POT TRACKER

Project Proposal: CS -5630 / CS – 6630 Data Visualization

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PROJECT INFORMATION

TITLE:

PotTracker

PROJECT DESCRIPTION:

An application that gives ward wise analysis of potholes in Mumbai, India.

PROJECT MEMBERS:

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REPOSITORY:

https://github.com/PotTracker/web-application

BACKGROUND AND MOTIVATION

Accidents due to potholes are one of the major problem in developing countries like India. Poor construction quality leads to a large number of potholes which cause accidents and traffic issues. According to the Road Accident Report (2014) published by the road transport and highways ministry of India, 6,672 people died in accidents caused due to potholes and speed breakers. In this project, we try to present a visualization of the potholes in a city and help the government in taking corrective measures.
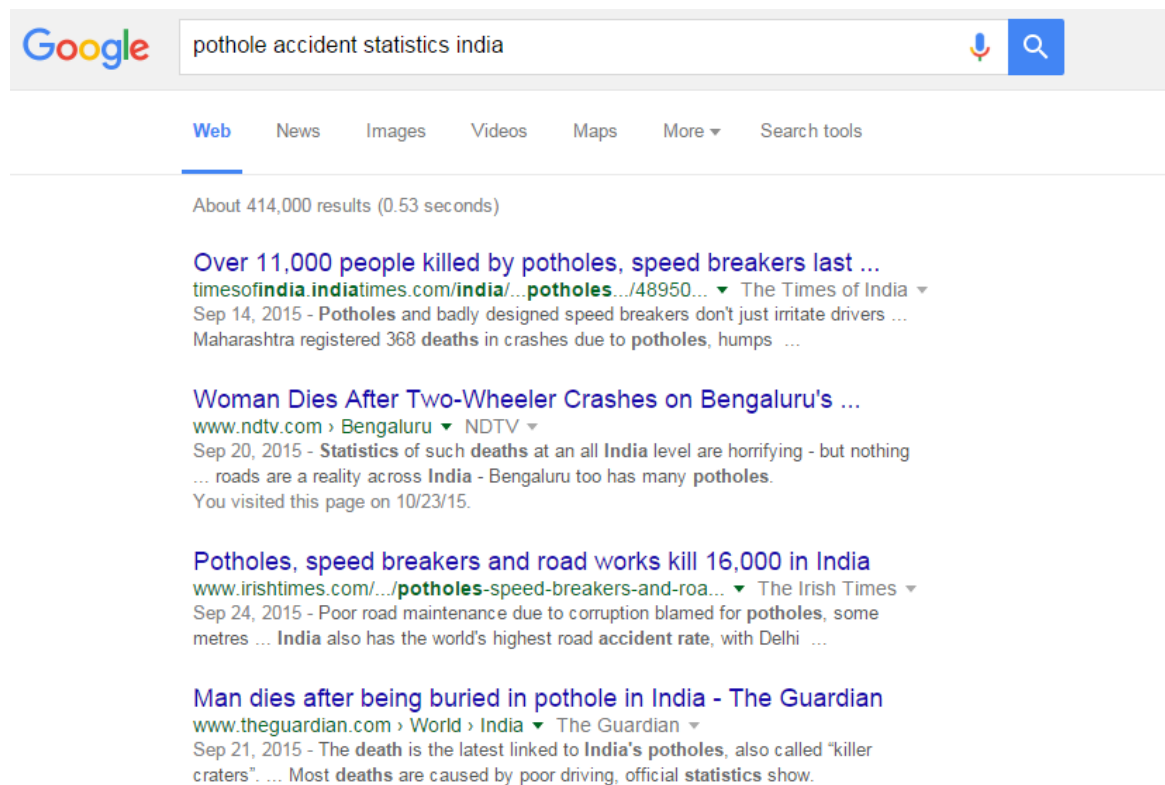

Fig 1: Google search snapshot of accident due to potholes in India

Basically, our visualization aims to keep track of the ward wise data of open potholes, closed potholes and the fresh potholes in Mumbai city. Both the government and people of the city are our audience. Government can use our visualization to effectively track potholes and create a plan to take appropriate measures. People can use it to compare the ward-wise increase and decrease in number of potholes and gauge the efficiency of the local leaders in the respective wards.

