Civic Complaint Application under Smart City Project

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Abstract- **Reporting street or any civic problems has no longer been an easy process for the citizens. They have to undergo a long procedure and formalities to report such problems like street damages, street cleaning, potholes, garbage bin overflowing, light post damages etc. or in short everything that comes under the surveillance of municipality .There is still no guarantee that the reported grievances would be addressed by the concerned authority. That is why most of the time complaints go unheard, unanswered and unresolved usually because the company is too large to worry about one little complaint from a single person.**

To facilitate this complaining procedure, we are going to implement an online web application that lets citizens report problems with infrastructure in their city to relevant authority. So whenever people come across any defects in city`s infrastructure, transportation, environment cleanliness or any daily life disturbances, they can share, discuss and get resolved the problems by concerned authority by means of this online web portal. The complaint is registered via a mobile application. The Global Positioning System (GPS) sensor presents in smart mobile devices will determine the exact location of problematic zone and camera can be used to take the snap of problematic zone as a visual proof. The system then generates a form consisting of all data entered by user along with the location and visual proof and send that to the central server notifying the concerned authority.

Index Terms- **Android, APIs, Camera, City`s infrastructure monitoring, Civic complaints, GPS, Smart city project**

I. INTRODUCTION

Since complaints are a valuable source of feedback to improve the infrastructure and condition of our city. The citizens may have complaints with respect to their environment and city`s infrastructure but they might not like the traditional complaining system in which they have to undergo a long procedure like going to the office and standing there for hours in queue, wasting so much of their valuable time and efforts.

So, to gap the bridge, we came up with an online application introducing a new platform for sharing problems between civil service authorities and the public just in two clicks which can be easily used by the citizens in an optimal manner keeping them unaware of the background processes and details. Since it is a smart phone era where everyone possess smart phone. Among several existing platforms for mobile phones, Android is one of the largest platforms in the world that runs on several smart phones and tablets. Thus developing an android application to full fill this purpose will maintain a satisfactory relationship between citizens and governance and accelerate the process of civil development where all contribute to improve the condition and infrastructure of the city.

Fig. 1 Overview of system process

II. EXISTING SYSTEM

There are various types of researches have been made to develop such efficient systems in different application domains. All were using different technology and architectural paradigm that gives rise to some demerits. Some of them are as follow:

Kim Nee Goh, Yin Ping Ng, Kamaruzaman Jusoff, Yoke Yie Chen and Yoon Yeh Tan have developed an architecture for GPS based road management system [2]. The proposed system obtains GPS coordinates on a cellphone supporting Assisted GPS. The complaint along with the GPS information is send via an SMS to an SMS server over the GSM network. The data in the SMS is retrieved and stored in a database. This information is then plotted on Google Maps.

Umar Farooq, Tanveer ul Haq, Muhammad Amar, Muhammad Usman Asad and Asim Iqbal have proposed a system based on GPS and GSM to improve public transportation management services in Punjab province of Pakistan [3]. Each bus is equipped with an In-BUS Module that sends information about its location and number of passengers to a base station using SMS. The base station uses the information received from all buses to respond to user requests for the location of a particular bus. The BUS Stop module on every bus stop receives information from the base station about the buses arriving at that stop, and displays this information on a dot matrix display.

In Canada, a same type of site has been in working for Canadian citizens and it is accessible at http://www.fixmystreet.ca/. The site named as FixMyStreet Canada which is maintained by the non-profit organization visibleGoverenment.ca. The web site is inspired by the "mySocity" website and it has several advantages. One of the remarkable feature of this site is it ensures to keep in touch with city councilor to obtain ward maps for the reporting area. It supplies all the reports to city councilor by email or by using "311" hotline number. Another feature of FixMyStreet Canada is the maps can get in other formats as per request from the users. Another unique feature of this site is the visual complaint status. With every complaint there comes a status bar where red block indicates send request, yellow block represents answered and the green block represent problem solved.

In Germany, the name of this type of available software is "Mark-a-Spot" accessible at http://mas-city.com/. "Mark-a-Spot" has used some new technologies at their GUI and technical side. This application has following advantages: It gives the freedom to its users to choose between Google maps and Open Street Maps. The software is royalty free and it does create transparency and document active management action. AdHoc's image use is another good addition of this application. One of the key features of this application is voting on proposals. Mark-a-Spot is developing now increasingly becoming a platform for online dialogue with a focus on geo-referencing. Mark-a-Spot also integrates the system with Facebook and tweeter. The tweeter addition makes the system a new user experience. People can tweet their problem and tweet fixed issues directly to a twitter-account.

III. SYSTEM ARCHITECTURE

The architecture of the system is based on three tier client server architecture to map user-server-officials-(worker) model. The system is consisting of three phases and each phase uses different technology to serve particular predefined intended task and synchronize the working of each layer to form a compact system.

