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Disease Prevention Manager by Geographic Location

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Abstract

A platform will be created that will allow the user to obtain information about the diseases for which more consultations are presented in certain hospitals, for this will be created a model that takes into account the geographical location, the historical occurrence of diseases in their immediate environment, age, Water quality and other data that are available in open data sources. The platform will show in detail the number of patients suffering from a particular disease. The platform will also show cartographic layers with close attention points (Clinics, Hospitals, Health Centers), heat maps with the historical distribution of occurrences of each disease, cartographic layers that indicate water quality and other factors that can help determine the Quality of the environment allowing the user to make a visual evaluation of the place where he lives, studies or works.

Keywords: Disease, prevention, location, health, open data, Google maps

INTRODUCTIÓN

Platform will allow the user to obtain a prediction statistical diseases which can be developed using a model that takes into account the geographic location, the historical occurrence of diseases in your close environment, age, air quality, the water quality and other data that are available in open data sources. The platform will display an action plan based on countering the main factors that trigger each disease with a possibility of high occurrence depending on the model, generating a prevention plan personalized for each user.

Platform will also display cartographic layers with nearby points of care (hospitals, clinics, health centres), heat maps with the historic distribution of occurrences of each disease, cartographic layers that indicate the water quality, air quality and other factors that can help determine the quality of the environment by allowing the user to make a visual assessment of where you live studies or works.

BACKGROUND

Although there are few related works that exactly use open data sources to generate heat maps that show the occurrence of diseases in a given area, heat maps have been used to determine the occurrence of news generated in South Korea and are reported by Newscasts or portals worldwide, by Chen [1]. Keneshloo [2] uses GDELT (The Global Data on Events, Location and Tone) to predict an internal political crisis in a country of interest, is a very useful tool for social scientists and policy makers. It has a large amount of event data for historical analysis and thus generate a predictive utility. Santoso [3] in Design of a web-based Geographic Information Systems Spatial for Distribution of Historic Site and using the database of The National Archaeological Center of Indonesia offers a geographic information system on the distribution and location of historical sites in the region Of the island of Java. It is established that in terms of preservation, registration and the provision of information to the public on the importance of cultural heritage, for now, is very scarce, therefore the use of technology is especially needed in the topic of saving and consulting the Information related to historical sites. Chen [4] in Long Short-Term Memory Model for Traffic Congestion Prediction with Online Open Data is based on the increasing gravity of traffic congestion and making use of open data online, it creates an application that Can predict future traffic conditions to create immediate solution strategies.

As regards health Cannataro [5] in Using open data in health care and tourism, he implements an initiative of the Italian Ministry of Health, which is making available through the internet a cloud-based software tool that uses a set of Open Data for Tourist (OHT), can offer tourist information on the nearest health care providers (pharmacies, public emergency rooms, hospitals and doctors) in Italy to Through an accessible application in Mobile Devices. Voth-Gaeddert [6] is based on a set of regional data from Guatemala obtained from the USAID Open Data Web site to determine the factors causing a growth retardation of a large part of the Guatemalan children population. This work is an important first step in the evaluation of a new method of analysis of the health information systems that are currently being developed in Guatemala. In Lin [7] Constructing PM2.5 Map based on Mobile PM2.5 Sensor and Cloud platform, the concern of the general public for the quality of the air and the protection of the environment is taken into account so that by means of the implantation in The sensors PM2.5 in the mobile can be sent real-time information of air quality to a database that in turn will paint on the map a state of the air quality surrounding the user. Boonchieng [8] Carried out a study to develop a system used to collect and analyze geographical data in the field of medicine. The objective of this study is to apply the GPS localization services that are available in mobile devices. The aim of this study is to apply GPS localization services that are available in mobile devices Common to the district's health systems, storing data in a private cloud system.

