"BETTER NATION WITH BETTER CITIES"

HARI KRISHNA GADI[1]

[1] Student, Andhra University College of Engineering
55-4—122, simhadripuram,
H.b.colony, Visakhapatnam,
Andhra Pradesh.

Abstract:

India is a vast country and with a population of nearly 130Crores among which almost 31.6% of people are the residents of the cities which are under the governance of the municipal corporations. So in order to provide better services by the municipal corporations the way the municipalities interact with the citizens has to change and the way the municipalities react to the problems and suffering of the citizens has to change. There is a complaint registered in at least one of the municipal corporations for every 3 minutes in our country. So the idea is to create mobile applications which acts like a bridge of communication between the citizens and the governing bodies. So this app is a Nationwide app and anyone can see the registered issues at any street of the cities of this country. And can also attach the image and video files to the location of the complaint and the information regarding the issue such as a sewage leakage , un cleaned roads and anything of such incident. And only the person who has opened that issue will be able to close the issue after the necessary work is done by the local municipality. And these complaints are redirected to the local municipal corporation's desk for this we need to develop and web application for the for the purpose of municipalities to be able to receive the issues opened. We can fire up the issues on the Indian map with the Heat map layer above that representing the opened issues. So on a whole we can see a bigger picture where the density of problems is more and also where the major allocations such as funds and other allocations.

About the Author:

Mr. Hari Krishna Gadi.

I am a B Tech final year student from Andhra University College Of Engineering from the Geo Engineering Department and the Geo Informatics course and have even been 2nd Runner up for the Mapp your own way contest held as the part of the ESRI's user Conference in the year 2017 and I have a paper to my name in the Springer series.

E mail ID: gadiharikrishna@gmail.com
Contact: +918330927092

Introduction

India is a vast country and with a population of nearly 130Crores among which almost 31.6% of people are the residents of the cities which are under the governance of the municipal corporations. There are around 227 municipal corporations in our country which takes care of the basic enmities of the people residing in the cities. So the better the service provided by these municipal corporations the better will the living in the cities and so finally in this country. So in order to provide better services by the municipal corporations the way the municipalities interact with the citizens has to change and the way the municipalities react to the problems and suffering of the citizens has to change. There is a complaint registered in at least one of the municipal corporations for every 3 minutes in our country. So the idea is to create mobile applications which acts like a bridge of communication between the citizens and the governing bodies and this app is a nationwide which lets the users, the citizens of this country to register an issue in the form of geo tagged image files which gets notified to the local municipality and anyone can see the registered issues at any street of the cities of this country. Only the person who has opened that issue will be able to close the issue after the necessary work is done by the local municipality. We can fire up the issues on the Indian map with the Heat map layer above that representing density of the opened issues at the real time. So on a whole we can see a bigger picture where the density of problems is more and also we also the density and cluster analysis helps us in making important decisions such as where the major allocations such as funds and other allocations for the public works has to be done. On a whole it is building the whole ecosystem to make things easy and better. As a part of the research the analysis on how the complaint points for overspill of garbage in the city of Visakhapatnam is distributed.

The Study Area

Visakhapatnam city is located on the east coast of India (Fig 1) and is the major city in the state of Andhra Pradesh (Fig 2). Visakhapatnam city is the administrative center of the Visakhapatnam district (Fig 3). Visakhapatnam is nestled among the hills of the Eastern Ghats and facing the Bay of Bengal on the East. It stretches for around 682 km^2. The city is a home for around 20.4 lakhs people during the time of 2011 census. This number would rise to 30 lakhs by now. It is both an Industrial hub with a steel plant and is also a tourism place. The city also has the one of the oldest country's shipyard and also it has the largest seaport. The Visakhapatnam Municipality was set up as early as early as in 1858. The basic infrastructural needs of the people are fulfilled by the Municipality and the Municipality was converted into Municipal Corporation in 1979. The city has evolved into the Greater Visakhapatnam Municipal Corporation in the year 2005. The GVMC Boundary (Fig 4) is spread over 6 zones and 72 wards.