A. System Architecture

The system follows Model-View-Controller (MVC) architectural design pattern which organizes the interactive application into three separate modules: one for the

application model with its data representation and business logic, the second for views that provide data presentation and user input, and the third for a controller to dispatch requests and control flow. In order to maintain the dynamism of contents under MVC following are used.

Model: Enterprise Beans (JavaBean: a class) that encapsulates objects and can be displayed graphically. It provides access to the state of the system and system's functionality. It can notify the view(s) that its state has changed.

View: The JSPs, generated in the presentation layer (the browser). It displays the state of the model to the user. At some point, the model (a.k.a. the observable) must registers the views (a.k.a. observers) so the model can notify the observers that its state has changed.

Controller: Servlets create beans, decide which JSP to return, do the bulk of the processing. The responsibilities of controller are: Accept user input, Button clicks, key presses, mouse movements, slider bar changes, send messages to the model, which may in turn notify its observers, Send appropriate messages to the view.
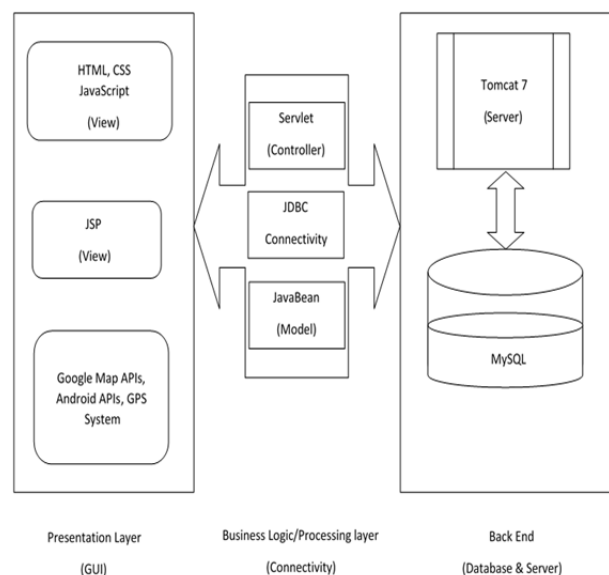

Fig. 2 Component Architecture of the Application

Benefits of MVC:
Clarity of design:
    Easier to implement and maintain.
Modularity:
    Changes to one don't affect the others, can be developed in parallel once you have the interfaces.
Multiple views:
    Games, Spreadsheets, PowerPoint, Eclipse, UML reverse engineering.

Features of the system:

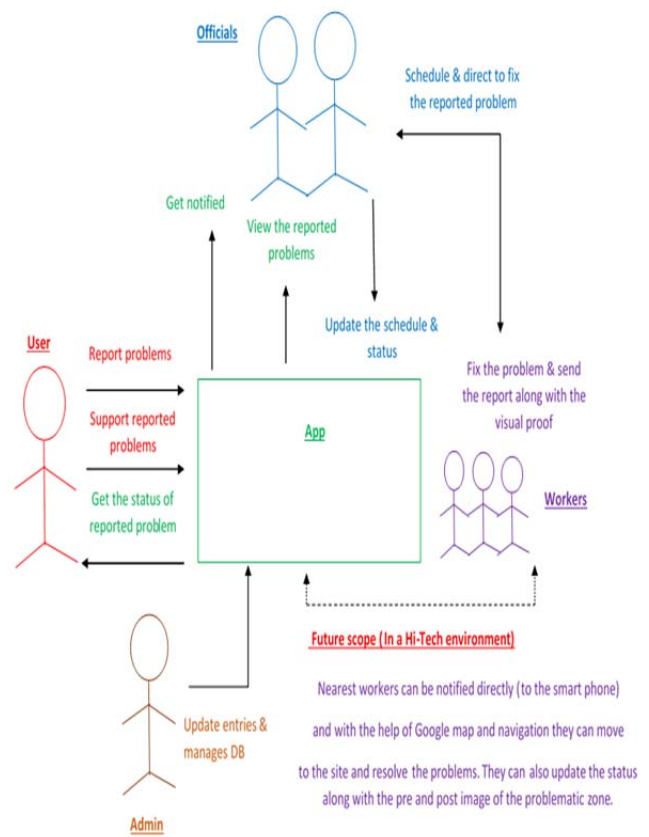| Features	Description
Visual proof:	Capturing and uploading the snap or video of the problematic zone as a visual proof.
Locating problematic zones	By GPS and Google Map
	Zip code: For GPS disabled devices, map of that particular area will be displayed and user can easily locate the problematic zone. This enhances the flexibility of the system among the users.
Date and time integration	The integrated clock and calendar will calculate the date and time automatically for every user activity.
Possible suggestions for the reported problems by users	Under this section users can give possible suggestions to fix reported problems as per their perspective.
Support to prioritize the reported problems by giving likes and dislikes and/or commenting	This could be helpful to prioritize the problems and to ensure the relevancy.
Status of the reported complaints	The user can track down the status of the reported problem such as "The problem is addressed", "Scheduled to resolve" etc.
Reminder(alert message) for the pending action on the reported complaints	If the reported complaint has not been addressed by the officials within a specific span of time, then database itself generates the same problem and notifies the authority by placing that problem to the updated list. In this way the complaint can`t be ignored or skipped without taking proper action.
Notifications	The server side algorithms automatically generate a predefined form consisting of all information entered by user and then send that report to concerned authority and notify them. Every action and update is notified to respective users.
Processing	Once the user lodges a complaint, the entire processing is done automatically and these processing and background details are hidden from users.

