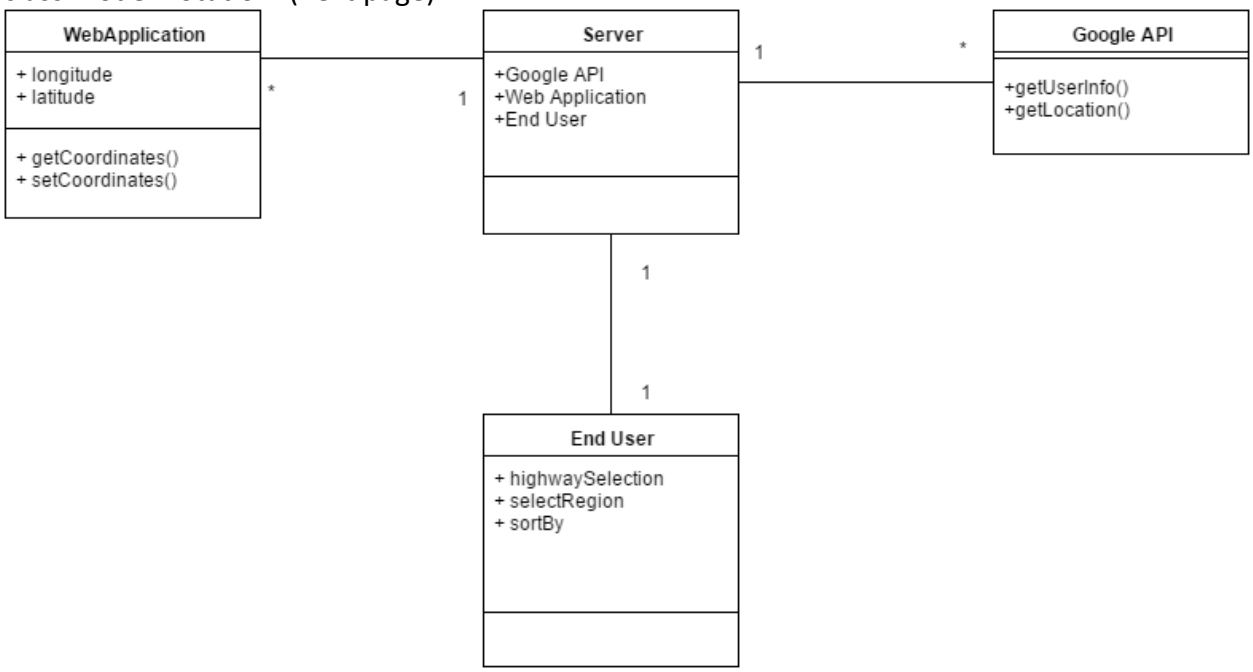
- Description: The product contains satellite view of high ways which includes North American region and a European region, too.

- The system should display the latitude and longitude of the user. The shortest path should be display on when the user hits a search button.

- System takes an address from the user in the form of string, and then displays the coordinates of maps depending on search's criteria.
  1. Priority:
  2. Author:
  3. Date:

b. Data Requirements

This is the business subject model of system created by Unified Modeling Language (UML) class model notation: (next page)



This class diagram shows the static structure of the system being modeled; and is includes the types being modeled within the system. In most UMI system, these types include:

- **A class:** It represents the rectangle containing three components stacked vertically. As shown above diagram, top compartment shows the class name. For example; Server, WebApplication are names of the class. There is a list of attributes used in the system in the second compartment of the class.

- **Relation:** This part shows the relation between two classes. Figure indicates the relation between classes in the system. There is a one to many relation between Server class and Google API, same as between Server and WebApplication. There is one to one relation between Server and End User.

- **A data type:** Data type is the type of information entered by end user. It might be in the form of character or integer as well. User enters the address which can be formatted by alphabets and numbers. So, char() is the suitable data type for this system.

- **A method:** It a list of methods which a class is using. As shown in diagram, Google API and WebApplication are using several methods. They are represented in camel case followed by "()".

10. Look and Feel Requirements

a. Appearance Requirements

- The website will obtain information representing the client's original website's design such as colors and the college logo.

- The website will be a combination of text, tabular and maps based data.