PROJECT OBJECTIVES

Our project is a part of a major project that has two components, Mobile application and Visualization application. We are assuming that there is a mobile application which will run as a background service on the mobile phones and tracks the location of the potholes whenever a vehicle running the mobile application crosses it. This application will sense the twitch and send the latitude and longitude of that (pothole) location to the cloud server. Our project focuses on the visualization application. This application will read the data from the server and show the stats of the potholes on page. Visualization will change in real time as the new data gets added on the server by the vehicles.
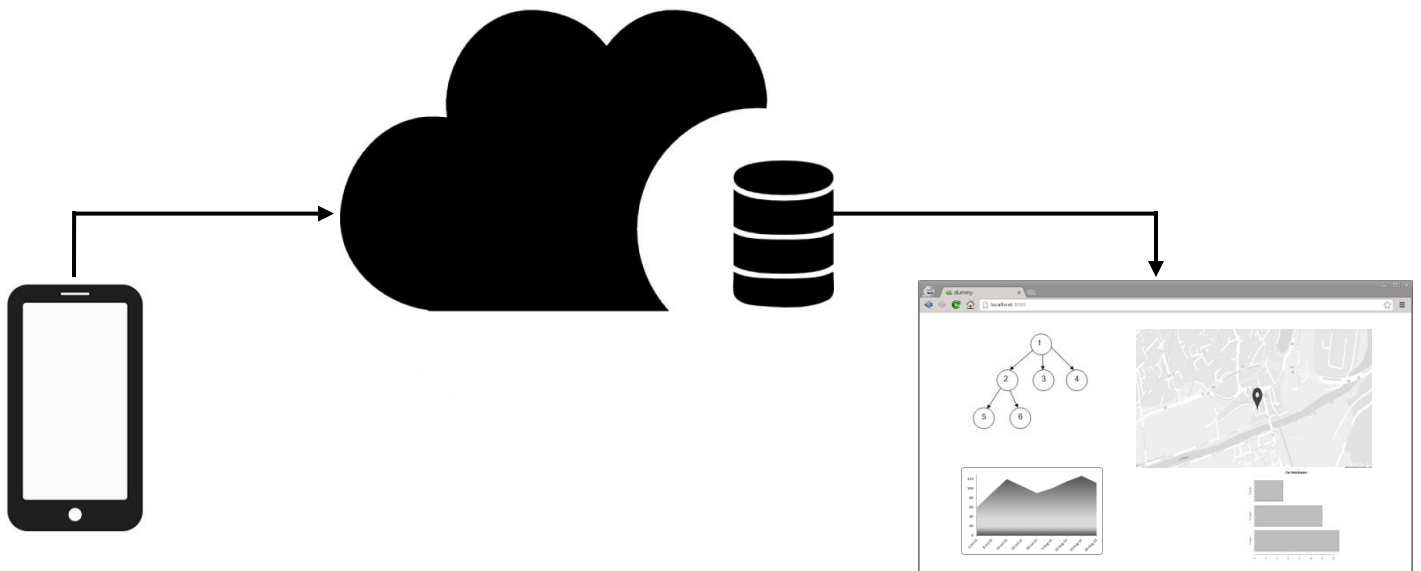

Fig 2: Schematic of PotTracker

In this application we are focusing on five major points

1. Ward color density will changes with the count of the open potholes on the map.
2. Tree Diagram of Mumbai city with branches as wards and leaves as active potholes.
3. Number of open potholes in particular ward with respect to time will be shown in area chart
4. Top 10 potholes based on the calculations of vehicle hit in selected ward.
5. Location of the open potholes in selected ward.

DATA AND DATA PROCESSING

Two types of data are required to build this application:

ADMINISTRATIVE BOUNDARIES (WARD) SHAPE FILES.

The Shapefile format is a common standard for representing geospatial vector data. It is in fact a grouping of several files formatted to represent different aspects of geodata:

- .shp — shape format; the feature geometry itself.
- .shx — shape index format; a positional index of the feature geometry to allow seeking forwards and backwards quickly.
- .dbf — attribute format; columnar attributes for each shape, in dBase IV format.

Link: http://www.diva-gis.org/gdata

We are currently focusing on potholes per ward in Mumbai. We will use this shapefiles to display the boundaries of ward in the Google maps.

Fig3: Ward wise shape file visualization for mumbai city

Processing: We convert the Shapefile data into GeoJSON format such that it is easily readable using D3 and merge this data with roads in Google Maps.

LOCATION DATA READ FROM THE PRIVATE DATABASE

Currently, we will generate our live feed of data for the locating the potholes. Our data primarily has two important fields:

- Latitude, Longitude of the pothole
- Timestamp at which a vehicle hit.

In the future, we can get this data from our mobile application.

