

A Crowdsourcing-Based Platform for Better Governance

Vishal Chandrasekaran, Shivnesh V. Rajan,
Romil Kumar Vasani, Anirudh Menon,
P. Bagavathi Sivakumar and C. Shunmuga Velayutham

Abstract The world's population has been increasing as every year passes by, and Governments across the world face a stupendous challenge of governing each country. These challenges include providing proper sanitation facilities, efficient disaster management techniques, effective resource allocation and management, etc. Crowdsourcing methodologies, which empower the common man to provide valuable information for better decision making, have gained prominence recently to tackle several challenges faced by several governments. In this paper, we introduce a crowdsourcing-based platform that makes use of information provided by the common man for better governance. We illustrate how this platform can be used in several instances to attend to the problems faced by people.

Keywords Crowdsourcing · Smart environments and applications · Mobile phone · Location-based services

V. Chandrasekaran (✉) · S.V. Rajan · R.K. Vasani · A. Menon ·
P. Bagavathi Sivakumar · C. Shunmuga Velayutham
Department of Computer Science and Engineering, Amrita School of Engineering,
Amrita Vishwa Vidyapeetham (University), Coimbatore, India
e-mail: c.vishal1993@gmail.com

S.V. Rajan
e-mail: shivneshr@live.com

R.K. Vasani
e-mail: romil.vasani93@gmail.com

A. Menon
e-mail: anirudhmenon763@gmail.com

P. Bagavathi Sivakumar
e-mail: pbsk@cb.amrita.edu

C. Shunmuga Velayutham
e-mail: cs_velayutham@cb.amrita.edu

1 Introduction

Over the years, mobile phone based applications and location-based services have become a medium for users to provide valuable information for decision making, for spreading awareness, etc. OpenStreetMap [1] is one such application, wherein users spread across different geographical locations can contribute toward building an accurate online map of the world, by creating maps of their locality and incorporating it onto the world map. Airbnb [2] is another application that provides a platform for people across the world to rent their apartments to tourists. OpenStreetMap and Airbnb are just two examples out of several location-based services available in the market. The purpose of these applications is to empower the common man with a platform that helps him reach out to several other people and spread any valuable information he might possess.

In today's fast paced lifestyle, we see that almost every individual carries a mobile phone with him/her. Thus, there is immense opportunity for several organizations, including the Governments, to make use of information provided by the people to provide better service to them. The information provided by the people can be reporting a crime at a location, reporting an epidemic outbreak, reporting public infrastructure problems in a locality, etc. Ushahidi, a crisis mapping platform, was established in 2007 and deployed in Kenya [3] and Haiti [4] deploys crowdsourcing methodologies to provide an up-to-date, openly available crisis map. In January 2008, Kenya faced a massive outbreak of physical violence during the presidential elections' period. At that time, Ushahidi was set up in Kenya to continuously log the violence cases in several parts of Kenya and report it to the public, so that they could take the necessary precautions to be safe. In January 2010, a 7.0 magnitude earthquake struck Haiti and a vast population of Haiti were affected very badly. Traditional disaster response methodologies failed to succeed due to the massive destruction of property and land, rescue workers found it hard to identify the places where people were stuck and where supplies were necessary. Ushahidi provided a way to share critical information coming directly from the Haitians. Reports about trapped people, medical emergencies, and specific needs, such as food, water, etc., were received and plotted on a map, and published online. Thus, the emergency response teams were able to assist and speed up the rescue process. Ushahidi has been very effective in mapping national crisis and helping the people in need. One other way of getting information from the people is by making use of the social media. Twitter, a prominent social media platform, was used by the government officials of the State of New York when superstorm Sandy and winter blizzard Nemo struck New York in October 2012 and February 2013, respectively [5], to convey storm-related information and gather information from the public who needed help. The above platforms find their use during national emergencies. There are several other scenarios [6, 7] where crowdsourcing plays a crucial role for Governments to reach out to the public, collect information from them, and serve them better. However, with the increasing population across the world, a platform is needed for the people to report public issues to the government authorities on a

daily basis. This would improve the way a government functions right from the lower-level administration to the top-level management. The government would know the issues faced by the public and can take the necessary steps to rectify the problems, thus improving the quality of life in their country.

