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Citizen Complaint System for Urban Maintenance Using GIS

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***Abstract*—** In today's time the working of local government body is very important and to meet the requirement of the digitized society the local body also need to improve their working style. some of the responsibility of the local government body is to take care of the wear and tear in the city and to keep the city clean, As many of the cities in India are not fully digitized or aren't smart cities yet where sensor and camera would find out the faults the cities are mostly depended on the citizen input as complaints for this work, But the current method for complaining is very tedious and time consuming, so most of the people just ignore the problem and try to live with it, so change this we have come up with online complaint system in which people can easily lodge their complaints from their phone instead of going to the respective office, they can also look what is the current status is of their complaints and what actions are been taken by the local government body, all they need to do is just take a picture of the problem and submit it to the local government body for actions with the details of the problem, So by this we can evolve from being a normal city to smart city in steps.

***Keywords*—** Complaint system ,Non-emergency ,Smart city,Urban areas,Local goverment

I. INTRODUCTION

World is going through the urban development phase. Experts predict that the population will be double by 2050 meaning 70 percent of the total population will be living in major town or city [1]. With the ever increasing population it is necessary for local government body to improve their services because the city as only as smart as the services provided by it, as the services directly impact the quality of the citizens life. So the urban apps are very essential for smarter cities [1].

The simplest method to make cities smarter is to make a platform where citizens are allowed to participate in the decision concerning the society as humans can be more accurate then sensors and cameras and they are cost less as well as participation will not be remunerated [2].

The complaint system of any city is very important because no doubt how good the things installed in city, fault will occur with time but the local government body should take care of it and replace or repair the things in the city, thus complaint system plays an important role in the quality of life of citizens.

In India the current system of complaining is very tedious and complex, citizen who wants to lodge a complaint need to go the respective department and file a complaint by standing in line, many a term people don't even know Which department the complaint is to be filed thus making the process very complex and inefficient so sometime people don't even file the complaint to save them from this Process. Apart from this after filing a complaint there is no proper way to check the current status of the complaint and what action have been taken on the complaint ,making the system more complex.

So the propose system would be in which people can take pictures of the neighborhoods issues and submit the picture along with details to local government body, the complaint would be lodged along with the address of the issue with the local government which in turn can forward the problem to the appropriate department and the department will look after the issue. The citizens will be made available with the current status of the complaint and what action is being taken against it and how quick the problem can be solved [3].

(a) Problem Definition:

We want to create a system for registering the complaints of the citizen with the municipal office of the city, most of the problems in the neighborhood isn't resoled early because the concerned departments does not know about it, as citizens does don't complaint because of the tedious process and sometimes even after complaining the application is stuck in the process and does not reach the concerned department when the problem come to their notice they then resolved it as early as possible, so if we present a system where the citizens could complaint about the issue without the trouble of going to the department standing in the queues and registering complaints and the complaint can be forwarded to the respective department with ease so that would make the life of the people much more better and make city a better place to live.

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The system should be using the latest technologies and should be easy to use and self explanatory it should make things ear for the citizen and not complex it.

(b)Nature of Problem:
So what kind of problems are we talking about, the problems can be anything from pothole, street lights graffiti removal, illegal parking, abandoned vehicles and many more, any problem that disturbs the physical order in the society. The problems will not consist of bill not paid, delay in service complaint and complaints like that though this types of complaints can also be added in future with some different mechanism.

(c)Area of study:
The current of area of study for this projects it the lovely city Aurangabad from Maharashtra. The city is mixed with old structure as well as the new structure which have been developed in recent years. Aurangabad is also been selected as one of the city to build a smart city by the prime minister of India for the project of smart cities in India
Aurangabad Municipal Corporation (AMC) is the local civil body. It is divided into six zones. The Municipal Council was established in 1936, the Municipal Council area was about 54.5 km^2. It was elevated to the status of Municipal Corporation from 8 December 1982, and simultaneously including eighteen peripheral villages, making total area under its jurisdiction to 138.5 km^2 extended its limits [11].

(d)The Existing system:
The current Complaint system in Aurangabad city has two ways of lodging a complaint firstly u can go directly to the concern department and file a complaint or secondly u can use the online system. The Second method is a web based System in which u can register the complaint with detailed information such as type and subtype of complaints .after successful registration of the complaint the operator then forwards the complaints to concerned departments heads which in turn forward to the ward officer concerned with that area. Currently the Aurangabad district is divided into three parts and has different officers for this three different parts so according to the complaints location the head of the respective department forwards the complaints to the appropriate officer in charge of the area[9][10].