VISUALIZATION DESIGN

DESIGN - 1

Fig 4 – Map showing potholes location
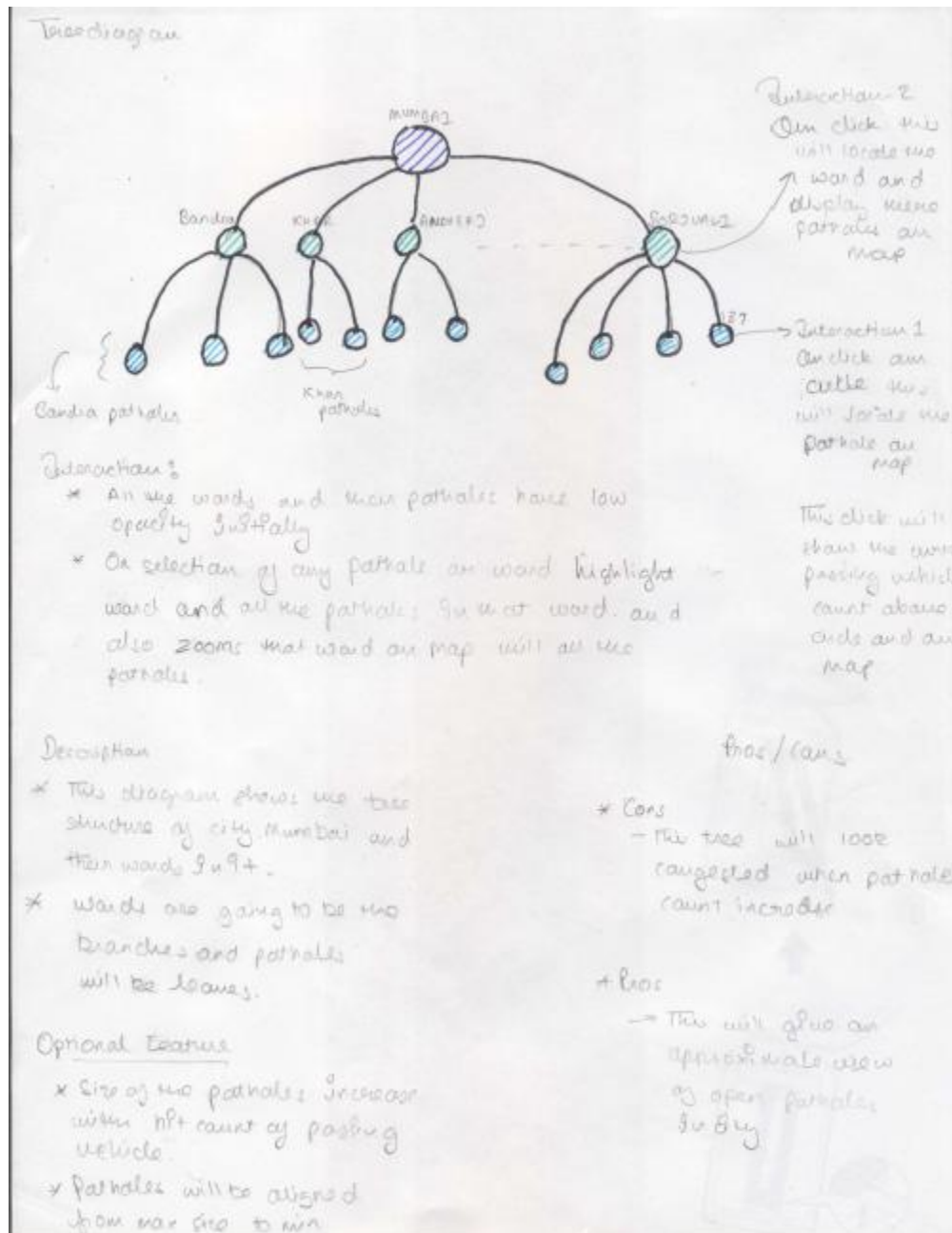
DESIGN - 2

