



Health Promotion Board GIS Application

ANLY482 ANALYTICS PRACTICUM
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Overview

The Health Promotion Board (HPB) was established as a statutory board under the Ministry of Health in 2001 with a vision to build a nation of healthy people. HPB organises many Health Promotion programmes and requires many tools to assist them in planning to ensure efficient outreach and maximize public resources.

Motivation

The need for this GIS application came about as the current work processes at HPB is very time-consuming and they would like a custom-made application to assist in their planning. It is difficult for new colleagues to learn quickly as some technical knowledge is required, and hence very reliant on staff who are strong in using QGIS. It is a very manually intensive process now, as they are required to do analysis by selecting suitable areas for their outreach programmes and calculating their KPI on excel spreadsheets.

Objectives

Our objective is to build an interactive and visual web application that utilises GIS functions for geospatial planning and analysis. It will be able to compute and analyse HPB KPI reporting metrics. The web application should be easy to use to support the staff both technical and non-technical in their many Health Promotion programmes and outreach planning. It will also assist the staff in clear and easy to understand presentations to the executives who have little or no background in GIS analysis so as to be able to plan their operations.

Scope of Work

Our scope of work includes building a web application that would run on a SVY21 projection. One of the key visualisation feature is allowing users to toggle, view and overlay map layers, on top of base layers from Open Street Map. Attributes of each location can be displayed on mouse over and users may customise the colours used to represent pointers on different map layers. The function to upload a .shp, .csv, or text file would be included, to allow users to plot their own map layers. Users will also be able to edit the map layers and download the changes in .shp, .csv or text file format.

To allow users to calculate the KPI, a form would be required to allow users to input the buffer radius and type of services to search for, within the radius. The application will also generate charts and graphs to visualise the KPI and related data.

Stakeholders

Research and Strategic Planning, Health Promotion Board

Data

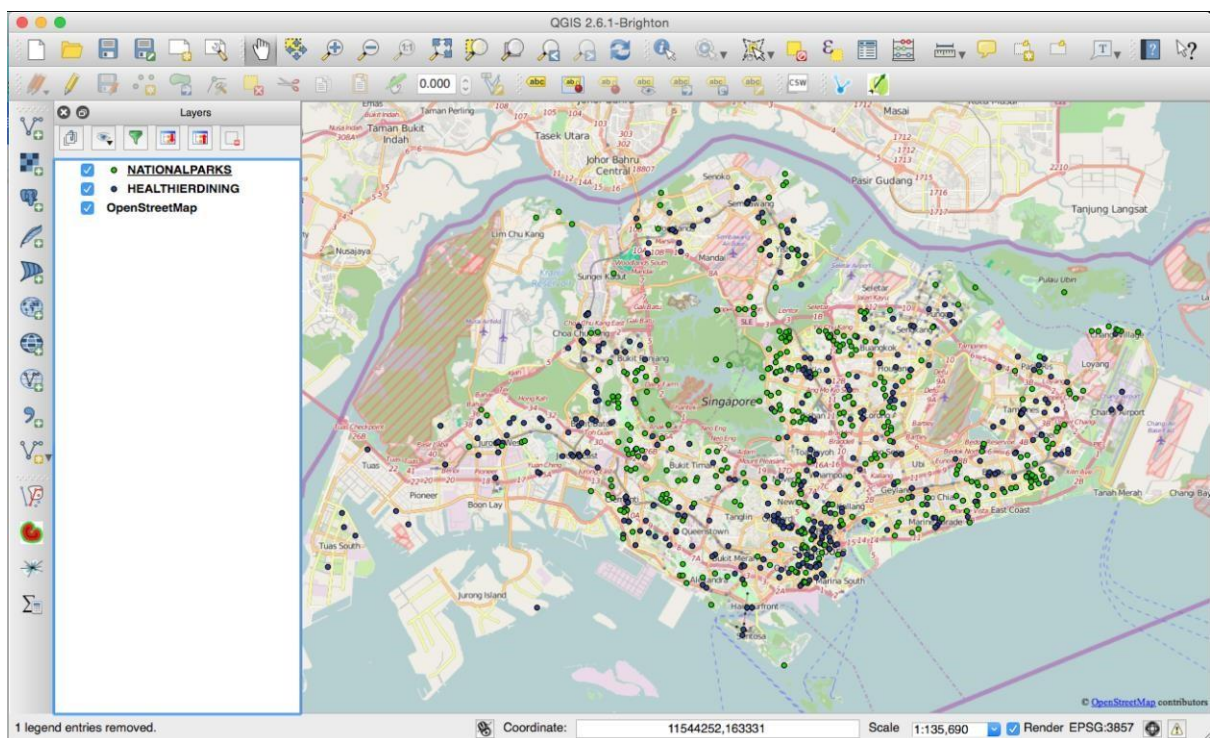
The following datasets would be required for this project

- Living dwellings
- Healthier dining options(Restaurants, Fast Food, Food Court, Coffee shop)
- Parks
- Community centres
- Residential Committee
- Smoking Cessation Touchpoints
- GRC zones

The above datasets would all be represented in point form, with the exception of the GRC zones.

Datasets in the form of .csv, with only postal codes would have to be geocoded. This can be done via Google Geocoding API, but google has imposed a limit of 2,500 requests a day (Google, n.d.). Alternatively, we can use other geocoding api available online but using a government sourced API would be most ideal for the geocoding of postal codes.

