An Interactive Web Dashboard for Visualizing SUMO Traffic Simulations on Large Road Networks

1 About CentroGeo

The Center for Research in Geography and Geomatics (CentroGeo[1]) is a Mexican public institution devoted to research, education, technological innovation, and dissemination of knowledge in geomatics and contemporary geography.

The Observatory is a CentroGeo group that aims to generate transdisciplinary information about urban phenomena in order to propose simulation models that allow experimenting with what-if scenarios about relevant urban problems, helping key decision-makers to develop better public policies.

An on-going research project at the Observatory is the design of novel route traffic algorithms powered by machine learning and distributed computing for a variety of vehicle traffic scenarios that arise in large metropolitan cities.

2 Project background

The vehicle routing algorithms designed by the Observatory are tested by means of SUMO[2] traffic simulations. SUMO is an open-source microscopic and continuous traffic simulation package designed to model a variety of traffic systems including road vehicles, public transport, and pedestrians.

The Observatory is in need of a Web application that allows the inspection of postmortem SUMO simulation data, by making use of state-of-the-art **interactive visualizations of large road networks showing the position and routes of the individual simulated vehicles.**

While there are a variety of client-side libraries that allow programmers to embed traditional charts (bar plots, line plots, scatter plots, pie charts, etc.) in web applications, there are no libraries for visualizing road networks on web documents.

[1] https://www.centrogeo.org.mx/
[2] http://sumo.sourceforge.net/

To fill this gap, CentroGeo has produced **React Sylvereye**, a new JavaScript library for React that allows web developers to easily embed WebGL-powered interactive visualizations of large road networks on top of tiled web maps.

Project objective

To develop a dashboard web application that exploits CentroGeo's React Sylvereye library to generate and display web-based visualizations of SUMO vehicle traffic simulations by consuming postmortem SUMO simulation data.

Application requirements

The idea is to develop a web dashboard that meets the following requirements:

Backend:

- Can ingest SUMO postmortem simulation files and store relevant metadata in a relational database.
- Implements a RESTful Web service that allows the frontend to query road network and SUMO simulation data.

Frontend:

- Shows a dashboard that allows the client to visualize road networks on top of tiled web maps by using CentroGeo's React Sylvereye library.
- Shows simulation data on top of the road network visualization by using CentroGeo's React Sylvereye library by considering the time dimension.
- Shows basic simulation statistics by making use of traditional interactive charts (line plots, bar charts, scatter plots, etc.)

Please note that the students *do not need to know how to use SUMO nor how to design and run simulations*. SUMO postmortem simulation files for testing the web application will be provided. Also, students will be given access to CentroGeo's React Sylvereye library along with its documentation.

Note: It is not permitted to modify or redistribute, partially or as a whole, the provided CentroGeo's React Sylvereye library, neither in source code nor in binary form, nor to use CentroGeo's React Sylvereye library out of the scope of the University of Twente's 2021 Module 4 student project described in this document, nor outside Module 4 student project's original academic purpose.

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