

# Statistical Inference of Tele-Ophthalmology Camp Data Using Gis

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## Abstract:

Teleophthalmology ; QGIS

Health Care plays an important role in every human's life. Now-a-days due to lots of stress people are getting many types of diseases they are not conscious about their health. This paper aims to survey through different camps in rural / urban areas and collect the details of those areas affected by a specific disease. Statistical Inference is the process of data analysis to deduce properties of an underlying probability distribution. It is used to gather information from collected data to make general conclusions about a larger population. In this paper, we propose to identify the type of eye problem prevalent in each particular area. Hence, Teleophthalmology data from various eye camps conducted by Sankara Nethralaya is taken as input. This data about various eye camps were fed into QGIS software. Based on the data fed, the parameters such as nature of eye disease, number of people affected and camp places are plotted on QGIS OSM. From the results we were able to identify that Emmetropia and Cataract are the major contributing eye diseases from 13 camp places. The major areas for 13 camp places taken for study are: Chennai, Thiruvallur and Kanchipuram districts. The statistics which is taken for study is Teleophthalmology. Quantum Geographic Information System, shortly called as QGIS is used for analysis. It is software, which is used to extract the required location from the satellite image. This study helps to have an early detection of the spreading diseases and provides a secure atmosphere for this citizens. It also helps in transforming India into Digital India, by ensuring the government health care services to know about the places which need at most care immediately.

## Keywords:

## I. INTRODUCTION

### A. GIS

GIS is known as Geographic Information System. It is used to store, manipulate, analyze, capture, manage and present or geographic spatial data. It is an application tool which allows the user to create interactive queries, analyze the spatial information, edit data in different maps and present the results of all these operations. It can compare the unrelated information by using location as the variable key index. Locations in the earth space-time may be recorded as dates/times of occurrence and x, y, z coordinates representing, longitude, latitude, and elevation respectively. [4]

### B. STATISTICAL INFERENCE USING GIS

Statistical Inference is the process of using data analysis to summarize the properties of the probability distribution. It is used to gather information from samples to make general conclusions about a larger population. The gathered data can be plotted or mapped in QGIS software. It makes suggestion about a population by using data taken from the population with some form of sampling. It gives a hypothesis about a population for which we wish to draw inferences, statistical inference consists of:

- Selecting a statistical model of the process that generates the data
- Deducing propositions from the model. [3]

### C. TELEOPHTHALMOLOGY

Teleophthalmology is a branch of telemedicine that delivers eye care through digital medical equipment and telecommunications technology. It enables access to eye specialists for patients in remote areas, disease screening, diagnosis and monitoring. Eye screening is conducted in different places and data is collected for further analysis.<sup>[2]</sup>

### D. OBJECTIVES

The objective of the paper is to Integrate GIS (Geographical Information System) into e-Health and Telecommunication. So it can transform India into DIGITAL INDIA by ensuring the government health care services to know about the places which need at most care immediately. This work performs statistical inference of teleophthalmology data obtained from teleophthalmology camps conducted by Sankara Nethralaya. These data are plotted on OSM using GIS. Once plotting is done we will be able to retrieve the type of eye disease prevalent in that area. Based on the study, government/hospital will be able to take up action to eradicate or identify the reasons for the outbreak of eye disease.

## II. LITERATURE SURVEY

- A. "MOBILE APPS AND WEB GIS-BASED ACCESSIBLE HEALTH AND SOCIAL CARE SYSTEM FOR PEOPLE WITH DISABILITIES" ABDUL RAUF ABDUL RASAM ; AZRI HAZIQ AZLIN ; NORAIN MOHAMED SARAF, *IEEE 8TH INTERNATIONAL CONFERENCE ON SYSTEM ENGINEERING AND TECHNOLOGY (ICSET)* 2019.

Disability is defined for both evolving concept and manifestation of interaction between person with disabilities (PWDs) with physical and environmental barriers that holds them back from giving an effective participation in society. A person fall under this category will find self-trapped in vulnerable conditions as he or she may not counter their daily problems without observation from their guardian. This approach of development of mobile apps and web-GIS-based healthcare system in Ampang helps to improve potential to assist PWDs in term of accessibilities to reach healthcare centers. The main objectives of this paper are: i) to study the needs evaluation of the proposed system, ii) to develop a mobile and web GIS-based healthcare information system and iii) to assess the performance of the proposed system. Five main steps used to achieve the goals are user need assessments, data collection, system design, system implementation and system testing phase. The selected examinee agreed on the development of the proposed

system, namely the mobile apps and web system. The system was designed with options such as doctor home visit, ambulance and medication delivery. Medical support team can also carry out analysis in the system for PWD needs such as shortest path analysis, buffering and viewing of the options.<sup>[8]</sup>

- B. "ANEMIA DURING PREGNANCY IN PERU IN 2017: A GEOGRAPHIC INFORMATION SYSTEM STUDY" CARLOS SOTOMAYOR ; GUILLERMO WENCESLAO ZARATE SEGURA ; DAVID TARAZONA, *IEEE 38TH CENTRAL AMERICA AND PANAMA CONVENTION (CONCAPAN XXXVIII)* 2018.