B. Workflow of the system

Fig. 3 System workflow diagram

i. User:

The user will primarily use the GUI for registering a new complaint by providing the necessary data. If user is not a registered user then he will have to register first and then sign in to the app and look for all registered complaints and their results. The user can also keep track of the registered complaints and its status.

ii. Officials:

These are the actual people working for the app. When a complaint is registered, it will be notified to the officials of respective department. Accordingly they will inspect and analyse the report and will take further action like addressing the problem, scheduling to fix it and directing the nearest worker etc.
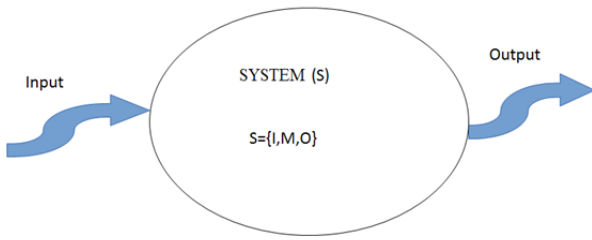
iii. App:

The application system has two major components, the first one is the server application and the second one is the mobile application. . The server application will run on the web server. The client application will run as a web application or an android application on a standalone PC or on an android based mobile phone respectively.

iv. Admin:

The task of the admin is to deal with the server side application and handle database related operations and managements, update entries, maintain users' accounts, etc.

C. Mathematical Model

Let 'S' be a system that defines "Social Complaint App".

It is a set consisting of following subsets.

S= {I, M, O}, where

'I' is a set of all possible inputs to the system.

Inputs (I) = {X1, X2 / X1= Location & X2= Compliant Data}

'M' is a set of different modules and processing unit of the system.

Modules & Processing units (M) = {M1, M2 …….M9}, where

M1= GUI Handler (GH)
M2=Validation Manager (VM)
M3= Location Manager (LM)
M4= Camera Manager (CAM)
M5= Configuration Manager (CM)
M6= Google Map Handler (GMH)
M7=System Date & Time Handler (SDTH)
M8=Connection & Communication Manager (CCM)
M9= Database Manager (DM)

'O' is a set of outputs from the system.

Outputs (O) = {Y1, Y2, Y3, Y4, Y5}, where

Y1= Notification
Y2= Allocation of Complaints to relevant authorities
Y3= Location and map of problematic zone
Y4=Proper action taken (Acknowledgement)
Y5= Status

i.   User Login Process:

Let 'S1' be a set of User's parameters for login.

S1= {Uid, Pwd}, where

Uid – User id of the user

Pwd – password of the user

Parameter/Condition	Function/Operation
Uid, Pwd	F1,F2
If(user==valid_user)	F1:Proceed()
Else	F2:Discard()

ii.   Find Current Location:

Let S1 be a set of current location request parameters.

S1= {Lat, Long}, where

Lat: Current Latitude

Long: Current Longitude

Parameter/Condition	Function/Operation
Lat, Long	F3,F4
If (current Lat, Long is not valid) Discard Lat,Long	Discard Lat, Long F3:discardLatLong()
else Record Lat,Long	F4:Proceed()

iii.   Let 'S3' be a set of parameters required to file complaint.

S3={Rid, Dest_addr, Compdata, Lat, Long}, where

Rid: Request ID

Dest_addr: Server destination address

Compdata: Complaint data

Lat: Current latitude

Long: Current Longitude

Parameter/Condition	Function/Operation
Rid,Dest_addr,Compdata,Lat, Long	F5, F6, F7
If (Complait_data && Location_co-ordinates == valid)	F5:generate_report() F6:send_to_officials()
Else Discard request	F7:discard_operation()

IV. CONCLUSION

Hence we conclude this paper by providing an immensely useful platform, encompasses new tools and technology, for the betterment of society with an ease of access towards problem reporting and quicker result than anticipation. With the onset of new technologies and innovations, human patience has shortened. Quick on-point result is expected with zero presence of human error. This App does quite the same thing providing several advantages over conventional manual complaint registration process with a greater efficiency, transparency and convenience.

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