In several countries across the world, the reported grievances are not yet digitized. Digitization of the grievances reported by the public would ease the process of solving the problems faced by the public. In this paper, we demonstrate such a system that helps people to report their day-to-day grievances, such as uncleared public trash cans, open potholes, faulty street lamps, lack of medical facilities in a locality, etc. The primary contributions of this work are:

- To provide a platform for the public to report day-to-day grievances on-the-go and not rely on phone calls or any other mode of reporting issues.
- To make sure that the right people in the administration department is notified of the issues and an efficient tracking of the reported grievances is also made possible.
- To digitize the grievances reported and improve the service offered by the government officials.

The next section mentions details about the system architecture and the modules in the system and how the proposed system serves as a platform for the public to report grievances.

2 The Grievance Reporting System

In this section, we describe the set of mandatory inputs required by the system to report a grievance and later describe how the system works with the input provided.

2.1 A Broad Classification of the Grievances to Be Reported

To ensure a formal classification of grievances reported, users have to classify their grievances into one of the following categories:

- Infrastructure Grievance

A grievance is deemed as an infrastructure grievance if it is related to the damage of public buildings, government establishments, etc.

- Medical Grievance

A grievance is deemed as a medical grievance if it involves providing information related to a spread of a disease in an area, lack of medical facilities in an area (no hospitals, lack of medicines, and lack of qualified medical personnel in the area), etc.

- **Public Grievance**

A grievance is deemed as a public grievance if it affects a majority of the people in the locality. For example, lack of traffic sign boards and traffic lights in a densely populated and busy area, uncleared trash cans in a locality, etc.

The above classification also serves as a method for identifying the type of problem that majorly prevails in an area. It must be noted that, the above classification can be made flexible depending on the application and that more classifiers can be included in the future. However, we demonstrate our public grievance addressal platform based on this classification.

2.2 Reporting a Grievance

To report a grievance on-the-go, the users can use a mobile application. Sending a report requires that the users provide the following mandatory information:

- **Type of grievance**

As previously explained, the users should classify the grievance according to the provided options.

- **Location of the grievance**

The location of a grievance can be manually provided by the user or it can be taken automatically using a global positioning system, available in majority of the mobile handsets available in the market today. In [8, 9], the various methodologies for obtaining the location from a mobile phone have been discussed. It has been proved that the accurate location information is obtained using the global positioning system and thus, the proposed crowdsourcing platform deploys the same for obtaining the location information.

- **Description**

Represents the observation made by the user, for example, uncleared trash cans in a locality.

2.3 The Process of Pruning Invalid Grievance Reports

The platform crowdsources information about various grievances in a given place. It is known that, there is a possibility of receiving erroneous reports of grievances. In such a case, tending to this grievance might prove to be costly for the authorities responding to the report. In order to validate a reported grievance, the following mechanism is used:

1. View the grievances in the user's locality.

The users are provided a visual interface, wherein they can view the grievances reported in their locality.

2. Vote for a grievance.

The user is given the opportunity to vote for a particular grievance. A user is expected to "upvote" a particular grievance, if he finds that the reported grievance is valid, or he can "downvote" a particular grievance, if he finds out that the reported grievance is erroneous.

3. Pruning the erroneous reports.

The difference in the number of upvotes and downvotes for a particular reported grievance is calculated, and a threshold value is used to remove erroneous reports.

The above mechanism stresses the fact that a system built for the people requires some amount of genuine participation from their side, to make sure that the authorities are informed about genuine grievances in a locality. Apart from ensuring that the genuine grievances are sent to the authorities, this pruning mechanism also improves the confidence of several organizations and governments in this platform. This would be crucial for obtaining an increased support from governments, Non-Governmental Organizations, etc., to respond to the grievances reported.

In summary, the following steps will be used to obtain a grievance and report it to the authorities:

- Obtain grievance specifications from the user.
- Initiate a voting mechanism to validate the issue.
- The valid grievances are reported to the authorities.