II. RELATED WORK

Some of the Ongoing and implemented Researches and projects that have used the user generated data are summarized below

(a)Citizen connect
Citizen connect was initially developed to as part of the new public management approach that Emphasizes on customer centered or citizen centered government to collect data about city problems from citizen. The system have evolved a lot from the traditional hotlines complaints system to mobile application and interactive web pages and now towards mobile and web tools that frame interaction with thin the reflective context. Currently the citizen connect application allows the citizen of Boston to take the picture of the issue in their society like pothole, street light outages and dying trees and many more and report this issue to appropriate municipal agency and this agency would then solve the issue and update the status of the complaint which is notified to the user via app. The citizen can make a new complaint, view the status of their complaint and check the number of issues and their status reported near them using a map. [16]

According to the database of reports received by the city of Boston's CRM (constituent Relationship Management) system between March 1, 2010 and May 11, 2011 the traditional channels i: e the hotline and internet portal generated 76,723 request for service covering 131 types of requests and the citizen connect app generated 11,541 request covering the 6 case types which include Pothole repair, snow plowing, snow removal, street light outages graffiti removal and general request. And all the reports from citizen connect include the address or intersection where services were to be rendered and all cases were geocoded [2, 10].

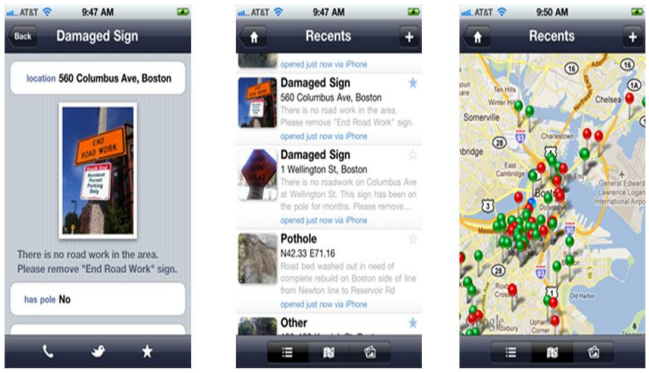

Fig 1 .A complaint registered in citizen connect [10]

(b)Fix my street
FixMyStreet is a platform for reporting common street problems such as potholes and broken street lights to the appropriate authority. Users locate problems using a combination of address and sticking a pin in a map without worrying about the correct authority to report it to. FixMyStreet then works out the correct authority using the problem location and type and sends a report, by email or using a web service such as Open311. Reported problems are visible to everyone so they can see if something has already been reported and leave updates. Users can also subscribe to email or RSS alerts of problems in their area.

It was created in 2007 by my Society for reporting problems to UK councils and has been copied around the world. The FixMyStreet Platform is now at version 1.5.5. And is an open source project to help people run websites. Some of the apps that are developed using this open source platforms for a particular constituency in uk (or even outside uk) are Writetothem, whatfotheyknow, theyworkforuou, hearfromourMP[15].
There were 3,147 reports made by the FixMyStreet in last week and 5,569 issue were fixed in last month [15].

(c) *Smartphone 311 App by City sourced*
The application developed by the company Citysourced is a similar app with some changes the Smartphone 311 app realizes that Smartphone and GIS could be used to crowd source these reports in a way that was both easier for residents and more efficient s for governments. To report the problem the a citizen simply takes a picture of it using the Smartphone's camera and submit it directly to the government with categorizing then problem using the drop down menus, the users does not need to add address as the Smartphone geo-tags the image with location the app automatically returns the location on the map. All the reports are delivered in Esri format that can be easily integrated with existing GIS implementations; Citysourced has developed the application using REST API (application programming interface) Data is returned is in XML or JSON. The cities that use the Citysourced services are given a customized app for the city [3].

