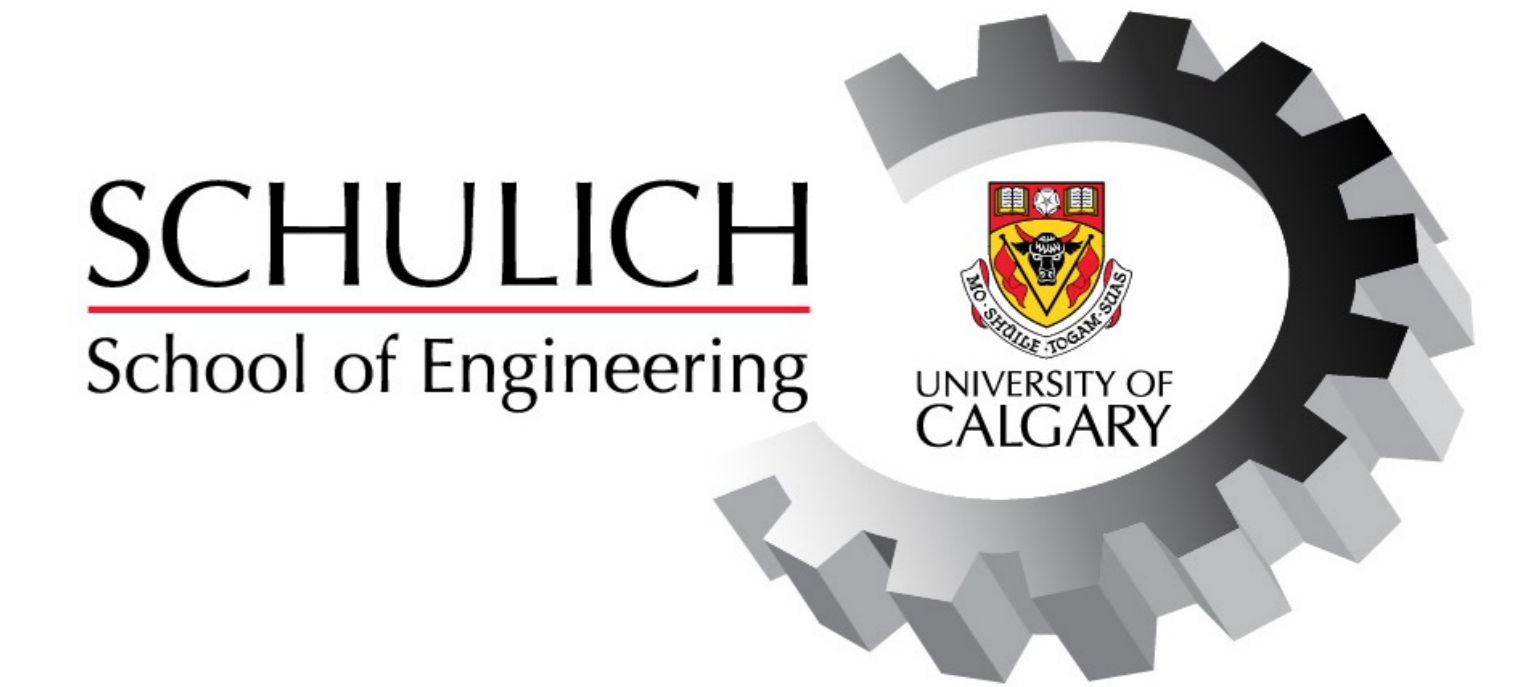# ReRoute - Dynamic Smart Routing

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Abstract

As the advancement of spatial technology has rapidly risen with the emergence of accurate and consistent Global Positioning Systems (GPS) over the past two decades, there has been a growing demand for dynamic route planning for route management systems. Routes can actively interact with spatial obstacles and live data to avoid them by rerouting the vehicle.

The aim of this project is to develop a platform that can accept spatial data input, allow users to customize algorithm interactions with the data, and respond dynamically to uploaded spatial data to facilitate routing to the destination. Additionally, the platform will integrate live traffic data and consider fuel economy to enhance routing decisions in real-time.

Introduction

The mapping platform :

- Enhances vehicle routing by avoiding high-risk and environmentally sensitive areas, leading to lower insurance costs and minimized risk of damage in case of accidents.

- Considers truck dimensions and actively rerouting to accommodate road conditions and traffic, the platform mitigates time loss and potential damages caused by navigation errors.

- Minimizes environmental impact by avoiding routes through sensitive ecological areas, thereby preventing potential damage from incidents like chemical spills and reducing localized emissions.

Results

A Geoweb app that's publicly hosted for any user to use providing:

- Authentication service for users to login and store their data.
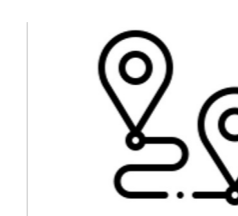
- Routing service that finds the shortest path around buffers.

- Implement various buffers on map and find the shortest path around all of them.

- Live traffic data displayed on to show areas with the highest congestion.