As for the topic of the presentation Konarski [9] Describes

methodologies to be able to adapt the Api of Google Maps and use it along with .NET technology to create a web application. Zhu [10] In Introducing Google Chart Tools and Google Maps API in Data Visualization Courses presents an article that pretends to be a practical guide for the visualization of data and visualization of information through web tools.

METHODOLOGY

The methodology to be used will be related to the standards marked by software engineering.

Business requirements

To check the status of a zone, DisePrevApp needs to search by geographical coordinates.

To perform initial disease registration DisePrevApp should use open data.

To register the location of the user, DisePrevApp should have access to the location of the internet browser.

To visualize the area of influence of an illness DisePrevApp must use a map of heat.

To see diseases on map DisePrevApp You could use a list of references on the side of the map

User requirements

The user of DisePrevApp will be able to visualize a list of diseases that appear in a determined sector.

The user of DisePrevApp will be able to know the distribution that presents a disease and therefore can prevent or reduce the risk of acquiring it.

Users can access through DisePrevApp to find nearby health care points from where they are located.

A user of DisePrevApp will be able to identify statistics of occurrence of diseases in a certain sector, allowing him to analyze the quality of the environment in which he lives.

Every user that enters DisePrevApp will find habits to prevent the most recurrent diseases of the sector in which he lives.

DisePrevApp will provide information to the user about diseases that must be taken care of depending on the location that is located.

