Cityzen: An Application to Address Civic Issues

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Abstract: Today, we are facing many civic issues, especially in populated cities. This is leading to increasing number of complaint registries. A transparent and approachable mechanism is required where the people of a locality are able to register complaints, check if they have been rectified and also support existing complaints. This application provides a way for people who are facing problems due to civic issues like garbage dump, sewage leak, potholes etc. to register a complaint using images which are automatically geo-tagged. The pertaining government agency can inform the public (through an image or message) of the rectified issue.

Keywords: Android; Geotagging; Cloud Computing; Mobile Backend; Civic Issue.

1. INTRODUCTION

The important issue all metropolitan cities are facing today is civic issues. The people living in these cities are too busy in their lives that even though they need to bear with it every day nobody will take initiative and complain about it to respective civic agency. As android phones have made our lives easier we can use its features and develop applications that help build our city and support ‘Clean India’. As geo-tagging (especially geo-tagged photos) is gaining popularity we can implement a medium through which responsible citizens can click an image of the civic issue and report it to the corresponding civic agency. This medium can act as communication channel between citizens and government which portrays a sense of democracy where people actively take part in making the country better. This can be made possible through geo-tagging of images of civic issues and send to the civic agency.

As there is growing popularity of android phones than any other phone, development of application using android OS is a better option. Some of the advantages of developing in android are (1) Open source framework. (2) Uses of tools are very simple. (3) Better availability of apps. (4) Great social networking integration.

Geotagging is the process of adding geographical identification metadata to various media such as a geotagged photograph or video, websites, SMS messages, QR Codes or RSS feeds and is a form of geospatial metadata. This data usually consists of latitude i.e., the angular distance of a place north or south of the earth's equator and longitude i.e., the angular distance of a place east or west of the Greenwich meridian. They can also include altitude i.e., the height of an object or point in relation to sea level or ground level, bearing, distance, accuracy data, and place names. There are two main options for geotagging photos; capturing GPS information at the time the photo is taken or "attaching" the photograph to a map after the picture is taken. The Global Positioning System (GPS) is a space-based navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil, and commercial users around the world.

Geocoding is the process of transforming a description of a location (such as an address, name of a place, or coordinates) to a location on the earth's surface. Geocoding typically refers to the transformation process of addresses and places to coordinates, and is sometimes called forward geocoding. Reverse geocoding [1] is the process of back (reverse) coding of a point location (latitude, longitude) to a readable address or place name. This permits the identification of nearby street addresses, places, and/or areal subdivisions such as neighborhood, county, state, or country.
Currently, the GPS information of social images has been widely used in many applications such as content browsing, image annotation, image search, and localization. Geo-tagging can help users browse and watch the images with their location-specific information in an intuitive way. It is possible to find images taken near a given location by entering latitude and longitude or with values from mapping services or GPS, into a suitable image search engine. It can also be used for mobile tagging as proposed by Dion Hoe-Lian Goh et al., [2] wherein location sensitive information can help people with disabilities to access information about resources in buildings. It can also assist navigation by geo-annotation one of which is proposed by Ashweeni Becharee et al., [3]. In addition, geo-tagging enabled information services can also potentially be used to find location-based news, websites, or other learning resources. These can also provide learners and instructors with further reference information. Geo-tagging can tell users the location of the content of a given picture or other media or the point of view, and conversely on some media platforms show media relevant to a given location. Therefore, it is important to model an image with both geo-tagged, visual features [4] and tags [5] to facilitate location-based image browsing. [6], [7], [8], [9], [10].

Any application that includes geotagged images requires storage of images their location and time of capture. The storage requirement increases as the users increase. This suggests that there is a need for cloud storage that helps in storing and retrieval of information at a convenient time constraint. Cloud computing, also on-demand computing, is a kind of Internet-based computing that provides shared processing resources and data to computers and other devices on demand. It is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services), which can be rapidly provisioned and released with minimal management effort. Mobile Cloud Computing (MCC) [11], [12], [13], [14], [15] is the combination of cloud computing, mobile computing and wireless networks to bring rich computational resources to mobile users, network operators, as well as cloud computing providers.

Thus we can infer that geo tagging and cloud computing are popular and are the important aspects for any and all the application these days. With the issue being discussed and technologies at hand the aim is to develop an application that addresses the civic issues.

II. RELATED WORKS

People either can go to the BBMP, BWSSB or BESCOM offices in Bangalore, India to register complaints with these civic agencies through written complaints or visit their official websites or their application, to register complaints with them. However, the status of the complaint is never disclosed with the public. In the application, people cannot support an existing complaint and call centre services are required by the application and hence high maintenance.