- Provide alternate route optimization based on user preference

Obstacles

The buffer functionality provided by the ESRI API presented several constraints, notably:
- Integrating the second routing API with the default leaflet fastest route algorithm.
- Enabling the API to take additional parameters outside start/stop.
- Enabling the use of multiple buffers simultaneously.
- Total buffer area cannot encompass more than 2000 street features using open-source API. Limits size and number of buffers.

Conclusions

The team was successful in enabling dynamic and interactive real-time routing through a user-friendly web application. The web application facilitates the leveraging of existing spatial data along with real-time data to provide dynamic routing. Additionally, historic user routing data is tracked and analysed to provide insight to users and specific recommendations based on vehicle information. Lastly, it allows users to specify different route optimization criteria.
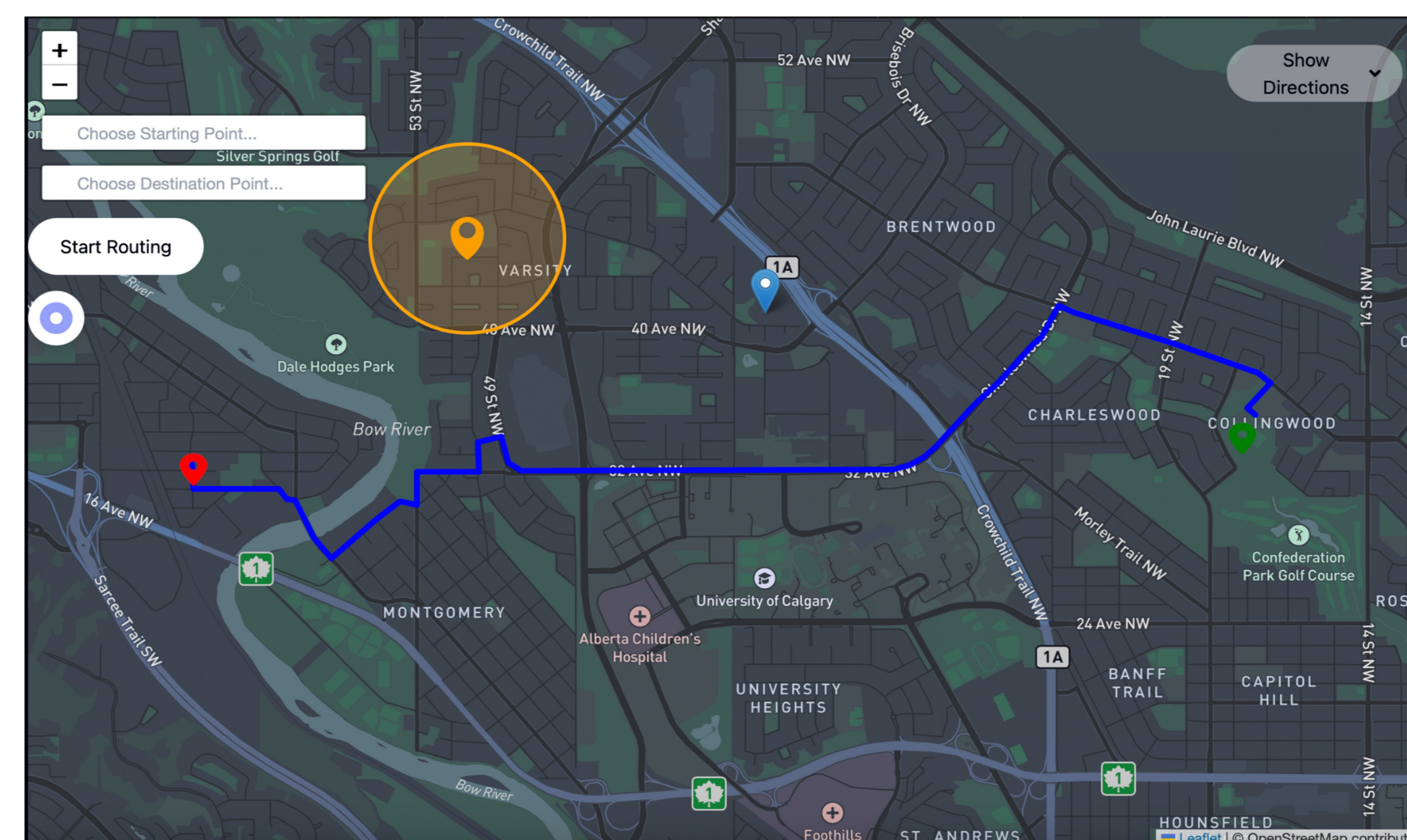
Methods and Materials

The platform is implemented as a website application. It makes use of several open-source APIs and frameworks to achieve our functional requirements.

- Back End framework in Django/Python
- Front End framework in React/JavaScript
- Front End styling using CSS Tailwind
- Map interface framework is Leaflet.js
- Basemap using Mapbox API
- Routing algorithm using Leaflet Library (node based)
- Buffer based routing using ESRI API
- Database using PostGIS

References

1. *ArcGIS maps SDK for JavaScript: Overview: Arcgis maps SDK for JavaScript 4.29: Arcgis developers*. Overview | ArcGIS Maps SDK for JavaScript 4.29 | ArcGIS Developers. (n.d.). https://developers.arcgis.com/javascript/latest/

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