- Students or users outside the College of Saint Rose will enjoy the same user interface as college faculty and staff.

- The requirement gathering procedure and designers will ensure that the website's appearance adheres to the client's vision for the final product.

b. Style Requirements

- The product should have a neutral and inviting mood.

- The product should influence students to navigate through the different parts of the website to grasp the concepts of data structures and algorithms.

- The website will focus on concepts of data structures and algorithms. The design of the website will not direct the user's attention to any other phenomenon.

- The client's specific requirements of the website might not be met within the first requirements gathering meeting. This is because a broader perspective is obtained during the initial meeting. Subsequent communication with the client will clarify further detailed requirements and design refinement.

- Fit Criterion:
  The website will attempt to gain 100% of all potential student's attention during their first experience understanding concepts of data structures via the website.

11. Usability and Humanity Requirements

a. Ease of Use Requirements

- The website will provide options for increasing and/or decreasing the font size. This is independent of the functionality which various modern internet browsers offer to alter font size. The location of the font size modification option will be strategically placed in the website so that it will be clearly visible to all potential users. This may aid potential users with special visual needs. Placement of the location font modification option will be discussed with the client during a future communication.

- The website will provide options for converting webpage text to speech. This will also be independent of the option which certain modern internet browsers offer for 'text to speech' functionality. The website will provide an initial alert window before the webpage begins to read the text out loud. Placement of the location font modification option will be discussed with the client during a future communication.

- Fit Criterion: 90% of all potential website users shall be able to successfully visualize a search-based data structure algorithm after following the instructions provided on the website.

b. Learning Requirements

- The website should have a user interface which is equally easy to use for both the client and students.

- The website will allow for successfully visualizing a given data structures algorithm by potential students in accordance with the client's expected learning curve time frame ranging between 0 seconds to 5 minutes.

- Fit Criterion:
  1. 100% of individuals who belong to the college and/or individuals who are familiar with the client's website user interface should be able to successfully visualize a given data structures algorithm within 3 – 5 minutes before contacting the webmaster for help.

  2. 100% of individuals who do not belong to the college and/or individuals who are not familiar with the client's website user interface should be able to successfully visualize a given data structures algorithm within 3 – 5 minutes before contacting the webmaster for help.

c. Understandability and Politeness Requirements

- The website will be designed in a way which mimics the user interface of the client's original maps-based website.

- The website's design may be altered to a more widely-acceptable website design given the client's permission, if the development team jointly conclude that the client's website's functionality is difficult to comprehend by the general public. This will also be reviewed during the quality assurance phase post website development.

- The website's design will ensure that focus is laid on its core purpose: visualization of data structure algorithms. Methods such as highlighting the data structure algorithm heading title on the initial page and providing headings on every subsequent webpage can help realize this purpose.

- The website will have no webpage elements providing functionality other than addressing the client's requirements. For example, there will be no local news, weather, events widgets present.

- No aspect of the website's internal framework will be displayed to the user. This will include programming code which may be displayed in the description section of a Google Search below the title of the search.

d. Accessibility Requirements

- The website will provide functionality within webpages to adjust font text size for potential users who may require visual aids.

- Users who are visually impaired may require external assistance and/or the use of the 'text to speech' function. The 'text to speech' functionality has been discussed in the 'Usability and humanity requirements'.

- Users with learning disabilities may require external assistance and/or any of the previously discussed options. These factors may increase the website's functionality learning curve.

- The client would like ensure that the website will allow users from both the college and guests, with or without disabilities to reserve rooms with equal ease.

12. Performance Requirements

a. Speed and Latency Requirements

- The website will follow the client's vision of the project and implement a predominantly text, tabular data and maps-based interface. Excess use of multimedia elements may contribute to webpage navigation latency and hence will be avoided.
- Fit Criterion:
  1. The website will ensure that visualization of the data structure algorithm will be displayed in real time.

  2. The website will ensure that no additional internal processes will occur during the visualization of the data structure algorithm on the chosen map.

b. Reliability and Availability Requirements

- The website should be available for data structure algorithm visualization 24 hours a day, 365 days a year.

- If an error is reported by a user via the error report form, the website will immediately notify the webmaster. The development team will attempt to resolve the issue as soon as possible.

