Web page development with an interactive map to represent the geographic distribution of National Schools in Sri Lanka

1. Background

There are over ten thousand schools in Sri Lanka, categorized as government, semi-government, private and religious schools. They are distributed across Sri Lanka's nine provinces, with each province having its own list of schools managed by the respective provincial education departments. The public schools are the mostly recognized and spread type among other types of schools and they are categorized under national and provincial schools based on the administrative perspective. They have further been categorized as A, B, AB and C type schools based on the highest grade offered and the availability of advanced level subject streams.

As schools are the foundation for education in a country it is vital to analyse the geographical distribution of this system. However, currently there is no publicly accessible detailed geographic representation available on the distribution of schools in Sri Lanka, except a few minor attempts. Therefore, this web development project aims to address a part of this gap through an interactive web map.

2. Objectives

The main objective of this project is to develop a web page with an interactive web map to represent the geographical distribution of national schools in Sri Lanka. The web page will consist of important descriptions about Sri Lanka`s school education system with an interactive map to represent all the national schools. A filtering system and popups will be applied to display the details about national schools up to the possible ground level based on the data availability.

Accordingly, the objectives of the intended web page are listed below.

1. To provide a summarized description about school system in Sri Lanka
2. To provide geographic distribution of national schools of Sri Lanka through an interactive map
3. To include filtering system to choose intended results based on a chosen criteria
4. To show school details on click through a pop up window

3. Data Collection and Preprocessing

The national school list of Sri Lanka was downloaded from the web site of Sri Lanka´s Ministry of Education as an excel file. The file included the columns ie. school name, address, province, district, zone, division, type of school, and medium of teaching.

The data set did not contain the geographic coordinates of the school locations. Therefore, they had to be geocoded in order to get the longitudes and latitudes of the school locations to locate them on the leaflet map. For that, "ArcGIS" geocoding service in R was used. The R code which was used to geocode and checking the correctness of the geocoded locations is provided as an attachment(Annex 1). However, as there were a few mismatches of coordinates found after visual inspection of the map in R, they were rectified manually through data obtained from google maps.

4. Workflow/Method

4.1 Web Tools used:

The intended web page was created using HTML, CSS, Java Script and Python web technologies. HTML, CSS and Leaflet JS were used to develop the frontend side whereas Python Django was used to work in the backend side. Additionally, R language was applied to geocode the locations of schools.

4.2 Web development steps

4.2.1 Django app development and setting up the python environment

1. As the first step, Django was installed, and a virtual environment("schools") was created in the project folder and activated.
2. A Django project was created as "srilanka_schools" and an app called "national_schools" was created inside the project folder.
3. The "national_schools" app was registered in the srilanka_schools folder to INSTALLED_APPS list.
4. A folder called "templates" was created inside the "national_schools" folder and another folder called "national_schools" was created in it. The html file called "national_schools_sri_lanka" was created here.
5. A folder called "static" was created in the national_schools folder and the CSS file was created here.
6. Another 3 folders were created in the same static folder as "js", "data", and "images" while they contain java script file, geocoded csv file and images for the web page respectively.
7. Static files were configured in the settings.py in srilanka_schools folder. (BASE_DIR/`national_schools`/`static`)
8. The geocoded csv file was imported into the views.py in the "national_schools" app. The html file was updated to access the data from here.
9. Inside the "national_schools" app a file called "urls.py" was created and it was connected to the html file.
10. Next, the app url was included in the urls.py file in the "srilanka_schools" project folder.

4.2.2 Java Script Programming

The java script file initializes the leaflet map using open street maps and start the initial view. It sets the boundaries for the map and limit zooming out of the country limits. And it sets markers to represent schools properly, set the pop ups and cascading drop down filters. It also clear filters and define the path to csv data file, handles downloading the data and parses its content. This file uses papa parse library to read and process the geocoded_schools_national.csv file, converting its raw text data into a usable JavaScript array of objects. In overall, this java script file handles the leaflet map and user interactions. All the map settings were developed using java script while the running setup was created using python Django environment.

4.2.3 HTML Structure and CSS

HTML document handles the structure of the web page. It structures the sections and layout of the web page, including appearing of filters, panels, instructions and the disclaimer. And this connects the page with leaflet and papa parse libraries and with the java script file which put the interactive map on to the page.

The “style_schools” CSS file defines how above all HTML elements look to the user. It styles the elements and controls the layout of the web page through styling.

