



India's Pride: PALACES AND FORTS

(CS621)

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ABSTRACT

Using PostgreSQL, PostGIS, QGIS and Web based mapping to represent India's Pride: PALACES AND FORTS.

INTRODUCTION

India is located in south Asia and is bordered by other countries like Pakistan in the west, China and Nepal in the north to north eastern part, Bhutan in the north east and Burma in the west. India is geographically located at 28° 36.8' N and 77° 12.5' E in the northern hemisphere of the globe.

India has a rich cultural heritage and history, and what better way to experience its regal lineage, than to visit the majestic palaces and forts in India? These structures that were crafted ages ago, still stand testimony to the test of time they have undergone and the beauty they have maintained throughout these years. More than 1000 forts and palaces are there in India built ages ago. Some palaces were built as forts, and many palaces (and religious temples) were built within the walls of forts. Some palaces owe their survival to having become heritage hotels. These samples are diverse in architectural structure and representative of India's rich and long history. Some early designs were to build with extremely thick stone or brick walls with reinforced gates to protect against elephants, others with more delicate touches, and later modern forts have a distinct European flavour. Early towns and cities began and grew around forts.

By keeping the above details in mind, I decided to identify all such forts and palaces in India and represent them using my knowledge of PostGIS, PostgreSQL, QGIS and Web Mapping which can be useful for any traveller or history lover to know about the historic places in India by the help of map representation.

This is an approach to show how the forts and palaces are spread out across the country which has its own history.

SPATIAL DATA DETAILS

The data required to deal with the objects was collected from various different locations. The polygon shape file for admin areas of India was taken from <http://www.diva-gis.org/datadown>. It provides free geographic data for any country in the world. We can select any area from subject tab for e.g.: Roads, Railroads, Landcover etc.

To obtain the data for palaces and forts in India I have used <https://overpass-turbo.eu/> .
The code written to obtain the data is:

```
[out:json];{{geocodeArea:India}}-  
>.searchArea;(node[historic=castle](area.searchArea);>;way[historic=castle](area.searchArea);>;relation[historic=castle](area.searchArea);>;);out;
```

Now to find out number of palaces in particular state in India (Rajasthan). shapefile of a particular state was taken from :

<https://www.arcgis.com/home/item.html?id=acb8cb18e7cd45c982086b6ef2bb5a62>

The code written to obtain the data is:

```
[out:json];{{geocodeArea:Rajasthan}}-  
>.searchArea;(node[historic=castle](area.searchArea);>;way[historic=castle](area.searchArea);>;relation[historic=castle](area.searchArea);>;);out;
```

Coordinate reference system details were obtained from
<https://epsg.io/>.

EPSG:7755 is specific to India but was not available on the spatial_ref_sys_table so need to proceed with general EPSG:4326 which is for whole world.

MANIPULATION AND ANALYSIS OF DATA

Our aim is to count the number of palaces in each state of country and then to count the number of palaces and forts for each district in a particular state (Rajasthan). The geographic data downloaded includes data at 2 levels. India is divided into 29 states, which are further divided into their respective districts. For Rajasthan it is divided in 33 districts.

To do such calculations interaction of Postgres and QGIS required.

Steps to implement the changes :

1. Added a vector layer (shapefile) in QGIS for india_admin_area and then import this in Postgres by providing a table name through DB Manager.
2. Now the operations must be done on this table.
3. The data which is collected from overpass turbo for palaces was saved in GEOJSON format.
4. Since the data is in GEOJSON format, I have used DB Manager from QGIS to import GEOJSON files and connect to Postgres Database.
5. Data is in the form of points and polygons both 150 – points and 346 – polygons.
6. Two tables are formed for each point and polygon data i.e. palace_point and palace_polygons
7. In Postgres I have added 3 new columns : total points, total polygons, total objects in the table india_admin_area (polygon).
8. Total polygons were calculated by joining the palace_polygons and india_admin_area based on Id's and applying the update query to enter the total number of polygons counted to the column in india_admin_area.
9. Total points were calculated by joining the palace_points and india_admin_area based on Id's and applying the update query to enter the total number of points counted to the column in india_admin_area.

