The Long Beach Olympic Experience

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Introduction

The main objective for this project is to create a web map that can be used primarily to provide a tool for tourists to navigate through the City of Long Beach's 2028 Olympic events. Patrons of the event, a non-GIS audience, will need access to information regarding transportation, hotels, event seating, dining options, and ticket purchasing instructions. It is important for the City of Long Beach to perform as a great host for these Olympic Games in order to be considered a viable tourist destination in favorable proximity to popular attractions. Ultimately, this web map will be useful not just for the Olympics, but long after. However, the information provided by this service is not exclusive to tourists, but can be useful for locals as well. Anyone that makes plans for coming to Long Beach for the day can realistically plan their whole day with this tool. The implementation of this service will provide reliable information to promote safety and convenience while acting as a highly capable tool for the city to plan and prepare for its shining moment of hosting this international competition.

FIGURE 1- *City of Long Beach*

The two fields of study that are examined in this project are Geospatial Science, including open source web map development, and Tourism. The significance of this project is reflected in how the two fields of study are incorporated into the results. The interactive web map is created to illustrate how GIS data can be integrated with web design techniques to produce a powerful resource for tourists as well as locals. If it can be proved that web maps can be made with minimal resources, it would encourage and inspire GIS technicians as well as web developers to incorporate more web maps into everyday methodologies.

Data and Data Sources

Dataset	Source
City Boundary, Bike Paths, Police Stations, and Points of Interest	**LongBeach.gov**
Metro Stations, State Highways, and Airports	**Los Angeles Geo Hub**
Bus Routes	**Long Beach Transit**
City Bikes	**LongBeachBikeShare.com**

Timeline

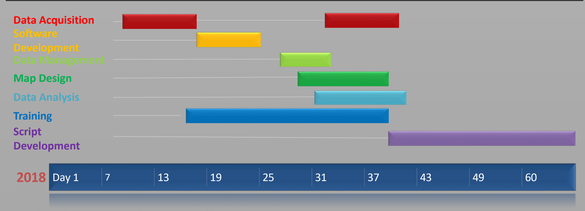

FIGURE 2- *Project timeline*

Methodology

A script for the web map was developed from scratch using a text editor and the Leaflet JavaScript library. Since the study area of the project is the City of Long Beach, four of the data layers required for the project were obtained from the data portal on City of Long Beach official web site (longbeach.gov). Pertinent data for recreation and tourism purposes was needed for this project. The Police, Bike paths, City Boundary, and Points of Interest layers were all found on the DataLB portal. For six of the other layers that were needed, the data points were digitized, and the attribute data was added independently. "Event Locations" was one of the layers that required digitizing and manual data entry. This was due to the fact that this information is not yet available to the public due to the Olympics being ten years away.

The next step taken was the process of creating and adding GeoJSON layers to a leaflet web map, the most important part of the entire process. This process began by using QGIS to convert shapefiles to GeoJSON files, which was found to be easy and fast. After gathering the GeoJSON files into one "Data" folder for the analysis, the folder was structured to be used as a directory for the final code (Figure 3). Then an "index.html" file was created to house the final JavaScript code. A separate HTML file was also added to serve as a homepage (Figure 4). Then, more folders were added that were be used as directories for reference. Image icons were downloaded and placed into an "images" folder to hold all of the images that were used in the final map. Once an appropriate basemap was established, and after adding the first few layers, the rest of the project proceeded without serious challenges. Most of the problems encountered in developing the code were punctuation errors, spacing errors, and missing brackets.

```
    <script src="Data/Bikeways.geoJson"></script>
    <script src="Data/Cityboundary.geoJson"></script>
    <script src="Data/FinalLocations.geoJson"></script>
    <script src="Data/Highschools.geoJson"></script>
    <script src="Data/Metro.geoJson"></script>

    <script src="Data/Metro_JSON.geoJson"></script>
    <script src="Data/Points_of_interest.geoJson"></script>
    <script src="Data/Police.geoJson"></script>
    <script src="Data/State_hwys.geoJson"></script>
    <script src="Data/Airports.geoJson"></script>

    <script src="Data/Bus_routes.geoJson"></script>
    <script src="Data/Bus_stops.geoJson"></script>
    <script src="Data/City_bikes.geoJson"></script>
    <script src="Data/Event_loc.geoJson"></script>
    <script src="Data/Flying_carlots.geoJson"></script>
    <script src="Data/Parking_lots.geoJson"></script>
    <script src="Data/Segway_hover.geoJson"></script>
```

FIGURE 3- *Folder connections in HTML file*

FIGURE 4- *The web map homepage*

Results

The final result of this project is an interactive web map that will serve as a tool for users to navigate and obtain information about the City of Long Beach during the upcoming Olympics in 2028. "The Long Beach Olympic Experience" gives access to fifteen different data layers for public use for travel to Long Beach. Most of the data available on the map is within the city of Long Beach. However, there are three layers: metro stations, airports, and state highways layers that extend beyond the city boundary to connect Long Beach with the rest of Los Angeles County. This is important because Long Beach will be the second largest footprint of the Olympics behind the Olympic village. Transportation plays a large role in this project because it will play a large role in how easily tourists can travel during the Olympic Games.