Use cases

1) Register disease

2) Check disease

3) Check the status of a zone

4) Register disease location

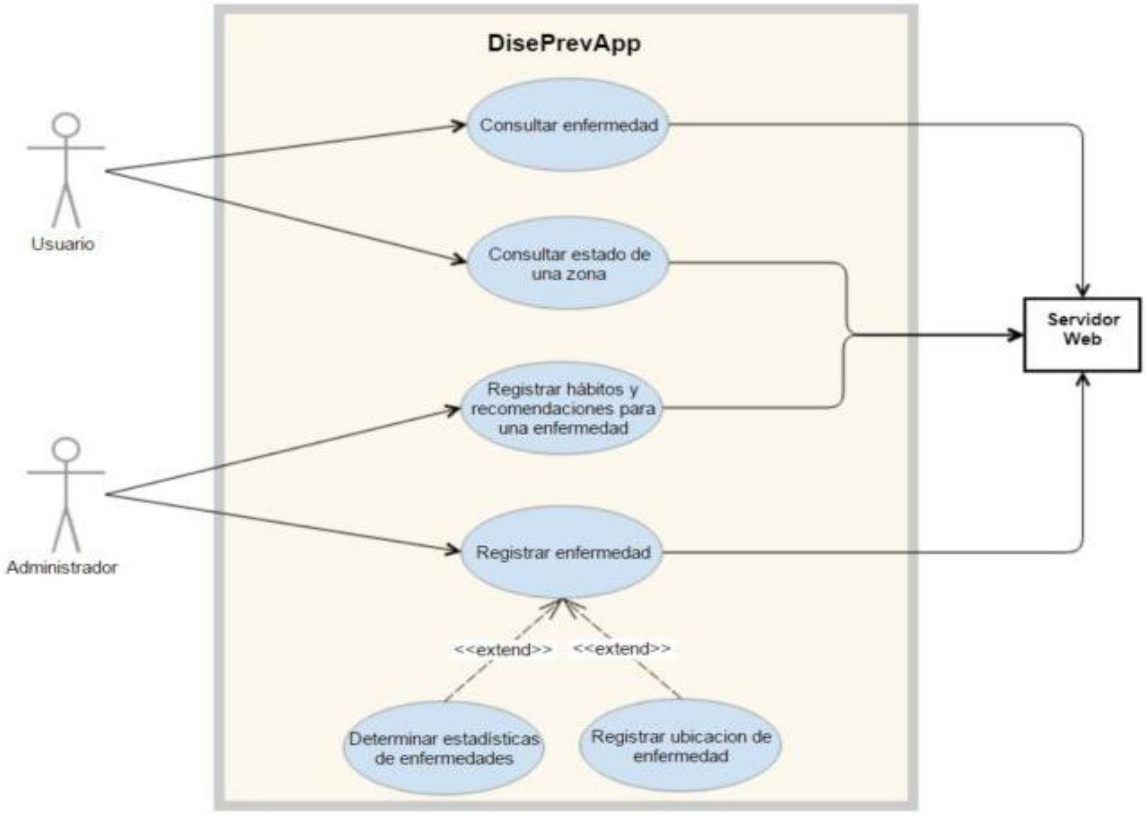

Figure 1. Use case diagram. Source: Author

Use-case templates

Table 1: Refer to a disease. Source: Author

Name	**Refer to a disease.**
Actors	User, administrator
Goals	See disease information to consult.
Triggers	Request consultation from a disease database
Pre-condition	Connection to the database that contains the information of diseases
Post-condicion	Consultation of disease, show on screen.
Basic flow	1 user / admin request for disease 2 user sees the disease information
Alternate stream	1 application for inspection of an anonymous user. 2 requested information is displayed to the user.
Exceptions	- There is no record of the disease that you want to check. - It has no connection with the database.
Qualities	● displaying information on a specific disease. ● shows places with more cases reported.

Table 2: Register a disease. Source: Author

Name	**Register a disease.**
Actors	Administrator
Goals	. Stored in the database a disease for statistical analysis.
Triggers	Request to register a disease
Pre-condition	Connection to the database that contains the information of diseases
Post-condicion	The disease is successfully registered for statistical analysis
Basic flow	1 the platform reads information from the database 2 platform records information
Alternate stream	1 Platform Manager enters the disease manually
Exceptions	Without access to the database
Qualities	

Table 3: Check status of a given area. Source: Author

Name	**Check status of a given area.**
Actors	User, administrator
Goals	Display information about a disease zone to consult.
Triggers	Request consultation from an area with respect to a disease.
Pre-condition	Connection with the application and maps, connection to the database that contains the information of diseases
Post-condicion	Consultation of the area in specific, displayed on screen.
Basic flow	1 user / admin request for zone. 2 user sees the area specific information.
Alternate stream	1 application for inspection of an anonymous user. 2 requested information is displayed to the user.
Exceptions	- There is no record of the disease in the consulted area... - It has no connection with the database.
Qualities	● heat maps display with regard to diseases. ● risk of the user against its location.

Table 4: Record location of disease. Source: Author

Name	**Record location of disease**
Actors	Administrator
Goals	Locate diseases that occur in certain sector
Triggers	Select site to locate the presence of disease
Pre-condition	Access to the database of maps, selecting the location of the user's position points
Post-condicion	Observe the location of diseases to perform a statistical analysis
Basic flow	The administrator enters the location of certain disease map - the user can see the diseases that arise according to the geographical location
Alternate stream	User expects to find in the application the most recurrent and updated map diseases
Exceptions	There is no access to the database
Qualities	● registry has case direction. ● registry has geographical coordinates of.

User Stories

As a user, I want to be able to identify various types of diseases so that I know what risks I am exposed to in my location.

As a user, I want to identify risk areas, so that I can take actions when crossing them.

As a user, I want to be able to enter my location so that I know what diseases I am at risk.

As a user, I want to know the location of nearby medical centers, so that you can address me in case of emergency to any of them.

As a user, I want to know more information about the diseases of my location, so that I can know what medications or precautions to take.

As a user, I want to be able to create an account in the application, so that I can have a history of places visited.

Functional requirement

Usability:

- The menu functions will have their respective display on the map with their respective icon and specifications of the chosen function

Performance:

- For DisePrevApp maps will be fully downloaded in an average of 3 seconds or less on an Internet connection of 10 megabits / second.

Security:

- The system will ensure that people who consult DisePrevApp do not enter or modify data collected in the database, to ensure the accuracy of the data.

