

Software design document

COMP.SE.110 Software Design

Weather and traffic data manipulation

Written by: Veikka Peltomäki, Niklas Kanetele, Eemil Lehto, Samuel Ahopelto

Introduction

This document works as a design document on our groups project in the course COMP.SE.110 Software Design. The purpose of this document is to provide a description of our system which is comprehensive enough to work as a source of details for how the software is to be built.

The software project will be implemented using programming language C++20 and the Qt framework. The project is to be implemented using agile methods where the group will continuously evaluate the gathered requirements and iterate on those.

System Overview

The goal of this software project is to create a software which allows its user to study weather conditions and its history as well as road conditions and its history and their correlation by studying graphs, tables, and other visualizations in the software UI. These visualizations will be based on data gathered from Digtraffic (road condition data) and FMI (Finnish Meteorological Institute, weather data). The data is gathered in real time using public APIs provided by Digtraffic and FMI.

The software will be based on a UI where the user is able to select if they wish to view weather data, road conditions or the correlation between these (weathers effect on road conditions). The user will be able to input the coordinates of the area which he wishes to study as well as select a timeline of the data involved in the visualizations. The user should also be able to compare the data between different timelines and coordinate areas.

Requirements

These requirements will be iterated on continuously during the development process as the software development group identifies more of them.

The software system shall be able to gather real-time as well as historical data on weather and road conditions using APIs provided by Digtraffic and FMI

The software system shall have a GUI which allows the user to select which of the provided data to study

The data shall be visualized in various forms such as tables, graphs, and plots.

The user should be able to select the timeline of the data they wish to see in these visualizations

The user should be able to specify coordinates of the area of where the visualized data will be based on

The system shall be able to process the data gathered from the API and do calculations based on it to provide the user with relevant information based on the calculations

Architecture

The software system is to be implemented using C++20

- Backend logic model
 - Executes other backend classes (Data gathering, Calculation and visualization, comparison)
 - Sends results and visualizations to the GUI
- Controller
 - Handles requests from UI and sends them to the backend
- GUI
 - Frontend of software
 - Based on prototype created in Figma with final implementation being iterated on that
 - Possibly based on Qt GUI
 - Visualizations of data collected and processed
- Data gathering component
 - Gathers and processes data provided by Digitraffic and FMI APIs
 - Data will be processed into a form which is easy to use in calculations
 - Saves gathered data into a database for later use (Not a must-implement)
- Calculation and visualization component
 - Gathered data is calculated to properly visualize for example the correlation between weather and road conditions
 - Data is turned into different forms of visualization
- Comparison component
 - User is able to save a coordinate+timeframe combination of their choice and compare this to another combination of coordinates+timeframe
 - The comparison will be visualized in a manner where the user is easily able to understand and differentiate the data

Example run case

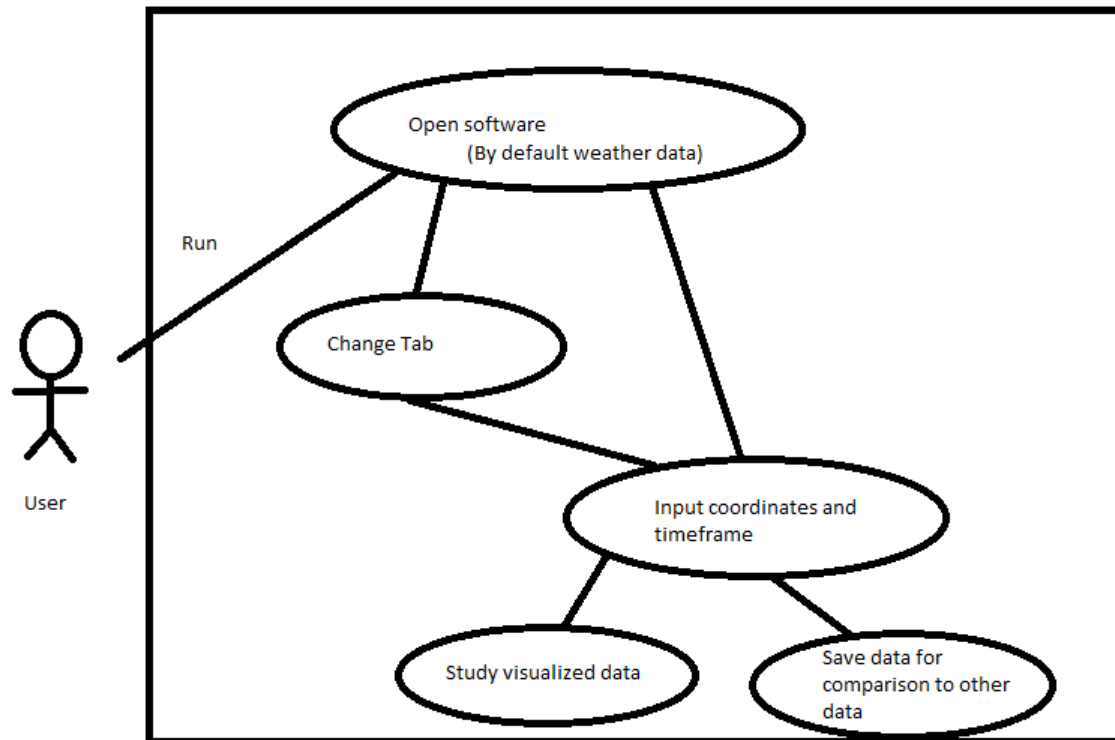


Figure 1 Very simple use-case diagram

- Software is opened
- Software is automatically opened to provide weather data of Tampere with a short timeline
 - o This data is by default gathered from the API and visualized on the GUI
- The user can either:
 - o Input coordinates and select a timeline to study similar weather data with different specifications
 - o Change to a different tab
 - Selection of two
 - Road conditions
 - Weathers effect on road conditions
 - Both have a default location (Tampere) and a default timeframe
 - o After inputting coordinates and selecting timeframe of choice user is able to save his selections to later compare them to another choice

The run case and architecture will be iterated on heavily as the project continues as for now only the basic functionality has been planned out.

Software project timeline

By 2.10.2022: Prototype of system UI and base design document done

By 30.10.2022: Somewhat working implementation of UI to be deployed with some functionalities. Working API calls to gather data from sources. Updated design document with self-evaluation based on the created prototype.

By 2.12.2022: Working final product