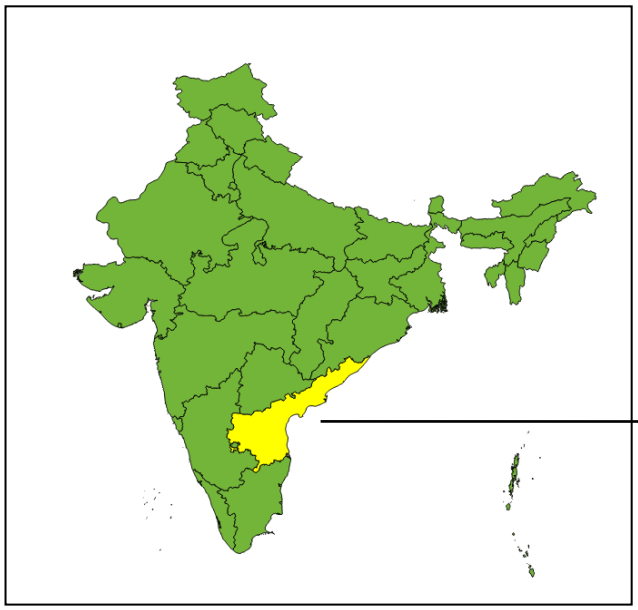


Fig: 1 – India

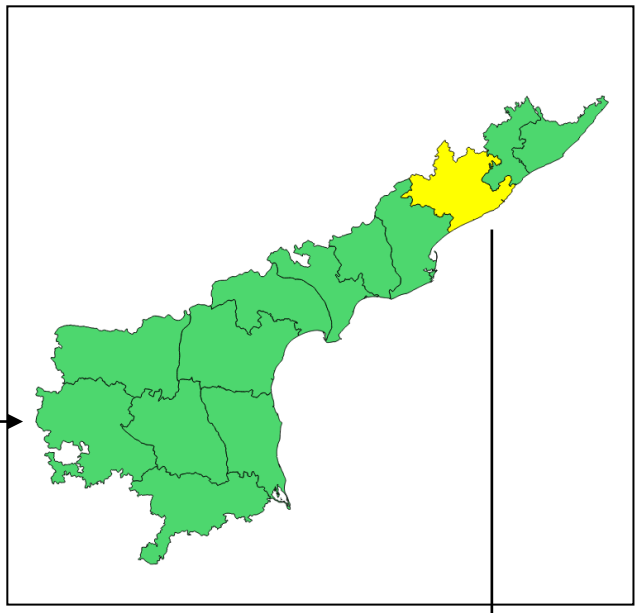


Fig: 2 – Andhra Pradesh

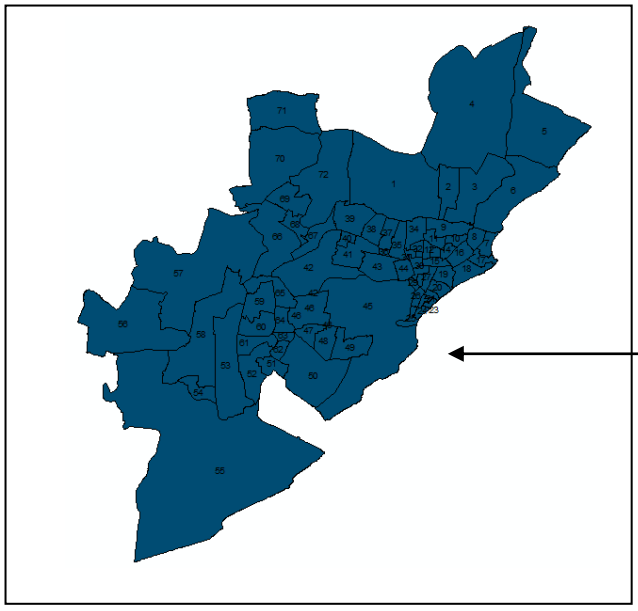


Fig: 4 – GVMC Boundary

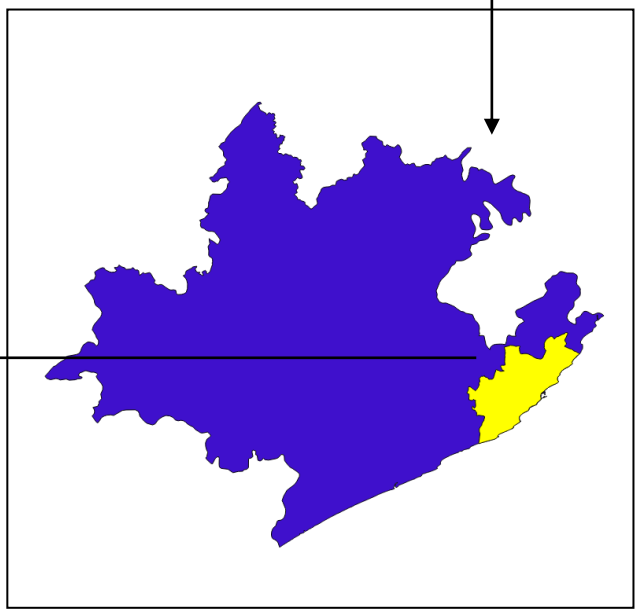


Fig: 3 – Visakhapatnam District

Methods of Study

The ward wise complaints registered against the garbage over spill on the roads were collected from the Greater Visakhapatnam Municipal Corporation was collected and a Shape file was created with the latitude and the longitude of the each complaint. The dataset consist about 352 locations spread all over the city during the first six months of year 2015 and also the severity of the problem at each location was also present with the dataset with the range of values from 1 to 5. The attribute table of the resultant shape file representing the complaint locations is as follows as Fig 5. The column String represents the name of the area in the string format and the severity is the severity of the problem and the shape representing the type of vector representation of the point dataset.

FID	Shape *	STRING	severity
316	Point	DESAPTRUNI PALEM	4
317	Point	PEDDA MADAKA	2
318	Point	SANIVADA	4
319	Point	MADAKAPALEM	3
320	Point	MANGALAPALEM	5
321	Point	PALAVALASA	3
322	Point	SIKUVANIPALEM	2
323	Point	KAJIPALEM	3
324	Point	DUGGAPUVANIPALEM	1
325	Point	UPPARAVANIPALEM	3
326	Point	SATYAVANIPALEM	4
327	Point	JAGGAYYAPALEM	2
328	Point	KRISHNARAYA PURAM	2
329	Point	LAKSHMI PURAM	2
330	Point	CHIMALAPALLI	3
331	Point	GOLLAVANI PALEM	4
332	Point	PAPAYYARAJU PALEM	3
333	Point	PURUSHOTTAMAPURAM	4

Fig: 5 – Attribute Table