Sturdiness:

- The system will be responsible for delivering updated database information; if the database update fails, the information will be delivered to users of a backup generated from the previous update.

Component diagram :

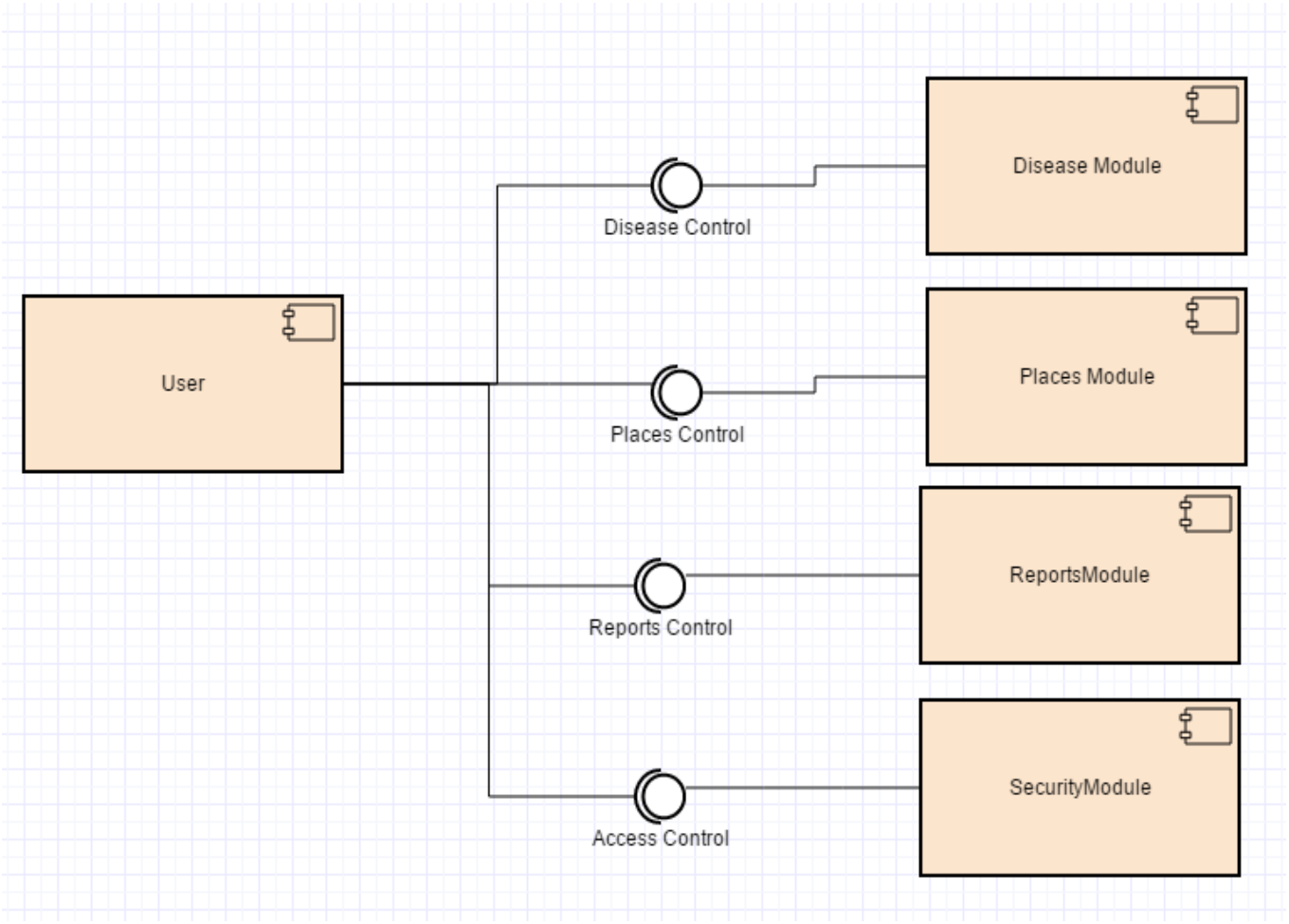

Figure 2. Component diagram. Source: Author

Class diagram :