Datasets in the form of KML would have to be converted to .shp or geoJSON and JSON formats. Shapefiles would allow us to explore the data on QGIS while geoJSON and JSON formats allow integration with javascript libraries like d3.js.



Parks and Healthier dining options in KML format on QGIS

Methodology

Before building the web application, we have to first process the data obtained. Data in .csv form with no coordinates given will have to be geocode prior. After which, it will be processed on R if necessary. Data will then be stored in PostgreSQL and managed using PgAdmin.

Map layers in .kml or .shp formats will be plotted on QGIS. Within QGIS, a plugin, QGIS2Leaflet, would then be used to generate a basic template of the web application.

The web application would then be linked to PostgreSQL for the necessary data to be processed and loaded only when requested. On the frontend, input field will be created to take in input for spatial queries. Spatial queries, such as searching for locational points within a buffer area of a selected location can be done with a PostGIS extension on PostgreSQL.

Data that does not require processing and is lightweight enough, can be saved in GeoJSON and JSON format to be read and displayed directly on the web application.

After which, on the d3.js would be used to plot charts and graphs linked to interaction on the map layers.

Technologies

Technology	Description
Bootstrap	An open-source framework for front-end development to add aesthetics to our web application.
D3.js	Manipulate data using HTML, SVG, and CSS to allow interaction and animation for our map.
GeoJSON	An open standard format designed for construction of simple geographical features with their non-spatial attributes based on JSON.
Leaflet.js	An open-source JavaScript library for interactive maps to help us add in the needed interactions.
OpenStreetMap.org	A free to use map of the world under an open licence which will be used for our mapping in our web application.

PgAdmin	An open-source administration and development platform for PostgreSQL that will be the database.
PostGIS	An extension in PostgreSQL that allows spatial queries to be run and processed.
PostgreSQL	An open source spatial database that is able to run and process spatial queries
QGIS	A free and open sourced geographic information system to create, edit, visualise, analyse and edit geospatial information.

Deliverables

A lightweight, portable web application that can be easily brought over to different machines without installation. The interactive web application should show the Singapore map with many attributes for filtering to assist in HPB's daily planning needs. The user would be able to use the web application for presentations and also export the generated results into various file formats.

Limitations

We will have to find a method for getting coordinates from postal codes. Also we need to make the application portable as there is a need to run SQL queries and the database cannot be hosted online due to the confidentiality of data.

Project Timeline

Week Number/ Date	Tasks	Milestones
Week 1 4/1/2016	Finalise our project sponsor Gather requirements	10 Jan 2359 Proposal & Wikipedia
Week 2 11/1/2016	Obtain data Familiarize with technologies Generate base layers for the web application	
Week 3 18/1/2016	Clean and process data	
Week 4 25/1/2016	Set up and connect database	
Week 5 1/2/2016	Create parameters and filters	
Week 6 8/2/2016	Develop Front-end Client Review Session	Mid-term Presentation & Report Update Wikipedia
Week 7 15/2/2016	Work on parameters and filters	
Week 8 22/2/2016	Computation of input options	
Week 9 29/2/2016	Visualisation of Charts	
Week 10 7/3/2016	Create export results module	
Week 11 14/3/2016	Client Review Session Refine web application	
Week 12 21/3/2016	Refine web application	
Week 13 28/3/2016	Refine web application	Final Presentation & Report Update Wikipedia Poster submission

Gantt Chart

Project tasks are estimated based on an average of 10 hours a week per team member. Total project hours: 390

Project Planner

Period Highlight: 2

Plan Actual % Complete
Actual (beyond plan) % Complete (beyond plan)

ACTIVITY	PLAN	PLAN	ACTUAL	ACTUAL	PERCENT	PERIODS													
	START	DURATION	START	DURATION	COMPLETE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Gather requirements	1	1	1	1	100%	█	█												
Proposal	1	1	1	1	100%	█	█												
Create Wikipedia page	1	1	1	1	100%	█	█												
Familiarize with technologies	2	1	0	0	0%		█												
Generate base layers	2	1	0	0	0%		█												
Clean and process data	3	1	0	0	0%			█											
Set up database	4	1	0	0	0%				█										
Connect database	4	1	0	0	0%					█									
Create parameters and filters	5	1	0	0	0%						█								
Front-end development	6	1	0	0	0%							█							
Mid-term Presentation	6	1	0	0	0%								█						
Progress Report	6	1	0	0	0%									█					
Update Wikipedia page	6	1	0	0	0%										█				
Work on parameters and filters	7	1	0	0	0%											█			
Computation of input options	8	1	0	0	0%												█		
Visualisation of charts	9	1	0	0	0%													█	
Create export results module	10	1	0	0	0%														█
Refine Web Application	11	3	0	0	0%														█
Final Presentation	13	1	0	0	0%														█
Final Report	13	1	0	0	0%														█
Update Wikipedia page	13	1	0	0	0%														█
Poster Submission	13	1	0	0	0%														█

References

Google. (n.d.). *Google Maps Geocoding API Usage Limits*. Retrieved from Google Developers: <https://developers.google.com/maps/documentation/geocoding/usage-limits>

Opfer, P. R. (2 June, 2010). *Using GIS Technology to Identify and Analyze 'Food Deserts' on the Southern Oregon Coast*. Retrieved from Oregon State: https://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/16305/Opfer_Essay.pdf?sequence=1