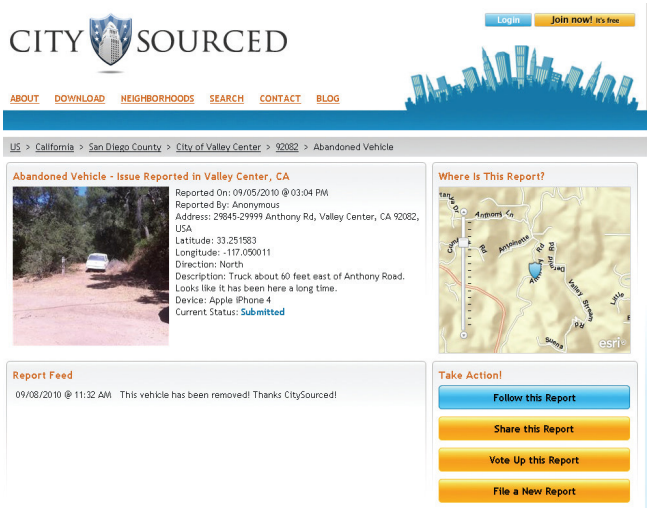

Fig 2. A complaint registered in city sourced [3]

III. COMPARATIVE ANALYSIS OF DIFFERENT NON-EMERGENCY COMPLAINT MANAGEMENT

The table below discusses works to be ready by various authors on complaint management system analysis. What are the various types of methods or authors, techniques used onto the system, main event phases, accuracy of the system based on scope of the project, types of complaint used and we analyses all different methods with limitations of the system discussed below:

Table 1. Different Complaint Management Techniques Comparative analysis

Author and year of publication	Techniques Used	Event phases	Types of complaints/Dataset/suggestions	Limitations/Future work
D López-de-Ipiña Et al.(2013) [1]	PostgreSQL database, JSON query, Query language for RDF (SPARQL), PhoneGap.	a) Citizens consuming useful data services in different domains but also contributing with complementary data to the city. b) City council uses this platform to track services and urban dataset assembled around them. c) Uses JSON- based API by IES CITIES for creating novel app for urban apps.	a) Extract and adapt heterogeneous structured and non-structured data from council repositories, sensor networks, web sites and social networks. b) facilitate the development of urban apps by end developers, thus fostering urban-related innovation c) Validate, promote and integrate user-provided data with open government data.	Future works: More complex, derived provenance information should be incorporated, allowing tracing back the full revision chain of data modifications.
K Benouaret Et al.(2013) [4]	Location based Crowdsourcing, CrowdSC Architecture.Bonita (open source BPM Suite).	a) Location based mobile crowdsourcing for Web and a mobile client. b) Design a frame- work for crowdsourcing Location-based queries on top of Twitter.	Suggestions: Query based complaint management technique, based on data selection, collection and set priority on all complaints types.	Limitation: To get quality of result best photo of the location have to select, but if user doesn't upload properly result varying.
Matthew DeMeritt Et al.(2011)[3]	ArcGIS10,mobile VGI(Volunteered geographic information)	a) These systems put repair incidents into prioritized Queues and assign incidents to work crews. b) This application turns average citizen with smartphone into a sensor for a city.	All types of complaints can register which sets prioritize queue (Reporting civic issues around) such as code compliance, drainage issues, graffiti, street issues etc.	Future Works: Transform civic engagement i.e Transformation happens from the inside out, so we're committed to finding new ways to help our clients connect broken workflows, deliver transparency, and create more efficient feedback loops

I Blecic Et Al.(2014) [5]	Web-based support system, question and possible answer priority based evaluation model, google spreadsheet app service (back office), and google web toolkit. Priority of reported issues is based on the the ELECTRE TRI rating method.	a) Allow citizens to report neighbourhood issues via Web, and to integrate it into the workflow of the city maintenance services operations. b) Low deployment and hosting costs and practically no systems administration costs, a highly replicable and transferrable solution, and a rapid development process relying on robust Google services.	Health and security, waste and material hazardious,natural flows (e.g.water streams),questions and priority based system on all complaint management.	Limitations: Choosing this Google-centric approach, using standard low-cost Google cloud services and development tools. Certainly, there are limitations on the scalability. There are for example limits on the GS record numbers and the GAS does not at the time of this writing contemplate connections to internal corporate databases.

IV. METHODOLOGY

The online complaint system would basically contain two modules, The first module for the users (the user of the system that would be the citizens of Aurangabad city) and the second module would be for Administrators of the system, the people who are in charge for running the system, validating the issue generated by the user and forwarding it to the appropriate department, the administrator module would also include the respective head of each specified departments and the in charge officer who will be responsible for physically solving the issue and updating the status of the issue.