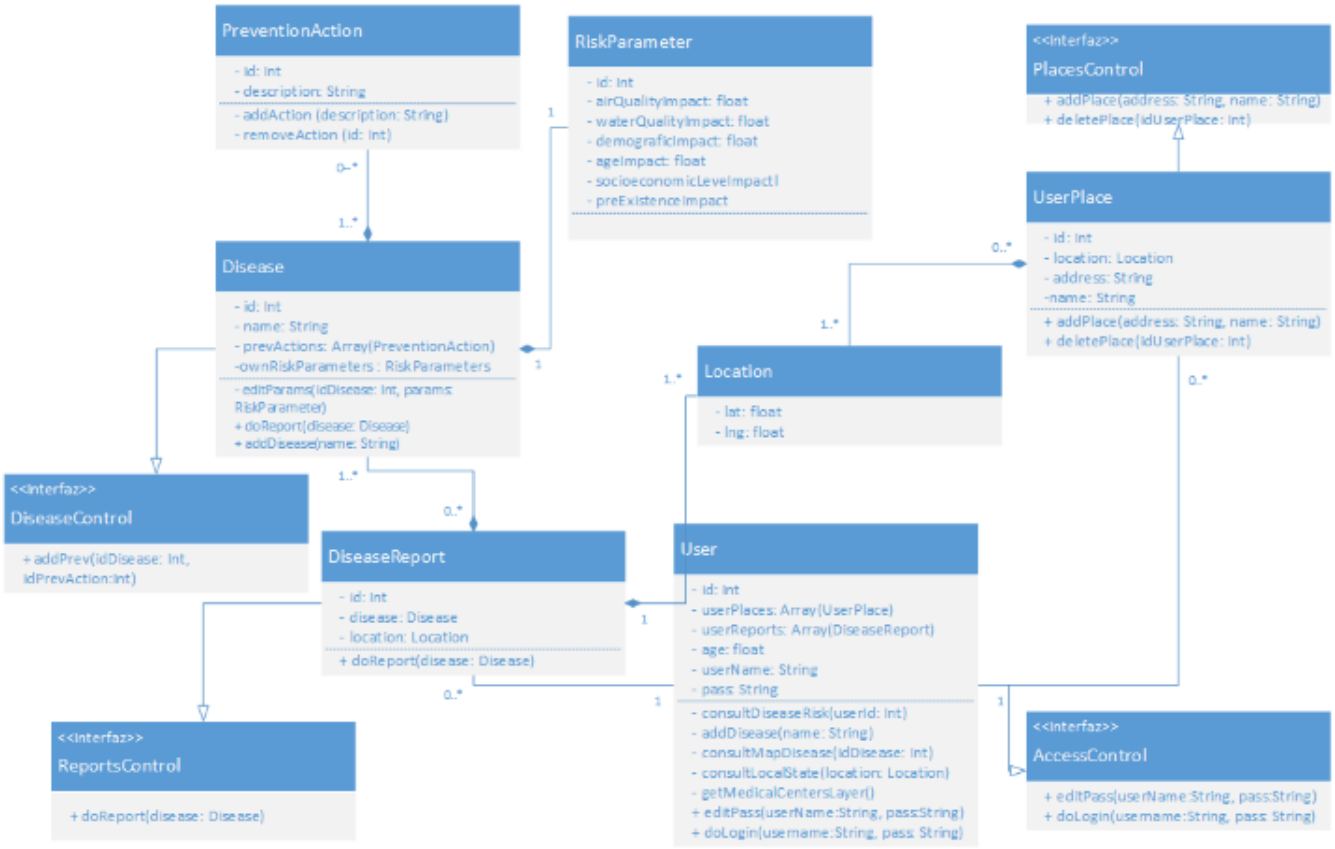

Figure 3. Class Diagram. Source: Author

Mockup :