10. Total objects were calculated by adding the total points and total polygons as shown below :

totalobjects real	totalpoints real	totalpolygons real
3	3	0
22	4	18

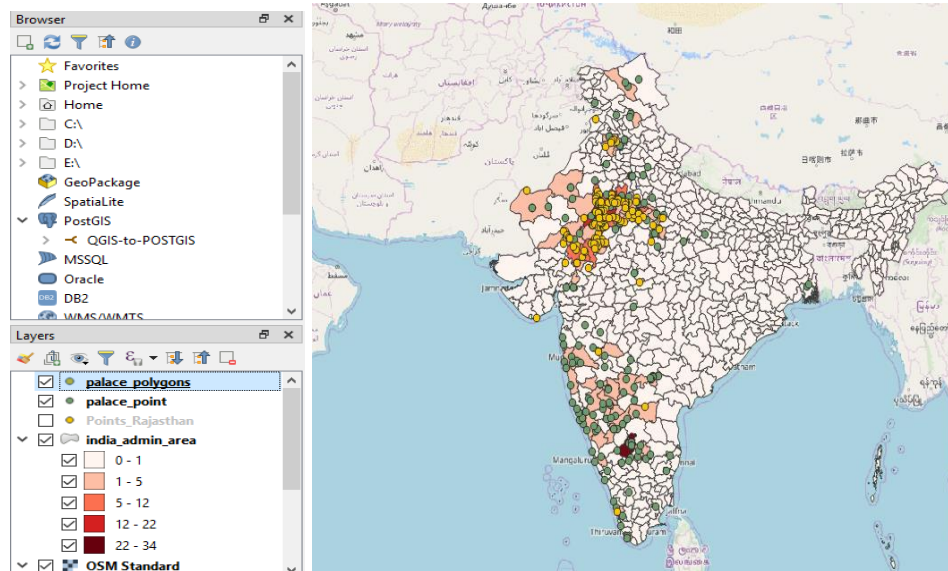
Same strategy is followed for rajasthan_admin_area. For a particular state. After completing the above steps in Postgres now the representation is handled by QGIS.

Refreshed the DB manager and again added the table (india_admin_area) to canvas.

CREATION AND ANALYSIS OF MAPS

Choropleth Mapping :

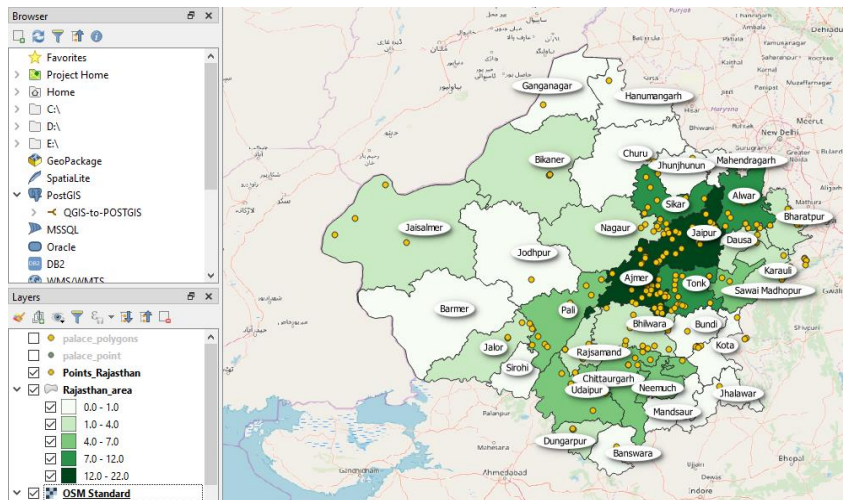
The classification is done with natural jenks (breaks) with class -5 and red colour ramp is used for displaying the choropleth map.



In the above choropleth map the grey dots are referred as palace_points and the yellow dots are referred as palace_polygons.

The map clearly shows that the greater number of palaces are in mid region i.e. Rajasthan state. With darker shades in this region we can conclude the count is between 12-34 in most of the parts of this state.

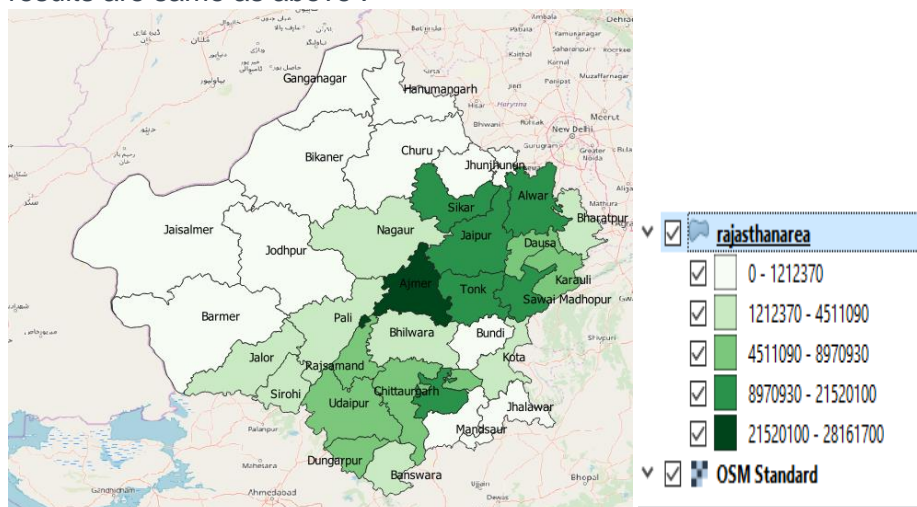
Now to find the count district wise in Rajasthan I followed the same process as India and the results are below :



The above **choropleth** map is the district wise count of the state with most palaces and from this we can clearly say that **Jaipur** and **Ajmer** are the district with most palaces due to their darker shades. Green ramp is used here for natural jenks classification with class :5.

