Accessible Interactive Map

SOFTWARE REQUIREMENTS SPECIFICATION (SRS)

CS 4850 Section 3

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Professor Perry

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Justin Connick

Megan Ingram

Derrick Novack

Spencer Williams

Emily Zhu

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Reversion History

Name	Date	Reason for Changes	Version
Spencer	04-19-2025	Changed reqs and tools used removed accessibility guidelines and standards	1.1

1.0 Introduction

1.1 Overview

The Accessible Interactive Map project is a web-based application with an interactive map where users can select start and end points to see optimized routes. The primary focus is accessibility for those with disabilities and user personalization according to lifestyle and goals. Although geared towards Kennesaw State University, the hope is to expand to other institutions.

1.2 Project Goals

The project aims to:

- Develop an accessible, web-based application
- Develop a user-friendly interface for selecting points and displaying routes
- Use existing APIs for route optimization (such as Google Maps API)
- Have cross-platform capabilities and easy configuration management
- Implement user management functionality to store preferences such as disability types and lifestyle goals
- Offer lifestyle tips such as calorie counts for different routes
- Meet accessibility standards with screen reader compatibility, high contrast modes, and keyboard navigability

1.3 Definitions and Acronyms

API = Application Programming Interface

CSS = Cascading Style Sheets

HTML = Hypertext Markup Language

KSU = Kennesaw State University

SQL = Structured Query Language

OSM = Open Street Maps

UI = User Interface

1.4 Assumptions

It is assumed the web browsers support HTML5, CSS3, and JavaScript standards. It is also assumed that they are compatible with accessibility technologies like screen readers.

It is assumed that any third-party APIs will remain free of cost and readily available for future software updates.

2.0 Design Constraints

2.1 Environment

The web-based and mobile-friendly software system functions as a navigation system to provide lifestyle guidance to users. Users will access this system through contemporary browsers available on various devices such as desktops, tablets, and smart phones. Users can access the system through any device that can support HTML, CSS3, and JavaScript. Individuals who are frequent KSU compose the main target audience for this system since route optimization functions and accessibility features serve them best, but global expansion possibilities exist based on future data availability.

The software system will run from a dedicated server provided by Kennesaw State University for reliability and growth purposes. A relational database platform among PostgreSQL or MySQL will manage user information composed of account information along with preferred routes and accessibility preference.

User-generated routes through Google Maps API or OpenStreetMap generate route calculations the system obtains from these external mapping services to provide real-time navigation assistance. The system will connect to screen reader accessibility software so visually impaired users can utilize its features. The user interface combines responsive design to accommodate web and mobile platforms alongside high contrast features, keyboard controls, and adjustable accessibility tools to maximize usability for every user type.

2.2 User Characteristics

This application targets KSU students, especially those with walking and seeing disabilities, as its main audience. Users with disabilities can benefit from the system because it provides special routing options, disability-related features, and personalized lifestyle recommendations. The application supports users of all technical abilities who study at KSU through a user experience that remains intuitive for everyone.

Wheelchair users along with other individuals who need wheelchairs or crutches can access the system with ease because it shows accessible routes which lead through ramps and elevators alongside proper curb cuts without options for staircases and mobility limitations. User will receive instant data about disabled accessibility status and wheelchair route timing estimations through the system.

Visual impairment users can take advantage of descriptive features that make usability better through screen readers, high-contrast modes, and text-to-speech functions. Users who exclusively use assistive technologies will find priority access to keyboard operation as an alternative to traditional touch of mouse input.

The solution focuses primarily on accessibility but contains optional features which allow fitness enthusiasts to record their walking activities like step counts and calorie expenditure as they move on campus. The system interface will maintain a basic, user-friendly design for those with different technological proficiency levels.

The application will advance to serve new institutions while preparing to accept public use through ongoing developments that honor accessibility needs alongside inclusive principles.

2.3 System

A web-based application, along with a mobile-friendly navigation platform, exists to boost accessibility while directing users toward lifestyle choices. Multiple technologies will be incorporated into one system to enable smooth accessibility between desktops, laptops, tablets, and smartphones. As a main functionality, the platform serves users by helping them find optimized routes with built-in accessibility considerations during planning.

Core Components:

1. User Interface (UI):
   - Designed using HTML, CSS3, and JavaScript to support responsive web design.
   - Optimized for accessibility with high-contrast modes, keyboard navigation, and screen reader compatibility for visually impaired users.
   - Offers an intuitive and minimalistic interface to accommodate users of all technical proficiency levels.
2. Backend System:
   - Built using server-side technologies like Python (Django/Flask), Node.js, or PHP for handling business logic and data processing.
   - Utilizes PostgreSQL as the relational database for storing user accounts, preferred routes, accessibility preferences, and tracking lifestyle-related data.
3. Mapping & Navigation Services:
   - Integrates with Google Maps API or OSM for real-time route calculation and accessibility-based adjustments.
   - Provides multiple route options based on user preferences, including wheelchair-accessible paths and step-free navigation.
   - Displays real-time updates on accessibility status for elevators, ramps, and other relevant infrastructure.
4. Accessibility & Assistive Technologies:
   - Supports screen reader accessibility software to assist visually impaired users with textual and navigational elements.
   - Includes adjustable text sizes, customizable color contrast settings, and text-to-speech functionality.
   - Offers keyboard shortcuts and voice command support for users with limited mobility.