‘Swachh Bharat’ is an unofficial app which contributes to the movement by collecting information from tweets, by users on Twitter, and maps geographically the location of places where the users have reported existing civic issues. It provides information about the Swachh Bharath Abhiyan by constantly posting videos and posts regarding the movement which helps people feel connected to the movement. It plots the location of the most affected issues faced by the people on the map using tweet data. This app has its own shortcomings. Some of them being – We cannot complaint unless and until we have a twitter account. And tweeting about a complaint requires the user to use a predefined tag that he has to use if the complaint has to be registered. But the biggest disadvantage of this application is that this application if for the entire country, so many issues go unnoticed and integrating civic agencies to work seamlessly across all states and cities takes an inhumane effort.

‘I Change My City’ is another application on the android play store that contributes to the Swachh Bharath Abhiyan Movement in its own small way. Here the user should take a picture of the civic issue anywhere anytime. User can post Complaint using the app and get it sent to the correct Civic Agency (BBMP, BWSSB, BESCOM, etc) within minutes.

‘BBMP Sahaaya’ is an official application by the Government of India. This app can be used to report grievance across 20+ departments like Road Infrastructure, Waste Management, Building Plans, Tax and Revenue departments, Health, Pest & Animal Control, Tree & Forest department, Public Safety, Welfare, Environment etc and issues like Encroachment, Corruption and Illegal Activities and so on.

‘Map My Waste’ is an initiative by the citizens of Bangalore city to map garbage dumps across the city so that the BBMP is aware of all the unofficial garbage dumps cropping up in multiple places across the city. However, timestamp is not attached to the geo-tagged images. There is no portal that shows whether or not BBMP has attended to the garbage disposal problems or not.

III. PROBLEM STATEMENT

The public capture images of civic problems concerned to civic agencies such as BBMP, BWSSB, BESC through mobile devices. Main objective of this paper is to design and develop an android application to upload the image to the concerned civic agency with its location which is geo-tagged, maintain acknowledgements and status of complaints and prioritize complaints. It also facilitates clustering of similar complaints.
based on similar location and type and supports existing complaints through vote up.

IV. DESIGN

The application enables a transparent medium through which the users can register complaint, view existing complaints and confirm the rectification of the issue. Initially user signs up to use the application which includes the username and password. No other information is required as privacy of the citizen is important and their identity is at discretion. Next time the user can login with username and password provided during sign up.

The user is then given with set of options to book a complaint and view them. When user intends to book a complaint the application opens any of the camera application in the phone and when image of the civic is successfully captured the user is prompted to enter the details such as type of the complaint, location landmark and comment and the image is automatically tagged with the location available through GPS. The coordinates that include latitude and longitude is converted to street address using reverse geo-coding and street address along with image is displayed. If the same complaint exists i.e., image captured at same location and registered as same type, then the vote for that complaint is incremented by one instead of booking as a new complaint.

If the user wants to track the complaint, he/she can view all the details of the complaint by specifying complaint id. The details displayed are complainant name, time of the complaint, image of the civic issues, votes for the complaint, type of the complaint, and location landmark of the complaint. The user is also provided with the filters which help him/her to view complaints based on priority that specify either latest or popular. Latest specify the complaints recently booked and popular specify the complaints with more number of votes. When user selects one of the complaints in the list, the details of that complaint is displayed that includes complainant name, time of the complaint, image of the civic issues, votes for the complaint, type of the complaint, and location landmark of the complaint.

When the user is provided with the status of complaint as cleared then user is required to recheck the cleared issue. If he/she is satisfied then confirmation of the status should be given. This enables user to decide whether the issue is actually cleared. This clearly gives a picture of coordination between officials and citizens in repairing the city.

This application helps civic agencies (admin) by placing all the complaints in a single platform. The complaints booked by All the information with respect to user and complaint is stored in the cloud. The data pertaining to user is name and password. The data pertaining to complaint is the image, the location at which the image is captured, the street address, time of image captured, type of the complaint, location landmark of the complaint, comments, votes, status and confirmation. The normal operation for user and admin is summarized in Table. 1.