The Shape file of the entire GVMC area with definite boundaries is obtained from the GVMC. When the shape file containing the points representing the complaint locations is pulled over the shape file of the GVMC boundary it looks as follows the Fig-6. But that is a mere map and wouldn't be enough for a decision maker to make a decision. So further more analysis of data has to be done. And we have different Spatial Analyst tools in the Arc tool box of the Arc Map 10.3. Tools such as Conditional, Density, Distance are present so we can make use of them for spatial. For our requirement we would go with the Density sub category and we can see three different types of density analysis such as Line Density , Point Density and Kernel Density.

Kernel Density Estimation

In statistics, Kernel Density Estimation[1] is a non-parametric way to estimate the probability density function of a random variable. Kernel density Estimation is fundamental data smoothening problem where inferences about the population are made, based on finite data sample. Let (x_1, x_2, x_3,……,x_n) be a univariate independent

and identically distributed sample drawn from some distribution with an unknown density f. We are interested in estimating the shape of the function f. Its kernel Estimator is

$$\hat{f}_h(x) = \frac{1}{n}\sum_{i=1}^{n} K_h(x - x_i) = \frac{1}{nh}\sum_{i=1}^{n} K\Big(\frac{x - x_i}{h}\Big),$$

Where K is a kernel- a non-negative function that integrates upon to one- and h>0 is a smoothening parameter called Bandwidth. A kernel with subscript h is scaled kernel and defined as $K_h(x) = 1/h\ K(x/h)$.