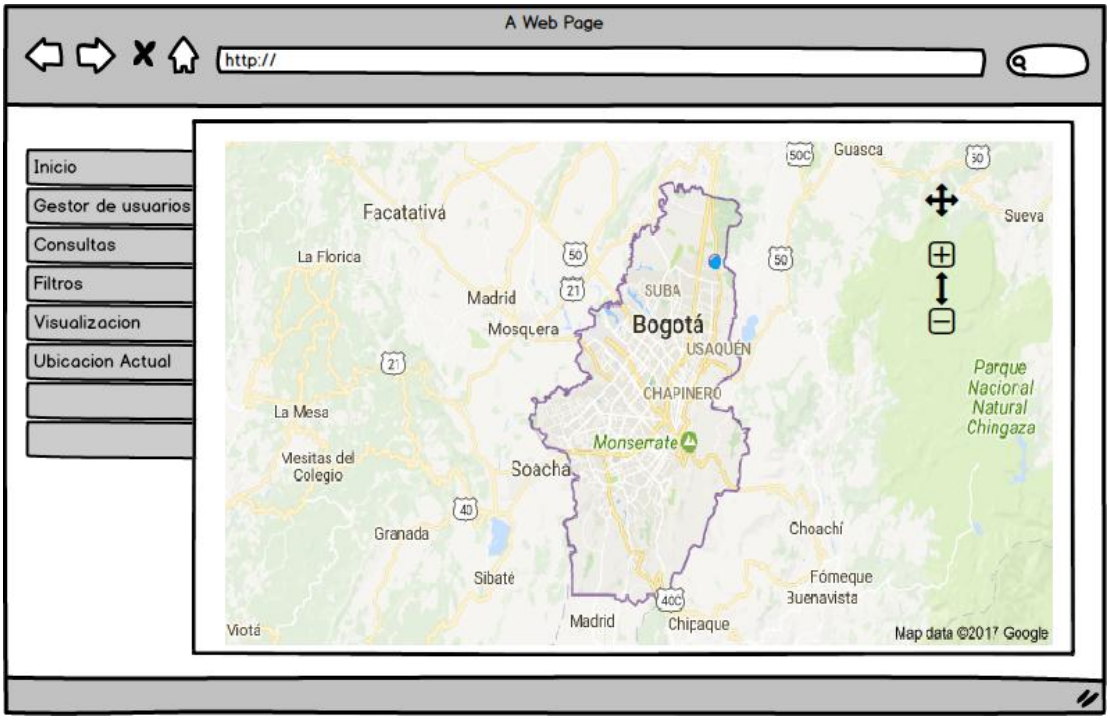

Figure 4. Mockup. Source: Author

IMPLEMENTATION

Data sets

-Hospitals of Bogotá

-Quality of water Colombia

Map

The map focuses on Bogotá D.C. (4.648943 ° N, -74.107862 ° W).

Two types of markers are used; Which represent the location of the hospitals and the location of the user.

Aplication

As the guidelines for good programming practice guide, three folders were created to separate javascript (css), css and icon files respectively and the main file called project.html

The js folder contains five files:

Bookstores:

Bootstrap.js

Justgage.js

Raphael 2.1.4.js

Nmp.js

File for information display:

Maps.js

The css folder contains the library for Bootstrap and the style file (styles.css)

Main code

Map

```
function initMap2() {
   //creando mapa de google
   map = new
google.maps.Map(document.getElementById('map'), {
      center: myLatLng,
      zoom: 10

   });
```