OpenStreetMap's aids in locating the POI on the map and also the routes to the maps hence it is used as a background layer.

Apart from this **density** distribution of various palaces is also calculated and the results are same as above :



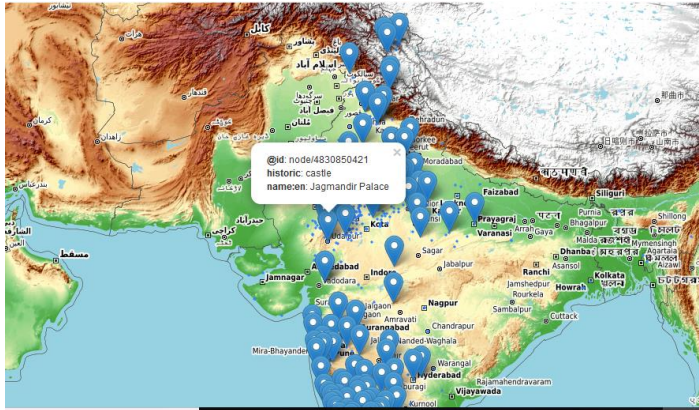
We can see here that the region Ajmer, Jaipur and its nearby places are darker than any other which clearly justifies that the density distribution in these regions for palaces is more than any other region.

Web map (LEAFLET) : The web app indicates the location of palaces all over the country with their specified tags. The steps required to create web map are :

1. Fetch the data from over pass turbo with code written before keeping area as India and save it as geojson format file.
2. I have used geojson3 HTML file from the lecture notes and updated it based on the representation required.
3. New layer is been added in the HTML file with the help of code provided by leaflet. The layer added is opentopomap. And then it is added to background layer names.

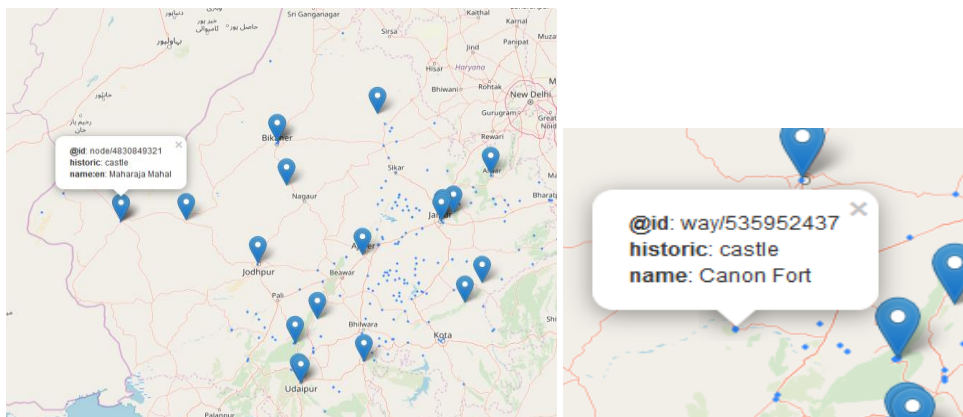
4. The latitude and longitude are change based on the centre coordinates of India i.e. 20.5937 (latitude), 78.9629 (longitude) and the zoom level is decreased to 5 for appropriate representation, as soon as we open the map.

After these changes as, we open the HTML file the output is as shown below:



The same changes are done for particular state wise distribution and the results are as shown below :

The **web map** shows points as well as polygons for palaces in the display as geojson file can display points as well as polygons. The tags are shown for polygons as well. In this web map we can easily identify the palace or forts with their respective names and id's by clicking on any point or polygon marker so it's easy for us to distinguish these palaces with the help of their tags and properties.



CONCLUSION

QGIS and PostGIS are the tools through which we can easily analyse and visualise any spatial data and with the special features of the QGIS it is possible for us to show the distribution of the data efficiently.

The same feature we used and represented the distribution of forts and palaces in each state of India as well as each district of Rajasthan.

We were able to find out the state with the most number of palace and forts then others which was **Rajasthan** and the districts with most number and density of forts were '**Jaipur** and **Ajmer** ' respectively and are the main source of tourist attraction as well this is the reason why these districts are popular among the foreigners due to its high rate of historic monuments.