- The website will undergo exhaustive quality assurance testing prior to the launch of the website to rule out a predominant percentage of errors. At the same time, the website does not constitute a high-value project and hence availability of support staff 24 hours, 7 days a week is not feasible.

c. Capacity Requirements

- The website can host 50 users navigating its webpages at the same time between 4 – 9pm on Friday and Sunday evenings.

13. Maintainability Requirements

- Website maintenance checks will be conducted on the first Sunday of each month between 8 – 9.30 am. The acceptance of this time slot will be discussed with the client in a future communication.

- The development team will discuss the possibility of sending a non-technical report to the client every time an error on the website is detected and resolved. This will be discussed in an upcoming client-development team briefing.

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14. Security Requirements

a. Access Requirements

- The website will be available to browse by students who attend the college and members of the public too. No special login requirements will be in effect.

- The website will afford the same level of security measures as that of the college website as the former will be hosted on the college website's domain.

- The website will display a Terms and Conditions webpage in the About section, the contents of which would be decided upon by the client.

- Fit Criterion: The website will allow guests and outside groups to use the client's website.

b. Privacy Requirements

- The website would not share user information, if any in any circumstances with any party other than those designated by the client.

- If the client decides to bill users for particular aspects of the website in the near future, the development team will use the technology and guidelines afforded through the college's cyber security system for storing private data, which may include information regarding monetary transactions, bank account information and/or credit card details.

15. Open Issues

In this project there is one concern which is time. Due to deadline, the project should be done in two months approximately.

1. **Time**: our client mentioned that the project deadline is in the last week of April.
2. **Technology**: are not visible due to the team's background is limited in this kind of project which involve algorithms.
3. **Applying Algorithms**.

16. Risks

Here The Risks are in order from the important to less important

1. **Time underestimation** time required to finish the project. Does not use the tools like project network to estimate the time and know the critical path is one of the risk that could led to underestimation of the time that may be needed.

2. **Team members**. if one of the team members leave the team for another position, which could cause a delay on the submission.

3. **Excessive schedule pressure:** Underestimated the time that needed to complete the project, pressure to meet the deadline which could led the team to critical mistakes.

4. **Management malpractice**: Action done by the professional who does not follow the standard of professional competence which could result in a clear damage to his client by the delivered product. In IT field the negligence and errors are possible, and it is the leader or manager task to avoid it by monitoring and keeping up with the project and the team. Also, team members are responsible toward themselves.

5. **Low quality**: The fast pace of the project to meet the deadline could lower the quality of the project.

6. **Low productivity**: is a tendency of lack of productivity and is due to the poor planning, poor management and lack of communication.

7. **Creeping user requirements**: is a tendency for product or project requirements to increase during development beyond those originally foreseen. Feature creep may be driven by a client's growing “wish list” or by developers themselves as the see opportunity for improving the product.
    - To deal with the requirements, creep changes during the execution phase: Making sure that all stakeholders and business users know about the scope.
    - Train team members how to identify and manage the scope changes. How to identify scope change when they see it, and to be able to answer correctly are appropriate back to the business user.
    - Communications, the team should continuously communicate and have appropriate communications plan to manage scope changes (commercial documents, statement work, kickoff presentation with the team, stakeholders and business users, reinforcing almost every week what the scope project is.)

17. User Documentation

1. **Technical specifications** to accompany the product: A detailed description of technical requirements, with specific acceptance criteria, stated in terms suitable to form the basis for the actual design development and production processes of the item having the qualities specified in the operational characteristics.

2. **User manuals**: is a technical communication document intended to give assistance to people using a particular system.

3. **Service manuals**: Provided book with instructions on how to keep the system working properly at different point in its life.

4. **Installation manuals**: Provided book with instructions on how to install the system in the devices and the computers.

18. Waiting Room

The development team should document any upcoming ideas, which could improve the product features. However, the team should concentrate on the project deadline and if the team got the team, they could add it.

- More of algorithms applied.
- Represent the longest and shortest path by coloring them.
- Search Box

The website's development team will obtain their motivation to create, design and deliver a website which meets the specific requirements provided via the requirements gathering process and eventually help realize the client's vision for the project.