Fig 5 - Tress Diagram showing ward and pothole details
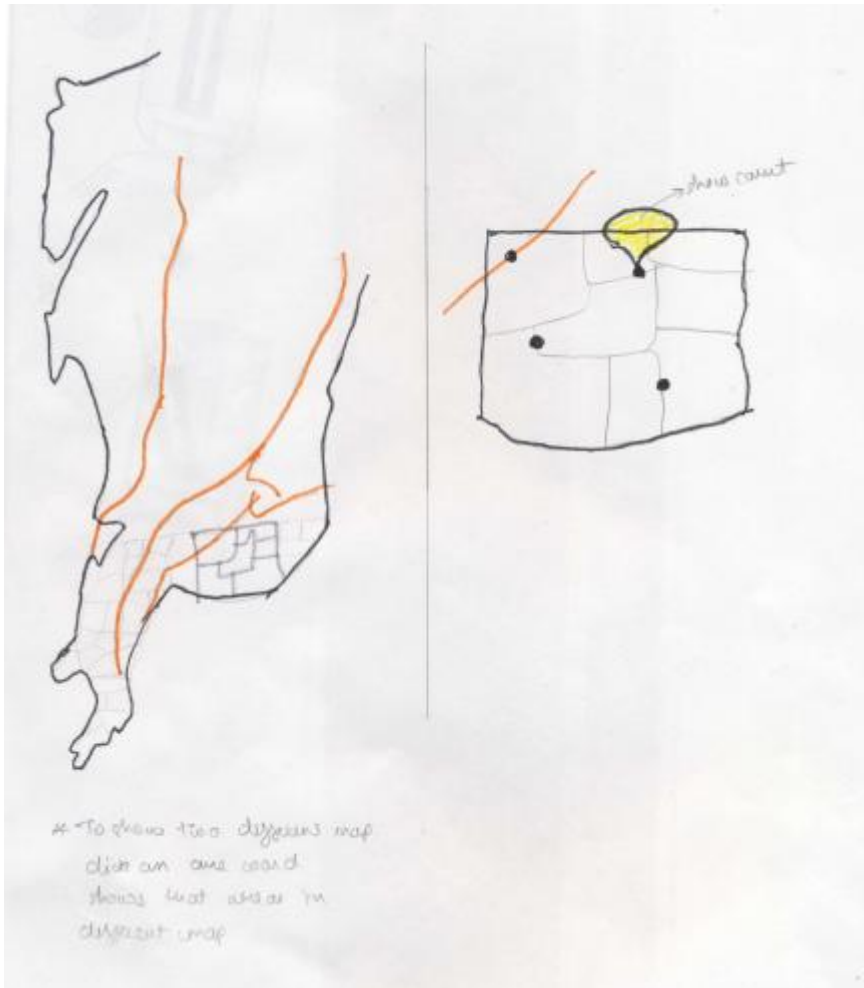
DESIGN - 3

Fig 6 – Two map - first one shows the whole area and second one shows the selected area on which mouse is clicked
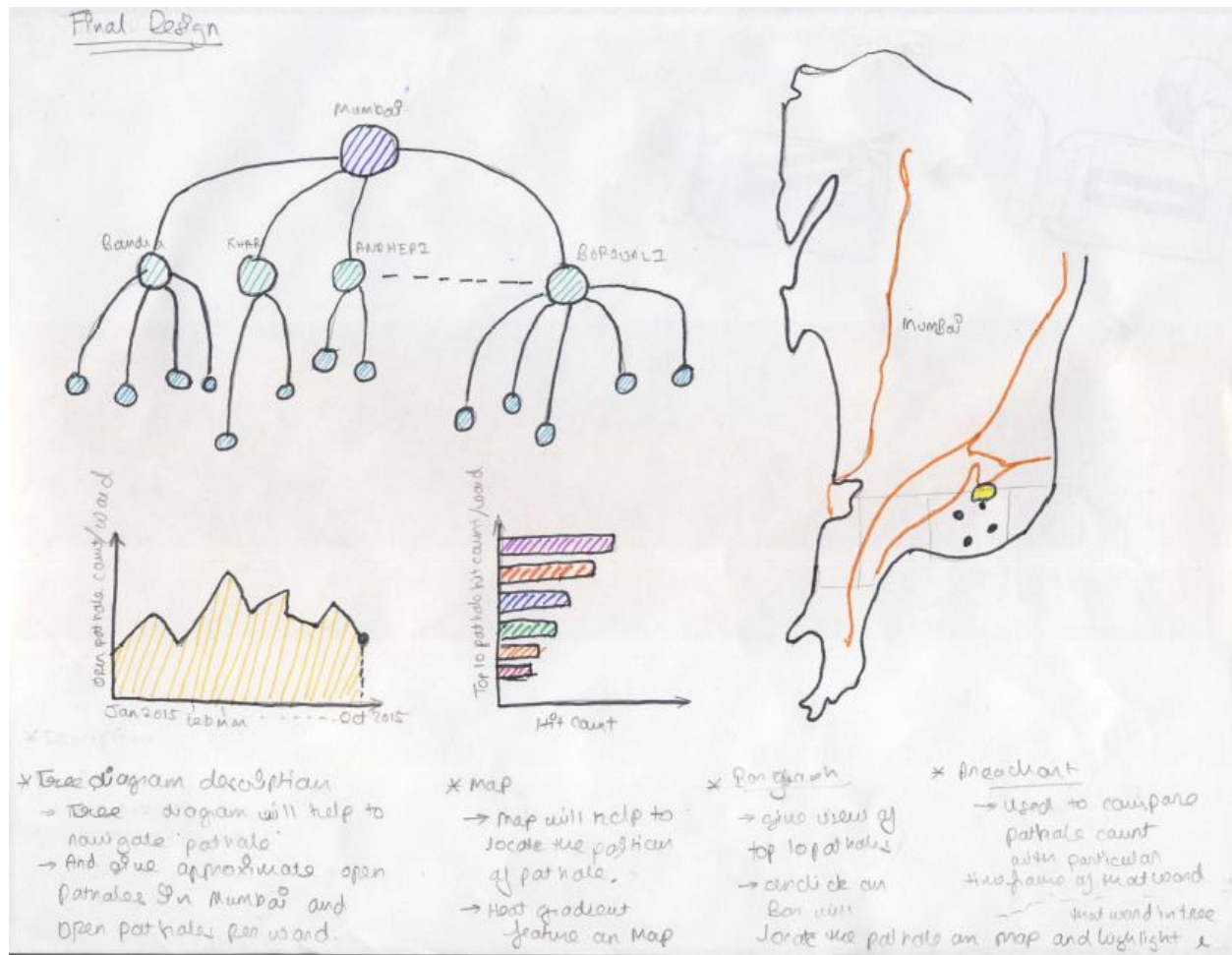
FINAL DESIGN