The resulting web map was written using JavaScript, CSS, and HTML. The code uses the Leaflet API to add GeoJSON layers of spatial information, as well as add functionality to create a user friendly experience. In addition to multiple layers, the web map offers two different basemaps. The streets basemap offers a traditional look at streets and roadways that will be easier for navigation purposes, while the grayscale basemap makes the images on the map stand out more and is more aesthetically pleasing. Eight of the layers that were added are represented by an image when turned on. The images chosen are very recognizable and were taken from emoji's and other simple icons that can be easily recognized by people of different backgrounds (Figure 5). There are several layers that do not use an image for representation. These layers are represented by colors. Most of the layers also feature pop-ups. When clicked on, these pop-ups will display information for the user, usually the name of the entity that is chosen.

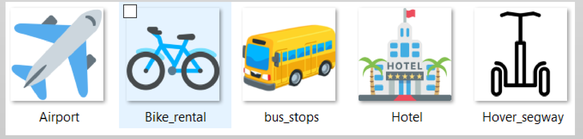

FIGURE 5- *Icons for web map*

The user also has the ability to zoom very easily with this map, a necessity for interactive maps. The zoom works well with a mouse wheel as well as with touchscreen technology. This will be extremely helpful for viewing data that is relevant to a specific neighborhood that the user is in (Figure 6). The most important elements included in the code are the GeoJSON files (with style settings- Figure 7), layer control, and the basemaps. These three elements give the web map accurately georeferenced data and functionality. Correct data and functionality are the two necessities of an interactive web map. The production of this web map was a success. But even success can be improved upon. This project can continually be improved as the Olympic Games near.

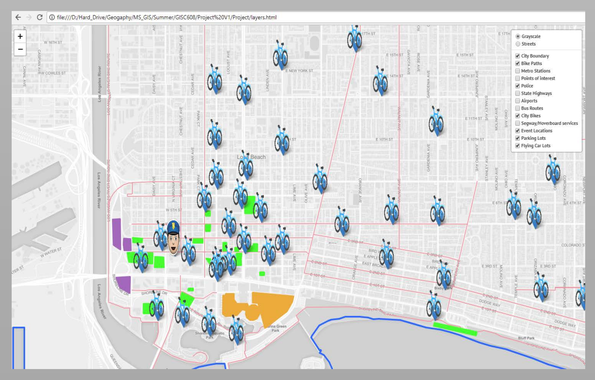

FIGURE 6- *The web map with 7 layers selected*

Discussion

```
var metroJSONLayer = L.geoJson(metro_json, {style:{"color":"#F0FF33","fillOpacity":5}});
var poiLayer = L.geoJson(points_of_interest, {style:{"color":"FF33E5","fillOpacity":5}});
var policeLayer = L.geoJson(police, {style:{"color":"#180D63","fillOpacity":5}});
var stateHighWaysLayer = L.geoJson(state_hwys, {style:{"color":"#000000","fillOpacity":5}});
var airportsLayer = L.geoJson(airports, {style:{"color":"#eaeaff","fillOpacity":5}});

var busRoutesLayer = L.geoJson(bus_routes , {style:{"color":"#c44354","weight":2, "fillOpacity":0}});
var cityBikesLayer = L.geoJson(city_bikes , {style:{"color":"#c44354","weight":2, "fillOpacity":0}});
var segwayLayer = L.geoJson(segway_hover , {style:{"color":"#c44354","weight":2, "fillOpacity":0}});
var elocationsLayer = L.geoJson(event_locations , {style:{"color":"#f2ab39","weight":4, "fillOpacity"
```

FIGURE 7- *GeoJSON layers added to the code (with style options)*

The results of this project are really quite significant. As previously mentioned, the data, software, and support were all accessed online at no cost. The web map produced is a testament to how easy it can be to produce a project like this with minimal resources and training. No tool was used at any cost, with the exception of the student license for ArcMap. GIS analysts can learn from this project that with practice, effective web maps can be produced and implemented to use as a web service, or add to a website to augment the dissemination of geospatial phenomena.

As for the final result, this web service can be used as a powerful tool even after the Olympics are over. There is ample information for tourism, as well as several methods of transportation that can assist residents as well. As long as there is a developer that will ensure the data is updated to keep the information as recent as possible, the map will be useful. This type of web service will only be relevant if the information is accurate.

Given a longer timeline, there are upgrades that could be made to improve the amount of attribute data housed within the map. Instead of clicking on a pop-up that has the name of a restaurant only, there could be the name, rating, and image of the restaurant all shown in one pop-up. The spatial data is accurate, but the metadata (and how it is displayed) can always be improved.

Conclusion

The results of this project depict an extensively planned and thoroughly researched analysis of web map design for the benefit of public use. Later versions of this project could be done with different web mapping APIs to see if there are certain aspects of the final web map that may be a better fit for this topic. It is possible that different APIs could be more suitable for the specific data that is being used. The revelation that the tools for this type of methodology are largely available at no cost are indicative of a forward movement of open sourced data dissemination on the web. This is a trend that all information scientists can appreciate and benefit from. The primary goal of GIS is to integrate geospatial data with attribute data for the purpose of analysis. The analysis is then meant to provide benefits to a specific group. This web map accomplishes those goals.

The web map that has been created is ultimately the final result of the process; however, the major significance of this project is the effectiveness of the methodology. With more experience, geospatial analysts can very easily begin to create web maps of all kinds for the purpose of sharing geospatial data, particularly for a non-GIS audience. With the availability of several web mapping APIs like Leaflet and Google, web users will benefit most by the influx in the embedding of web maps into frequently used websites. Geospatial scientists can relish the idea that maps can be more frequently integrated into the public arena. That would make our expertise that much more valuable.

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