In order to achieve the sustainable development goal of no hunger (SDG2) established by the United Nations general assembly, some malnourishment conditions need to be considerably eradicated or reduced. One of these conditions is Anemia caused due to deficiency of iron in pregnant women. In this work, public data from the National Institute of Health (INS) , Peru, is used in order to study the spatial distribution patterns of anemia in pregnant women over Peru at district level for the year 2017. By using the ArcGIS software, a map (shape file) containing all the districts of Peru was used to include all the non-geo coded data from the INS. Two maps were created -one showing the spreading of anemia across Peru and the other one showing the hot spots, cold spots and outliers. We infer that in many districts in the highlands regions, geostational anemia is widespread and regarded as a acute health problem (prevalence  $\geq 40\%$ ). Similarly, in some districts of three regions of the jungle and two regions of the coast, this condition is also considered as severe. The map produced using local Moran's I shows many hot spots in the central and southern regions of the highlands. An additional map with a detail about the southern highlands, shows how there are many outliers (low-high) in these regions which are in danger of extinct in the future. Hence, it is endorsed that the Ministry of Health from Peru, along with health practitioners address immediately about the widespread of anemia in these hot spots with for example some programs that have already proven successful in decreasing geostational anemia in countries like Nicaragua and Thailand.<sup>[9]</sup>

## III. STUDY AREA

The data used for analysis is collected from the medical camp, that was conducted in districts- Chennai, Kanchipuram and Thiruvallur by Sankara Nethralaya Eye Care Hospital, Chennai.

*Chennai district* is also known as Madras district or Madarasapattinam. It is a district in the state of Tamil Nadu,

in India. Chennai district covers an area of 426 square kilometer and it is located on the Eastern Coastal Plains of India and situated on the northeastern corner of Tamil Nadu along the Coramandel coast, a region bounded by the Bay of Bengal. It is surrounded inland by the districts of Tiruvallur and Kanchipuram. Its divided into 3 regions namely North, South and Central, which covers over 200 wards.

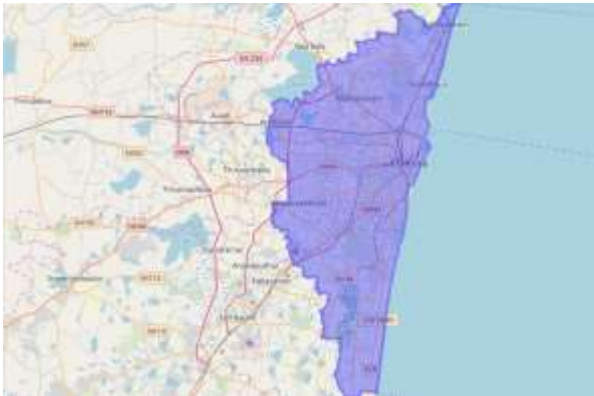


Figure 3.1: Chennai District

*Thiruvallur district* is one of the districts in Tamil Nadu. It is an administrative district in the South India. The north side is bounded by Andhra Pradesh state and the east side by the Bay of Bengal. On the southeast it is bounded by Chennai district, on the south by Kanchipuram and on the west by Vellore district. Thiruvallur district covers an area of 3,423 square kilometer. This district is divided into 3 divisions namely Tiruvallur, Tiruttani and Ponneri.

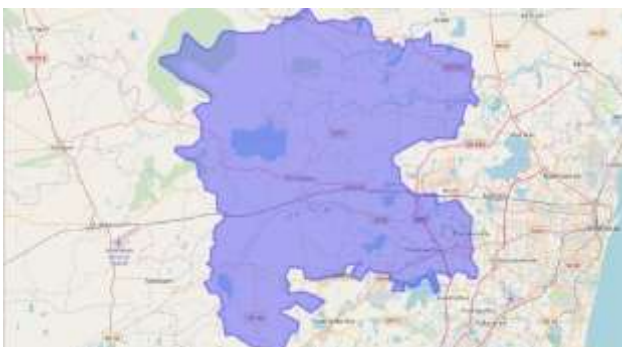


Figure 3.2: Tiruvallur District

*Kanchipuram district* is one of the districts in Tamil Nadu in India. Previously Kanchipuram district was a part of Chengalpattu district. In the year 1997, Chengalpattu district was split and formed by Kanchipuram and Tiruvallur districts. In the west it is bounded by Vellore and Thiruvannamalai Districts, north by Tiruvallur and Chennai Districts, south by Villupuram and in the east by the Bay of Bengal. Kanchipuram district covers an area

of 4,393 square kilometer. The International Airport in Chennai is located in Tirusulam in Kanchipuram district.



Figure 3.3: Kanchipuram District

## IV. METHODOLOGY

### A. SOFTWARE

The software used for this project is QGIS. QGIS is preferred because it is an open source software. The version 2.18 is used.