In the initialization of the application the user would be allowed to take the picture of the issue and since most of the Smartphone now have the option of geo-tagging the image we can access the current location of the user, if geo-tagging isn't available we can still find the location by using the latitude and longitude value of the position and geo-code the address from it in more easily readable form for the user, after the location of the user is detected the next step is to choose the type of issue he has from the list of various issue or he can type in his issue if the problem isn't categorized in any of the given problems. Then after filling all the additional information required the user can submit the request to the system, after that he can view the current status of the problem using the problem id generated or by using the complaint in your area tab [13].

The registered complaint will then be evaluated by the administrator of the system to whether or not the complaint is genuine one , If the complaint is good the administrator will then forward the complaint to respective department and who in turn will forward the complaint to the respective officer in charge for solving the problem in that area . The officer after solving the problem will then update the status of the problem depending upon whether or not the problem is solved.

For developing the mobile application we are using the Apache Cordova framework, Apache Cordova is a set of device APIs that allow a mobile app developer to access native device function of the mobile device from JavaScript. Combined with a UI framework such as jQuery Mobile or Dojo Mobile or Sencha Touch, this allows a Smartphone app to be developed with just HTML, CSS, and JavaScript. Thus allowing us to target multiple platforms at the same time, to support the application we are using web services on the server side which deal with all the database connectivity, for the web services we are using the dot net framework along with SQL server for the database. We are using asp.net to make the website for the server side and SQL server as the database for the data transfer between application and server we are using AJAX (asynchronous JavaScript and XML) and JSON ((JavaScript Object Notation).For accessing the location and displaying to the user we are using GPS and Google maps respectively[17].

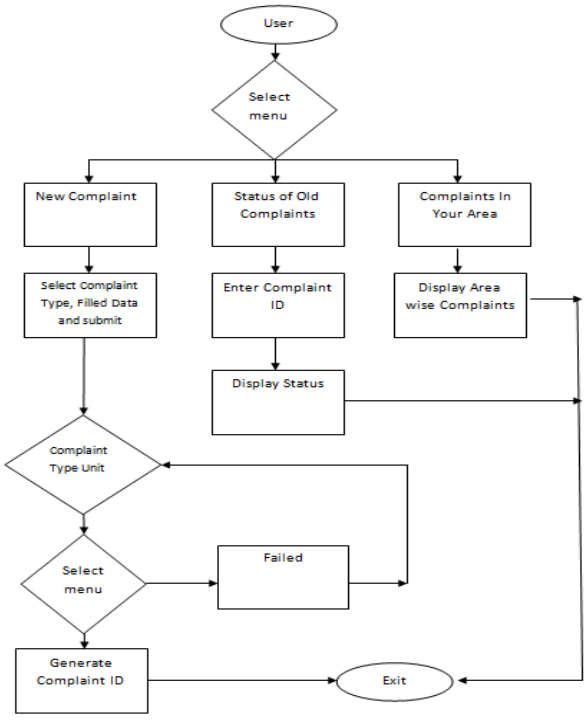

Fig3.Complaint Registration

V. ROLE OF GIS IN COMPLAINT SYSTEM

A Geographic Information System or GIS is a computer based system which allows to map, model, query, and analyze large quantity of data within a single database according to their location [7].

The availability of geographical information over the internet allows for increased transparency in the delivery of local government services. Citizen, government and local community leaders can monitor the public services available within their jurisdiction. The basic web GIS maps include the street layout, sites of tourist interest and real estate information, more advance web GIS maps may include political boundaries within the local government(e.g., wards ,council districts),thematic depictions of demographic and socioeconomic information [6].

Integration of complaint system with GIS enables the transparency in services delivery and the reallocation of resources according to jurisdictional needs.GIS allows the geographical tracking of citizen request for specific government services (e.g., pothole repairs, trash removal).for example a clustering of pothole repair requests from the same neighborhood could be indicative of generally poor road conditions in the area- which may require broader interventions from the city's infrastructure department to repair the roads [6].

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CONCLUSIONS

The implementation of a complaint system in a city has a potential to make a city operations more responsive and efficient, that will assist citizens with better utilization of services provided by Municipal Corporation within a particular area but such gains are entirely dependent on citizen participation.
The direct communication between the municipal corporation and the citizen to help in registered problems that citizen facing in urban areas and by continuously track them will result in a clean, peaceful and good environment.

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