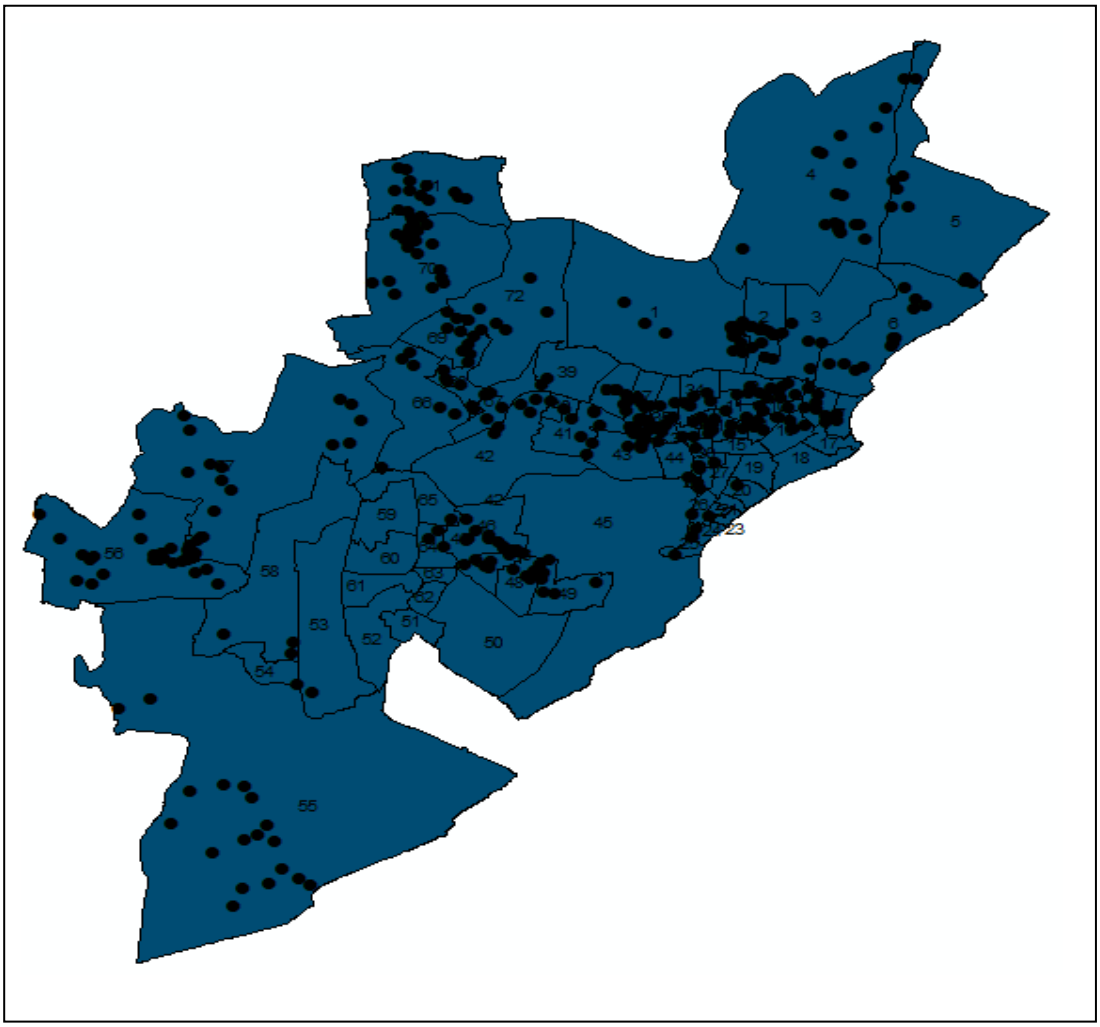
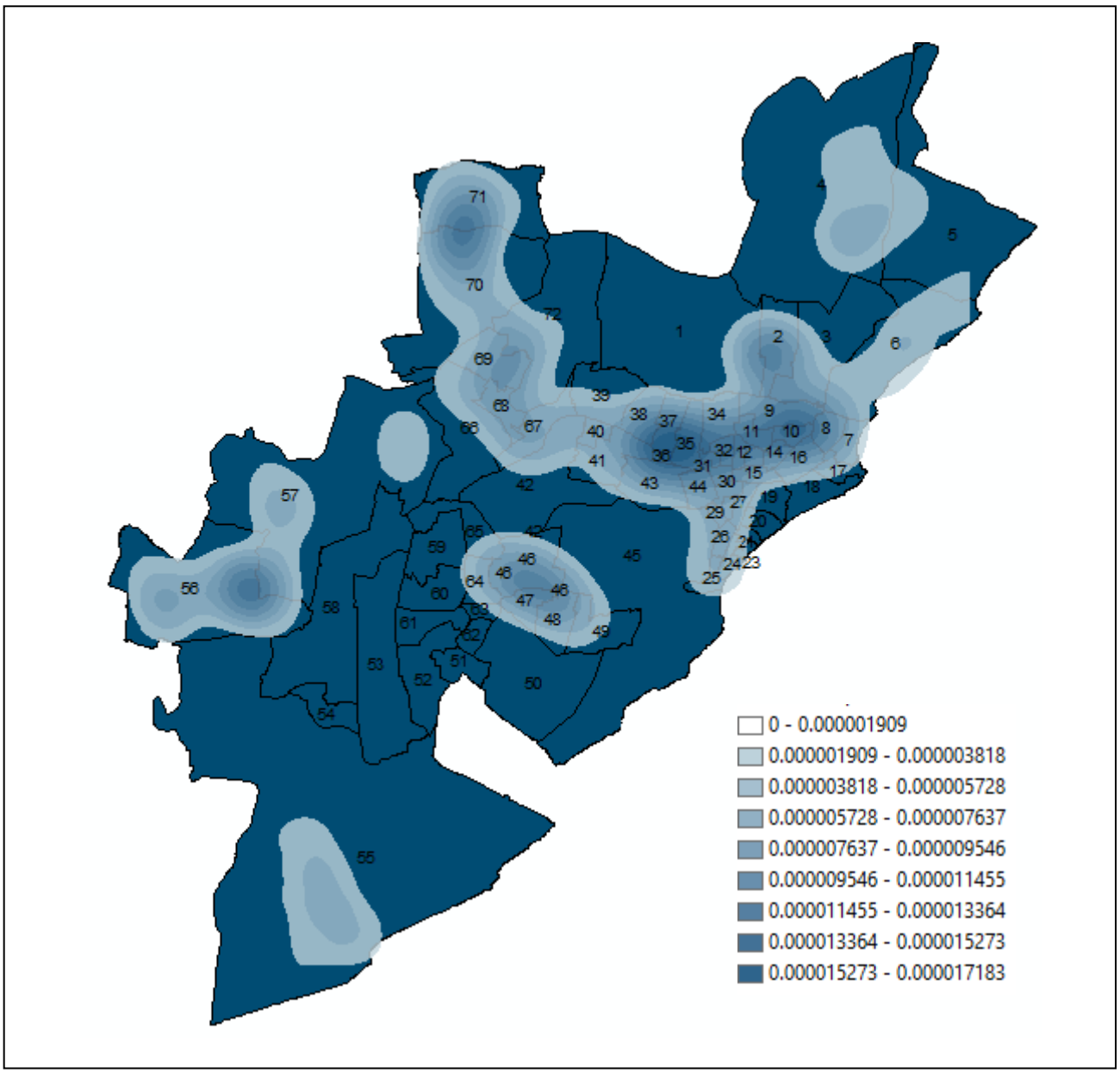