5. Lifestyle & Fitness Tracking:
    - Users can set personal goals related to steps taken and calories burned.
    - The system dynamically updates caloric expenditure based on route selections and walking distance.
    - Provides insight into lifestyle trends and activity levels over time.
6. Hosting & Deployment:
    - Hosted on dedicated Kennesaw State University servers to ensure reliability and scalability.
    - Designed to support future expansion to other institutions and public use cases.
    - Implement routine backups, security patches, and server monitoring for optimal performance.

The system aims to unite accessibility advantages with operational convenience by delivering inclusive navigational support to students with disabilities and promoting their choice of health-promoting practices. Future development will involve the incorporation of artificial intelligence for route suggestions alongside immediate community density monitoring and expanded open accessibility capabilities starting outside the university environment.

3.0 Functional Requirements

3.1 Login

Enter username/email

Enter password

Password recovery link

Click button to login

3.2 Register / Create Account

Enter first and last name

Enter email address

Enter phone number (optional)

Enter username

Enter password (minimum 8 characters with at least 1 capital letter, 1 lowercase letter, and 1 special character or number)

Click button to register

3.3 Home Page

- User types in a search bar to select start and end destinations
    - Display optimized route and other route options
    - Display lifestyle advice per route (calories burn per route)
    - Display time each route takes by walking or school bus / car
- Click Accessibility Button
- Click Lifestyle Button

3.4 Map Display

- Small display incrementing calories burned and steps taken (vs set goals as a ratio)
- Show precise, readable directions
- Show map image
- Show ETA
- Click button to exit navigation

3.5 Accessibility Button

- Multi-select checkboxes for selecting disability types
- Accessibility options
    - Screen reader compatibility
    - High contrast modes
    - Keyboard navigability

3.6 Lifestyle Button

- Multi-select checkboxes for selecting lifestyle advice options
- Users set their own goals (steps and calories goals per day/month/year)

3.7 Account Page

- View and edit personal info
- Update password
- Update Preferences

4.0 Non-Functional Requirements

This section outlines the necessary characteristics which design the accessible interactive map system to fulfill. These specifications cover several critical domains which include security together with capacity and usability and performance and reliability and maintainability features for meeting dual technical and user-focused targets.

4.1 Security

The system needs to implement comprehensive security procedures which keep user preferences together with account-related information secure. Only authorized user accounts holding authentication information alongside strong passwords will gain access to protected data. Data exchange will occur between client devices and Kennesaw State University's official servers.

4.2 Capacity

The system's capacity depends directly on the capacity of the server infrastructure operated by the school. The system currently operates on the existing server infrastructure, which must be designed to expand its capacity for increasing campus data amounts and user base expansion. When the user base increases, the system demonstrates its capability to maintain stable performance even during higher levels of concurrent operations. The system's dependence on third-party APIs leads to expanding expenditure costs as user numbers grow because the system uses various third-party APIs for its features. The budget and operational costs will experience an impact from increased user numbers because API expenses increase in this situation. The system needs efficient resource management and load balancing strategies, along with additional protocols for cost optimization through API pricing tier negotiation or data caching techniques, to manage increased API call expenses. Long-term sustainability requires future capacity planners to strike a balance between technology scalability and the current expense budget for effective planning.

4.3 Usability

The interactive map prioritizes accessible usability features as its core design component. Visual components will be designed for maximum visibility through high contrast designs. We will focus on ensuring that our colors make text, buttons and the map clearly identifiable. Different components like buttons, while being clearly labeled with icons to help users identify the functions of the buttons.

5.0 External Interface Requirements

5.1 User Interface Requirements

User interface requirements include accessibility features, interaction with the map, user inputs, how the app reacts to various screen sizes (phone, desktop etc.), and error handling. For accessibility features, we want to add more support for users such as simple navigation with clearly labeled controls. Having stable interaction with the map is important and we want to add the ability to zoom in, out, and drag the map. User inputs will allow users to use a drop-down menu or input fields to filter to make it easy to find what they are looking for. If the user runs into an error or issue, there should be pop up message with the error stated as well as guidance that the user can make it work.

5.2 Hardware Interface Requirements

Starting off, the app should be available and supported on all Windows and Mac laptops. For future versions, we would like to add GPS integration so that users are able to see their location in real time to help navigate more easily as well as making this app accessible on phone and tablet devices.

5.3 Software Interface Requirements

The app should be available and supported on standard web browsers on desktop and mobile. We will be using external APIs like Google Maps, and OSM. This app will use React to support accessibility standards.

5.4 Communication Interface Requirements

The application will utilize established communication protocols to ensure secure and efficient data exchange among users, external APIs, and internal components. All data transmissions will occur over secure channels such as HTTPS, with information formatted in JSON to maintain consistency and simplify integration across various systems. Interactions with external services, including Google Maps and accessibility tools, will be facilitated through RESTful API calls that support standard HTTP methods. This design will include basic error handling measures—such as retry mechanisms and clear user notifications—to manage potential service disruptions.

In addition to these measures, the application will incorporate strategies to handle real-time data requirements. Internally, well-defined interfaces will guide communication between application modules and entities and ensure that updates to one component do not negatively impact overall performance. This integrated approach to communication is designed to deliver a secure, reliable, and scalable user experience.