Figure 4.1: QGIS Version 2.18

### B. PLUGINS

The plugins that are available for installation depend on which plugins are configured to use. QGIS plugins are stored online in the repositories. By default, only the official repositories are active that we can only access official plugins. These are the first plugins we want because they have been tested thoroughly and are often included in QGIS by default. It is possible to try out more plugins than the default ones. Some of the important plugins to be installed are DB manager, Metasearch catalogue client, open layers plugin, Open street map (OSM), OSM place search, QuickWKT and Time Manager. <sup>[1]</sup>





**Figure 4.2: Plugins**

### C. OPEN STREET MAP

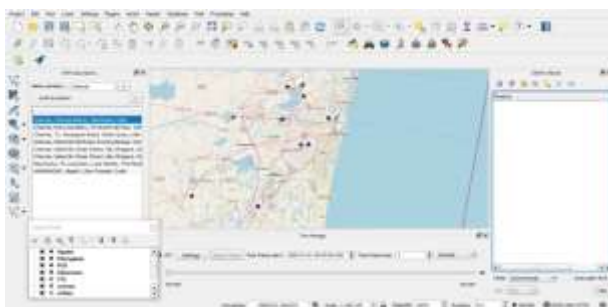
Once the plugins are installed, any type of map can be selected for georeference. Different types of maps are available such as satellite map, open street map, goggle street map, etc. here we will use OSM. OSM can collaborate two or more projects to create a free map of the world which can be editable, rather than the map itself, the data generated by the project is considered as its primary output.



**Figure 4.3: Open Street Map**

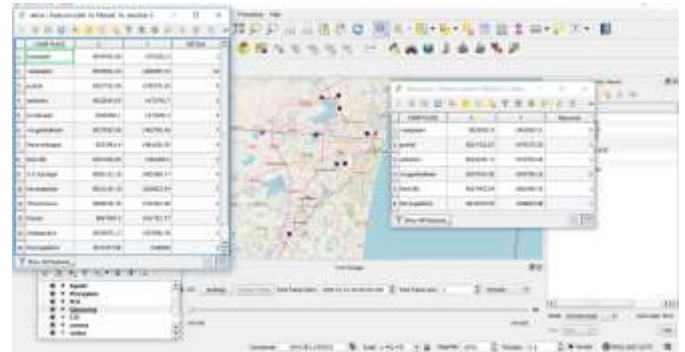
### D. PLOTTING

For plotting the collected data from the excel sheet we have to save the data in .CSV format. In the software we have to add layers. In the layers we have to add the CSV file (excel sheet). The excel sheet appears at the bottom of the dialog box in add layers. Now we have to select X and Y coordinates, then we have to click OK.



**Figure 4.4: Output of CSV Files**

Different colors can be used for different diseases. By attribute table we can know how many people are effected with that particular disease and in which places. This table will appear on the screen with the required details.



**Figure 4.5: Attribute Table**

For getting detail about one point on map, we have to click the details icon on the top and select the particular point at the right corner of the screen and the feature panel appears. Feature panel shows the attributes like camp place, X and Y co-ordinates and the number of people affected in the area.



**Figure 4.6: Details of a point**

## V. RESULT

Based on the data fed, the points are plotted in QGIS Open Street Map. The plotted map depicts the medical camp output for different zones of the districts Chennai, Kanchipuram and Thiruvallur, collected from **Sankara Nethralaya Eye Care Hospital, Chennai**. The difference in colors of the points indicate different eye problem that occur in that place.

The map shows the following parameters:

- Place where the camp was conducted
- Different Eye problem in each camp.
- The number of people affected with a particular eye disease.

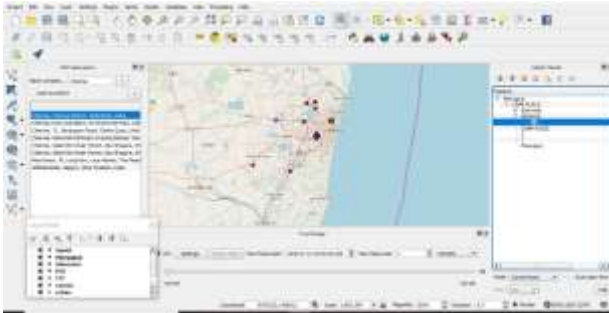


Figure 5.1: Final output

## VI. CONCLUSION

The numbers of people affected with eye related diseases are plotted in QGIS Software. The areas that were taken were studied in different zones from Chennai, Thiruvallur and Kanchipuram districts. The data is collected by conducting medical camps in these districts. This experiment provides a location based service and can be used for wide range of tasks involving geographical areas. It also allows us to detect the spreading diseases, early i.e., early detection of spreading diseases.

The future scope includes:

- Transformation of India into Digital India.
- Allows government services for normal and emergency conditions
- The project can be further extended by making the software as a mobile friendly application.

## VII. REFERENCES

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