Author:Own

Hospitals Database

```
var xmlhttp2 = new XMLHttpRequest();
var url2 = "https://www.datos.gov.co/api/views/c36g-
9fc2/rows.json?accessType=DOWNLOAD";
xmlhttp2.open("GET", url2, true);
xmlhttp2.send();
xmlhttp2.onreadystatechange = function() {
  if (xmlhttp2.readyState == 4 && xmlhttp2.status == 200) {
    var myArr2 = xmlhttp2.responseText;
    var text2 = myArr2;
    var json2 = JSON.parse(text2);


      for (var i = 0; i<80; i++) {

          var dataLine = [];
          //latitude - 0
          dataLine.push(json2.data[i][18][1]);
          //longitude - 1
          dataLine.push(json2.data[i][18][2]);

          Hospitales.push(dataLine);
      }
  }
};
```

Source: Author

Water quality

```
var xmlhttp3 = new XMLHttpRequest();
var url3 = "https://www.datos.gov.co/api/views/rzdg-
k539/rows.json?accessType=DOWNLOAD";
xmlhttp3.open("GET", url3, true);
xmlhttp3.send();
xmlhttp3.onreadystatechange = function() {
  if (xmlhttp3.readyState == 4 && xmlhttp3.status == 200) {
    var myArr3 = xmlhttp3.responseText;
    var text3 = myArr3;
    var json3 = JSON.parse(text3);
```

```
    for (var i = 0; i<23; i++) {

        var dataLine = [];
        //latitude - 0
        dataLine.push(json3.data[i][20]);
        //longitude - 1
        dataLine.push(json3.data[i][21]);

        aguaData.push(dataLine);
    }
  }
};
```

Source: Author

Progress bars

```
window.onload=function what(){
  document.getElementById("gauge").innerHTML = "<pre>
"+"</pre>";
  document.getElementById("gauge1").innerHTML =
"<pre>"+"</pre>";
  document.getElementById("gauge2").innerHTML =
"<pre>"+"</pre>";
  document.getElementById("gauge3").innerHTML =
"<pre>"+"</pre>";
  document.getElementById("gauge4").innerHTML =
"<pre>"+"</pre>";

  var g = new JustGage({
            id: "gauge4",
            value: 0,
            min: 800,
            max: 1400,
            title: "Enfermedad 1"
           });

  var g = new JustGage({
            id: "gauge",
            value: distancia,
            min: 0.0,
            max: 15.1,
            title: "Enfermedad 2"
           });
  var g = new JustGage({
            id: "gauge1",
            value: 0,
            min: 0.0,
            max: 15.1,
            title: "Enfermedad 3"
           });
  var g = new JustGage({
            id: "gauge2",
            value: 0,
            min: 0.0,
            max: 15.1,
            title: "Enfermedad 4"
           });
  var g = new JustGage({
            id: "gauge3",
            value: 0,
            min: 0.0,
            max: 15.1,
            title: "Enfermedad 5"
           });
}
```

Source: Author

Prototype :

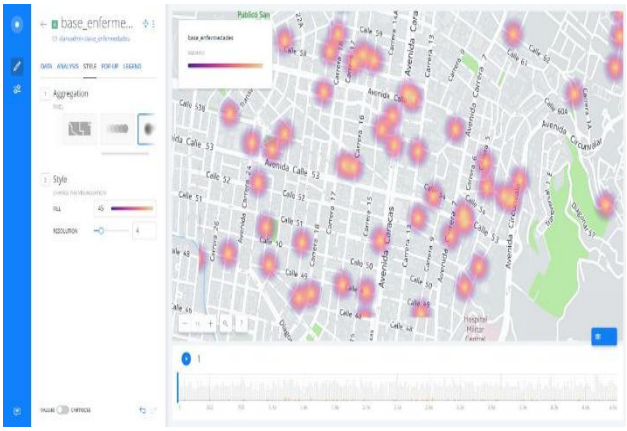

Figure 6. Drawn in html, styles: css, programming: javascript. Map: Google maps api v3. Source: Author

DISCUSSION OF RESULTS

As for the visualization, Zhu [10] In Introducing Google Chart Tools and Google Maps API in Data Visualization Courses presents an article that pretends to be a practical guide for the visualization of data and visualization of information through web tools, this guide was Of great utility to the time to be able to connect the application with the API of google maps and to be able to draw the different maps and markers, also had utility at the time of geo locate coordinates, but in none of the related works was found information to be able to draw Heat maps and progress bars which were of paramount importance for users to be able to optimally visualize the results and thus be able to interpret and make decisions.