### Table 1. Citizen- Operations of User and Admin

<table>
<thead>
<tr>
<th>Step</th>
<th>User Transaction</th>
<th>Admin Transaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Signs up other admins by providing user name and password.</td>
<td>Admin Logs in.</td>
</tr>
<tr>
<td>2.</td>
<td>Steps involved in user transaction:</td>
<td>Steps involved in admin transaction:</td>
</tr>
<tr>
<td></td>
<td>Step 1: User logs in or signs up.</td>
<td>Step 1: Admin Logs in.</td>
</tr>
<tr>
<td></td>
<td>Step 2: Views existing complaints filtered as latest and popular.</td>
<td>Step 2: If admin selects option of viewing complaints. Go to step 3.</td>
</tr>
<tr>
<td></td>
<td>Step 3: Set of options are displayed. If user selects the option to view a complaint. Go to step 4. If user selects option to search for a complaint. Go to step 7.</td>
<td>Step 3: If admin selects option of viewing complaints. Go to step 3.</td>
</tr>
<tr>
<td></td>
<td>Step 4: Camera opens.</td>
<td>Step 3: If admin selects option of viewing complaints. Go to step 3. If admin selects option to sign up other admins. Go to step 4.</td>
</tr>
<tr>
<td></td>
<td>Step 5: User captures image and determines its location.</td>
<td>Step 3: View and updates status.</td>
</tr>
<tr>
<td></td>
<td>Step 6: Other details are entered by user and complaint is submitted.</td>
<td>Step 4: Signs up other admins by providing username and password.</td>
</tr>
<tr>
<td></td>
<td>Step 7: User enters complaint ID.</td>
<td></td>
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<tr>
<td></td>
<td>Step 8: Details of that complaint are displayed.</td>
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</table>

V. IMPLEMENTATION

A conclusion An IDE for developing the android application, a cloud for storage, a mobile backend as a service for linking the application with the cloud is required. Android Studio is the official integrated development environment (IDE) for Android platform development. The cloud used in the application is Heroku. Heroku is a cloud Platform-as-a-Service (PaaS) supporting several programming languages. Heroku, one of the first cloud platforms, has been in development since June 2007, when it supported only the Ruby programming language, but has since added support for Java, Node.js, Scala, Clojure, Python, PHP, and Go. The add-on used is MongoDB. It is a free and open-source cross-platform document-oriented database. Classified as a NoSQL database, MongoDB avoids the traditional table-based relational database structure in favor of JSON-like documents with dynamic schemas (MongoDB calls the format BSON), making the integration of data in certain types of applications easier and faster. The add-on in Heroku, MongoDB has mLab which is a fully managed cloud database service that hosts MongoDB databases.
The mobile backend used is Parse Server. Parse is a Mobile Backend as a Service provider. It is a model for providing web and mobile app developers with a way to link their applications to backend cloud storage and APIs exposed by back end applications. Parse Server is a new project, separate from the hosted Parse API service. It is to provide and support the growth of an open-source API server, and allow new developers to benefit from the powerful Parse client SDKs regardless of where their application logic and data is stored. Parse Server can be deployed to any infrastructure that can run Node.js. Node.js is an open-source, cross-platform runtime environment for developing server-side applications.

![Flow of Data from Application to Cloud](image)

The image, geo tagged location and all other details captured through the application are stored in MongoDB that is supported by Heroku cloud. We make use of Parse Server APIs in Android to interact with the cloud. As MongoDB is a NoSQL database, Parse Server methods are used rather than SQL queries. Parse Server APIs are used in our application for login and sign up. A new session pointing to the logged in user is created when the user logs in successfully. This session gets deleted when logged out. Parse Server APIs are also used to retrieve the details of a complaint. While registering a complaint the image is stored as a File and latitude and longitude is merged and stored as a GeoPoint. The latitude and longitude is used to obtain the street address using reverse geocoding which is also stored in the database. The Parse Dashboard is used to view, manage and add or delete classes to the database. It is also used to track user sessions and provides security to the data from other users. Parse dashboard can be accessed locally using Node.js by running the following command in the terminal which expresses all the details to connect with the cloud. This includes a unique app id, a secret master key and URL to the Heroku cloud. If the connection is successful then the 4040 port on the local system is availed for the Parse Dashboard.

![Terminal Showing Command to Access Parse Dashboard](image)

The proposed paper addresses many of the disadvantages faced by other applications and also the other existing system. It also incorporates many key features that are required to make it easier for both the civic agencies and the people using the application to interact with each other and solve existing civic issues. Some of these features are listed below:

- The complaints are prioritized based on the severity of an issue. It depends on the number of people who registered the same complaint and a higher complaint count gets a higher priority. The Civic Agencies can view the complaints from most important to least important and go on solving issues based on priorities.
- The user does not need to link this app to any social media and just a simple standard account creation and login is sufficient enough for him to access all the features that the app provides.
- Proper Acknowledgements and status of a complaint is available to the user at all times.
- This application also makes the UI very easy to use and also incorporates much key functionality demanded by the public domain to make the idea implemented by an app more efficient and effective.