2.4 The Polling Mechanism

It is known that there can be multiple ways of resolving a particular problem. For example, suppose in a region, an increase in the number of road accidents is reported. The traffic police department can either install more traffic signals in the area or deploy more policemen, etc. The public who reported the grievance might want a particular solution to be put into action. In order to facilitate this, the proposed crowdsourcing platform deploys a polling mechanism for the concerned organizations to poll the users for obtaining the most preferred solution for the reported grievance. The polling mechanism also eases the decision-making process for the concerned organizations because they would exactly know what the public wants. Further, it ensures better decision making as it ensures an increased public participation.

3 Implementation and Results

In this section, we describe the implementation of the above system implementing the features mentioned along with the pruning mechanism. We developed an application programming interface (API) using Node.js. An Android application was then developed to implement the above features of the grievance reporting system. In the testing phase, the application was deployed in a suburb of Coimbatore (India) and data was collected to understand the type of grievances in this region of Coimbatore.

Figure 1a depicts the various grievances reported by the users in the testing region and Fig. 1b depicts the percentage of each type of grievance reported. The green colored markers denote the location of the grievance and when clicked, the user can view the description and the nature of the grievance along with the upvotes and downvotes received for the particular grievance. In general, when this application is deployed over a larger region, then the regions within the state where maximum grievances are reported can be identified. Subsequently, the local authorities of the region can be notified to take the necessary steps to tackle the grievances reported and improve the quality of living in these regions. Figure 1b can be used to effectively analyze the type of issues prevailing in a region.

3.1 Applications of This System

The digitization of the public grievances makes sure that the data reported by the public is made available to the public, which includes Non-Governmental Organizations and the government officials. Thus, it enables ease of access of data which will aid in better functioning of the organizations and industries related to the grievances reported by the public. This will ensure that some credible action is taken to resolve the grievances reported. The following are some of the industries where the proposed crowdsourcing applications can be effectively used. It is to be noted that the proposed system is not restricted to the below mentioned industries, and can be used in several other industries where inputs from public can lead to better decision making.

Healthcare Industry

Recently, Governments and organizations across the world are taking measures to fight deadly diseases like Ebola and Swine Flu. The proposed system can be used as a platform by medical personnel, to report individual cases of people diagnosed with the disease. As the number of reported incidents increases, the corresponding State Health Department and National Health Department can analyze the places of origin of these incidents and the pockets where they prevail the most. Subsequently, measures can be taken to assist the people in these localities and preventive measures could also be taken to make sure that the disease does not spread to other places. Further, these organizations can analyze the healthcare infrastructure across