Fig: 6 - Complaints Map

Kernel Density

The kernel density tool[2] calculates the density of features in a neighborhood around those features. In our case it is the density of complaints in a neighborhood. The population field could be used to weight some features more heavily than the others, depending on their meaning, or to allow one point to represent several observations. In our case we make use of the severity column as the population to weight the complaints in an area. After selecting the severity column of the complaints shape file and running the Kernel Density tool would result us a raster which when pulled over the base Shape file would look like a heat map and will be as the following fig-7



This generated Heat map looks far more informative than the just the data points over the base map shape file. Anyone with little knowledge of interpreting maps can clearly come to a conclusion that the wards with the darker values of over them are more problematic than the rest. Also to check the randomness of the datasets we can perform further more spatial statistical analysis such as Mapping clusters using Hotspot Analysis done using (Getis-Ord Gi*) method. But there are no any peaks found in the Incremental Spatial Autocorrelation output.

Scalability

This is one of the many datasets we could obtain from the app if it is implemented. We can do much such analysis and make decision making easy and effective for the better governance and also we can crowd source the datasets and this is a very effective way of collecting data because we can get the exact data required for our analysis and it will be the most effective analysis. The problems such as streetlights, drainage overflow and even water pipes leakage each problem can be a theme and each theme can be analyzed in the same way and the decisions can be made effectively. The idea in the nutshell is to build the build an environment involving citizens for the crowd coursing of the datasets and the analysts to analyze the datasets produced in the backend to the decision makers who make use of the results came out through the analysis.

Conclusion

From the above kernel Density analysis of the Complaints register against the overspill of garbage in the garbage bin in the first six months of the year 2015 it is evident that the wards 35,36,37,10,32,56,57,46 need a special care and the follow up to decrease the complaints in that area. Also we can kick in some other factors influencing the complaints in an area like the number of garbage collection points for an area, the population of the area. These factors are also to be considered and the effective analysis such as the spatial statistical analysis infers the better results.

References

1. https://en.wikipedia.org/wiki/Kernel_density_estimation
2. http://pro.arcgis.com/en/pro-app/tool-reference/spatial-analyst/how-kernel-density-works.html