The advantages of the proposed system are that it is limited to only Bangalore city so system is more effective. The complaints are prioritized based on many factors. It doesn’t use any other social networking accounts to register the complaint. It has an easy to use interface and acknowledgements and status of the complaint is always available.

**VI. RESULTS**

This application is in best interest of government and citizens helping them communicate problems and possible solutions. It facilitates a medium for citizens and civic agencies to accomplish their responsibilities. This application is intended to Bangalore city. It can be extended to other cities as well.

When the user opens application in his/her camera enabled android phone splash screen is displayed. The splash screen lasts for 3 seconds then it fades to display the login and sign up activity. The application redirects to login/signup screen. The only details user should provide is username that is unique for each user and a password. This is to authenticate the user.
During signup a new object of ParseUser class with username and encrypted password is created and during login the database is queried for the entered username. The password entered is encrypted and compared with the encrypted password in database. If they match then the login is successful.

![Figure 3. Screen Displaying Options and List of Filtered Complaints](image1)

After the user logs in the options are displayed as shown in Fig. 3 through which he can book a complaint, search for a particular complaint or filter the complaints and view the latest and popular complaints. When the user selects “Book a Complaint” option screen the application allows user to capture the image from one of the camera application. This helps the civic agency to view the severity of complaint caused and also indicates the proof of complaint being relevant.

If the user selects search from the options then he/she is redirected to the screen as shown in Fig. 5 where it is expected to enter the complaint id. Then all the details about that complaint id are displayed. This includes complainant name, image, time, votes, type of complaint and street address.

When the user has successfully captured the image he/she is redirected to screen as shown in Fig 4. The image captured and street address (obtained through GPS of the phone) is displayed. User should enter the details such as type of complaint i.e., to specify which agency this complaint is intended to, location landmark of the complaint and comment to provide any extra information about the complaint. When the user clicks on ‘SUBMIT COMPLAINT’ complaint gets lodged. If there is same type of complaint booked at the same location then the vote for existing complaint is incremented by one rather than storing it as a new complaint.

Two filters are implemented ‘Latest’ and ‘Popular’. ‘Latest’ is the one in which most recent complaints are displayed and ‘Popular’ is the one in which complaints with more number of votes are displayed as shown in Fig 3. When one of the complaints is selected the details of the complaint are displayed that include complainant name, image, time, votes, type of complaint and street address. It also includes options for vote up and log out.

![Figure 4. Registration of Complaint](image2)

![Figure 5. Searching for a Complaint](image3)

**VII. CONCLUSION**

The mission towards ‘Clean India’ is leading everyone to take initiatives, introduce methods or application that helps the same. There are initiatives to clean up the city but there is a gap between the people who go through problems like potholes, garbage, broken lights, sewage everyday and who have authority and responsibility to solve them. The layman finds difficult to take a step forward and complain to civic agency due to improper means of communication and time constraint.
As cleaning the city is not only the duty of civic agency but it is also the duty of citizens, a through medium through which citizens can report complaints is the need of the hour.

The paper is aimed at creating an application through which citizens can report the issues they are facing to corresponding agencies. The technologies like geo-tagging, reverse geocoding and cloud computing were explored to enable an application that is simple and powerful enough. This helps civic agency to know the location of the issue and rectify which otherwise would be difficult to identify the problems in. With the best support of government this application can be launched and everyone can be benefited from this.

As for future works we can add maps to guide civic agencies to the exact location of the issue. RTI could be linked to the application so that users can complaint if their issue has not been rectified for a long time. If the user fails to confirm the rectification the complaint would get expired after a particular duration. Right now the target audience of the application is the people of Bangalore City. The app requires the cooperation of the civic agencies so the complaints are addressed regularly or perhaps bring to notice of the people the cause of the issue and why it cannot be rectified in the near time. This application would not only help the people to easily register complaints and support existing complaints but also help bring awareness to the civic agencies and prepare a plan for rectifying them. If the application becomes a success and it overhauls existing similar applications, then we can implement the same model across the major cities of India, subsequently in the future to all the cities of the nation. This application could contribute to the Swachh Bharat Abhiyan one city at a time.

REFERENCES