According to Konarski [9], in September 2009 the percentage of mashups using the google maps API on the web was almost 33%, which means that for 3 existing applications 1 used this API. Although the number of applications presented by different software companies has been increasing, today the percentage of mashups that are based on google maps API is 44%, and hence the importance given in this Project to the presentation of the information with the help of the famous google maps.

As for the use of open data, the importance was in the use of JSON (JavaScript Object Notation) files, which as Keneshloo explains [2], one of the biggest advantages that has its use is that it can be read by any programming language. Therefore, it can be used to exchange information between different technologies, which was very useful when integrating the four technologies used: Javascript, css, html and google maps API v3. One problem that occurred was the lack of open data in the city of Bogotá and the difficulty of finding true data; moreover, in the database corresponding to the location of the hospitals, no JSON file was found and it was necessary as in Santoso [3].], Download the cvs and do an internal conversion in javascript to be able to display the information in the main html.

As in Boonchieng [8], it can be seen that women attend health services at a higher rate than men, and for this reason their hospitalization and mortality rates are much lower than theirs.

According to Voth-Gaeddert [6], of 30 cases studied in Guatemala on children with growth problems 7 are directly related to environmental pollution, this 23.33% is very similar to 22.95% of cases related to contamination by which you go to medical centers.

CONCLUSIONS

The first three causes of consultation with subsequent death of Bogota are chronic: ischemic heart disease (with 15% of deaths), cerebrovascular (7.08%) and chronic respiratory diseases (6.45%).

68% of consultations in hospitals in Bogotá are for women, whereas men tend to pay less attention to their health, since they go less to the doctor (32%) and total hospitalizations 59% are Men, against 42% of women.

Of the total number of diseases for which the physician is consulted in Bogotá, 13.79% are from influenza, 13.24% from hypertension, 12.20% from urinary infection, 7.03% from caries, 4.31% from Lumbago and 49.42% for other diseases.

The main causes of consultation in the town of Usme were caries (38%), hypermetropia (14%), astigmatism (15%), acute rhinopharyngitis (7%) and myopia (5%). The highest number of consultations correspond to the group of children under 10 years of age.

The main causes for consultation in Ciudad Bolivar were: acute rhinopharyngitis (11.92%), headache (7.86%), other abdominal pain and unspecified (4.31%), tonsillitis (4.01%), Gastritis (3.17%), diarrhea and gastroenteritis (2.87%) and asthma (1.76%), it is clear that water quality affects the high percentage of stomach diseases.

Women, in addition to those who tend to be more at home in the diseases or the state of health of the children, are the ones who attend the most by prenatal controls, genitourinary exams and cytologies, which raise the reasons for consultation.

Women go more to the medical consultation, first, for discomforts and inexplicable pains. In the second order, due to diseases of the genitourinary system. Third, from infections in the airways; Other diseases such as hypertension, which affect some organ of the senses, follow in the digestive system and in the musculoskeletal system.

Men turn to the doctor in the first order for: the pain or symptoms of unexplained health conditions; Secondly, infections of the respiratory tract such as pneumonia and bronchiolitis; In the third order diseases appear in sense organs; They are followed by other diseases such as hypertension, diarrhea, skin diseases and digestive system.

The prevention of major diseases of Bogotá can be carried out with: A healthy diet, exercise, stress management, zero tobacco or narcotics and little alcohol. In addition, low water quality in low-lying localities is directly related to stomach diseases.

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