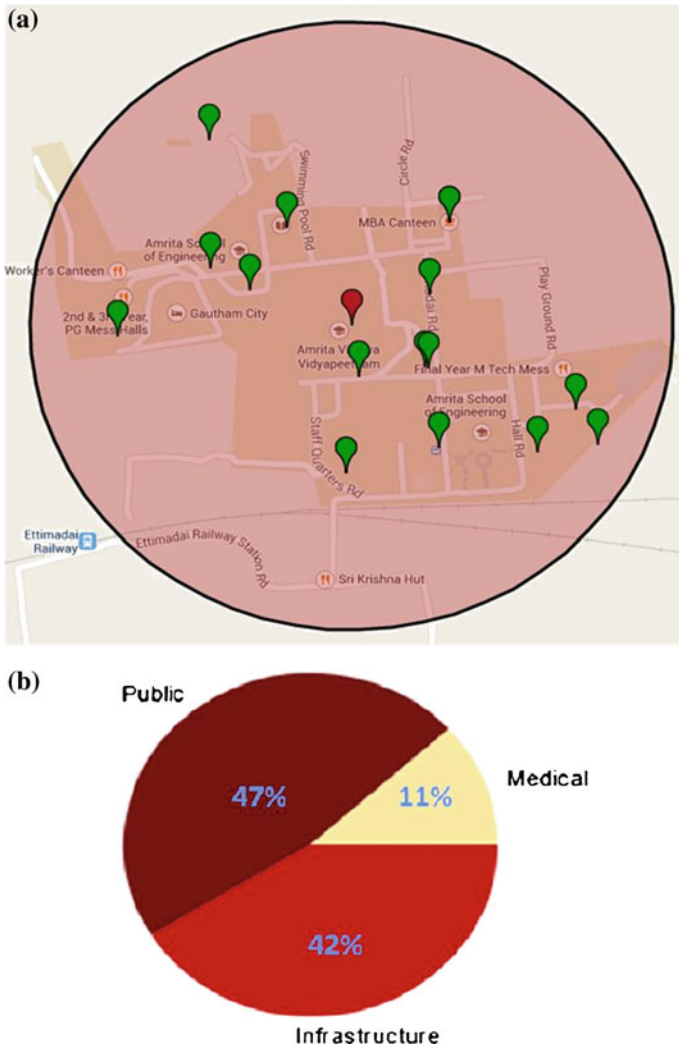


Fig. 1 a Grievances reported in the test region. b Percentage of different types of grievances reported

the country and accordingly allocate funds and set up establishments to improve the healthcare facilities in the regions which lack basic facilities to tackle such epidemic outbreak.

Road Traffic Department and Transportation Departments

Road rage on the national highways has been a matter of concern in recent years. Although, the traffic departments and transportation departments have been continuously working hard to reduce the number of road accidents occurring every

year, an efficient system to analyze the type of accidents happening is not in place yet. The proposed system can be used by the public to report all the accidents that they witness on the road. The concerned authorities can analyze the inputs from the public to take preventive measures in the places where accidents occur the most.

4 Conclusion

In this paper, we introduced a transparent platform for the public to report their grievances. This platform showcases the power of crowdsourcing methodologies and how the public play an important role to improve the quality of living of a country. It is essential for such a platform to exist to ensure that governments and organizations across the world allocate funds by taking into account the needs and grievances of the public.

As future work, we plan to enhance this system and release it as an Open Source platform. Further, it might be interesting to take into account the expertise of each user reporting a grievance. For example, a doctor who reports an epidemic outbreak has more expertise in the field of medicine in comparison to any other person reporting the same grievance. We aim to capture this expertise level of the user for improving the importance of the grievance reported. Finally, we plan to deploy the platform over a larger region and collect data for performing analytics for applications such as identifying the spread of several diseases in a country, type of accidents occurring in the country, etc.

References

1. Haklay M, Weber P (2008) Openstreetmap: user-generated street maps. *IEEE Pervasive Comput* 7(4):12–18
2. Airbnb, Inc. <http://www.airbnb.com>
3. Meier P, Brodock K (2008) Crisis mapping Kenya's election violence. Harvard humanitarian initiative (HHI)
4. Heinzelman J, Waters C (2010) Crowdsourcing crisis information in disaster-affected Haiti. US Institute of Peace
5. Barnes MD, Hanson CL, Novilla LM, Meacham AT, McIntyre E, Erickson BC (2008) Analysis of media agenda setting during and after Hurricane Katrina: implications for emergency preparedness, disaster response, and disaster policy. *Am J Public Health* 98(4):604
6. Kaigo M (2012) Social media usage during disasters and social capital: twitter and the Great East Japan earthquake. *Keio Commun Rev* 34:19–35
7. Degrossi LC, de Albuquerque JP, Fava MC, Mendiondo EM (2014) Flood citizen observatory: a crowdsourcing-based approach for flood risk management in Brazil. In: Proceedings of the 26th international conference on software engineering and knowledge, pp 1–3

8. Alt F, Shirazi AS, Schmidt A, Kramer U, Nawaz Z (2010) Location-based crowdsourcing: extending crowdsourcing to the real world. In: Proceedings of the 6th nordic conference on human-computer inter-action: extending boundaries. ACM, pp 13–22
9. Von Watzdorf S, Michahelles F (2010) Accuracy of positioning data on smartphones. In: Proceedings of the 3rd international workshop on location and the web. ACM