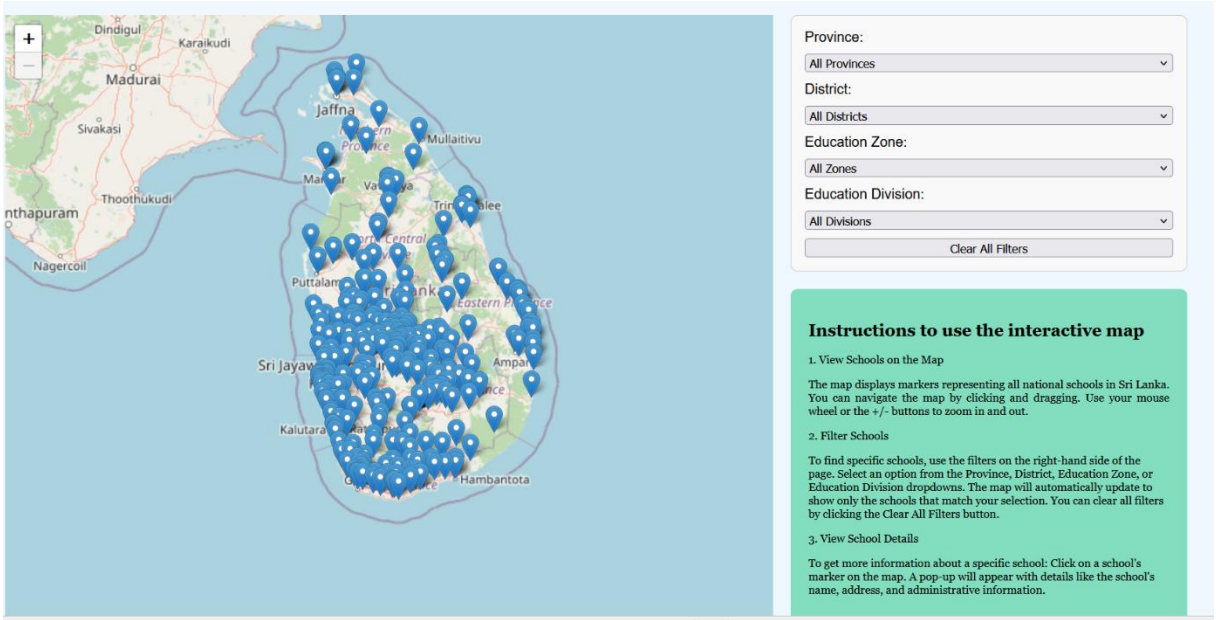
After setting up all the required components, the server was run within the project folder in the command prompt to create the web page and the provided url (http://127.0.0.1:8000/) was used to access the web page.

5. Results

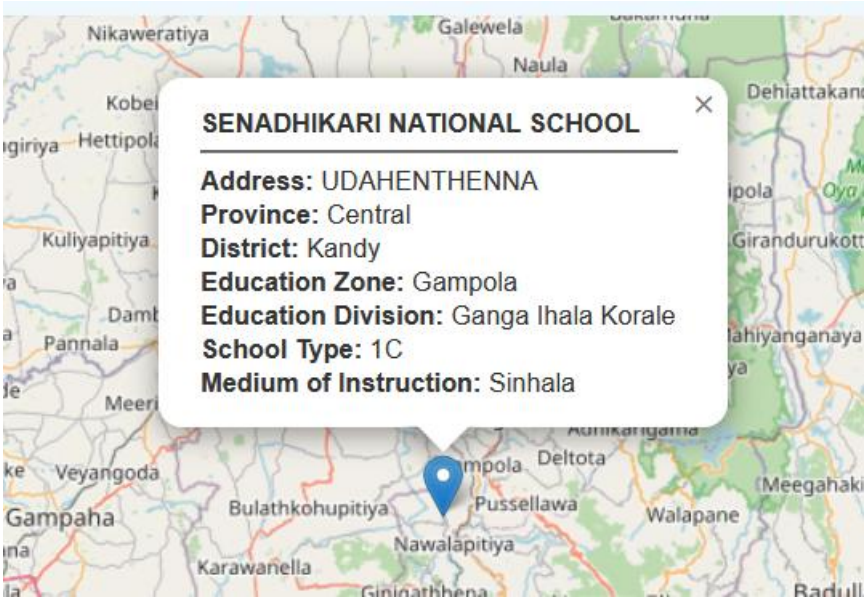
The title of the created web page is “Sri Lanka School Insight: A visual Education Dashboard” and a screenshot of a part of the web page is visualized below.

It starts with a title and a subtitle, and with two relevant images. The images are placed on the page in two columns. The next section is a brief description about the school education system and its administration hierarchy. There is a link to the ministry of education where appropriately positioned. Then it contains an illustration about the categorization of the schools in Sri Lanka. The next part is an explanation on national schools in which the map is all about. These background descriptions contribute to the comprehensiveness of the project's objective.

The second part consists of the leaflet map. It displays the map of Sri Lanka with its boundaries. At the start of the map all the schools are shown with markers as the default display. The map can be zoomed out and zoomed in; however zooming out feature has been restricted at a certain size to avoid unnecessary interactions. Filters and instructions to use the map are included in the right side panel. The user is able to filter the schools according to the desired province, district, zone and the division. After all, it contains an option to clear the filters and go back to the initial view of the map as required at any point of use.



When the user click on a marker on the map it gives a pop up with selected details such as the name of the school, address, province, district, zone, division, type and the medium of teaching, as shown below.



6. Discussion

In the initial proposal of the project, it was intended to visualize all the schools in Sri Lanka in the map. The data were available through government sources and they were downloaded. However, the geocoding process was not successful to locate the entire set of schools. I tried geocoding with several ways such as arcgis geocoding service and python in arcgis environment, open street map and arcgeocoder in R; however they rarely located accurate coordinates. This may be due to address mismatches or minimum service availability of those services for rural areas in Sri Lanka. Hence, I had to limit my map visualization to a limited set of schools with manual interventions.

However, the set up allows more data integration and further improvements through dedicated time and efforts. It will provide more detailed geographically integrated information to the relevant authorities to make advanced decisions in the school education sector in Sri Lanka.