Figure 7 – Final design of the complete web application with all the relevant views

DESCRIPTION OF FINAL DESIGN:

The final design has the tree node link diagram, the map, the Area chart and bar chart.

TREE DIAGRAM

It is used to navigate into the map using the ward and pothole nodes. It will show all the open potholes in Mumbai city and also ward wise. On clicking the ward, we will zoom into the ward in the map. On clicking the pothole, the pothole and its corresponding road gets highlighted. On hovering the ward node will give the number of potholes in that ward. In hovering the pothole node will give the number of hits (vehicle encounters) of the pothole.

Map Diagram

It will show the location of the wards, roads and potholes. Each ward has a heat gradient coloring based on the number of potholes. On clicking a ward, show the area chart corresponding to that ward.

AREA CHART

It will show the year wise, month wise count of the potholes in a specific ward. On clicking the year wise chart, it will zoom into a month wise chart.

BAR CHART

It will give the top ten potholes with maximum count of hits (vehicle encounters). On clicking the pothole bar, the corresponding pothole in the map will get highlighted. This chart will show the most dangerous potholes which need immediate attention.

FEATURES

MANDATORY

- Visualization of the ward-wise road map of the city.
- Heat map for each ward that indicates the ward-wise density of the potholes.
- Tree diagram to navigate into the map to find the wards and the associated potholes.
- Bar chart that shows the top potholes with maximum hits (vehicle encounters).
- Line chart that indicates per year, per month variation in the number of potholes of the city. On click of per year chart converts the chart into per month chart.
- The Map, charts and Node link diagram will dynamically update based on the live data that we retrieve from the server.
- Association between the Map, Node link tree diagram, Bar chart and line chart.

OPTIONAL

- Based on the data available for the previous year, we would like to forecast the per month increase in the potholes for the next year.
- Size variation of the ward nodes in the node link diagram based on the number of potholes in the respective ward.
- Size variation of the pothole nodes based on the number of hits (vehicle encounters).

PROJECT SCHEDULE

Modules	Description	Deadline	Responsibility
Data Reading and Wrangling	Location and Timestamp data creation, making the data	9th Nov 2015	Sunny
	Reading from DB and creating object of the active potholes		Yogesh
	Understanding shape files format and reading and converting into GeoJSON format		Mohan
Creating visualization elements	Display wards map using GeoJSON data and from the Google Map. Read potholes data from DB and display into map.	16th Nov 2015	Sunny
	Create area and bar chart and add event handling for the selection on map or bar chart.		Yogesh
	Display Tree Diagram by reading wards and pothole information from the data		Mohan
Interlinking of all Visualization and real time updation of visualization with the change in data	Map handling and real time updation handling	23rd Nov 2015	Sunny
	Chart handling and real time updation handling		Yogesh
	Tree Diagram handling and real time updation handling		Mohan
Testing	Testing whether complete visualization is running properly as per data. Fixing if any issues found. If time permits we will add optional features too	30th Nov 2015	Sunny, Yogesh and Mohan