

A NOVEL MOBILE INTERFACE TO REGISTER CITIZEN COMPLAINTS

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ABSTRACT

Municipal Corporation (MC) of a city is a local governing body which takes care of the functioning of the city. Among many other things one of the chief responsibilities of an MC includes addressing the complaints that the residents of the city might have. Maintenance of a large city requires that the MC be aware of any shortcomings either through surveillance (sensors/cameras) or by allowing the citizens to report them. The second option is usually preferred because there is a sense of belonging. A mechanism to accept complaints from citizens 24×7 would be the expectation from both the citizens and the MC. The Mumbai MC allows its citizens to place their complaints through several channels. The chief modes of complaint registration is (a) a visit to the ward office – where a person in charge listens to the complaint and asks for some personal details and puts it across into an electronic form for other departments within the MC to handle the complaint, (b) through a contact center over a telephone - where the complaint is registered by a call center agent by typing the complaint into the system and more recently (c) through a web portal. In this paper, we propose a novel SMS based mobile interface which can be used to lodge complaints. The essential idea is to make use of the existing web portal infrastructure [MCGM, 2008] and provide an easy, cheap and quick (complain as you see) mode of complaint registration around the clock. The proposed system enables and assists the citizen to place complaint through an SMS on their mobile phone in natural language.

KEYWORDS

natural language interface, complaint registration, e-governance, artificial intelligence

1. INTRODUCTION

There has been extensive research in the area of e-services for municipal use [IST World, 2008]. The idea is to understand the usability and utility of services that are provided by a MC using newer and better technologies. There have also been studies [Bobillier, 2007] which address the usability perspective of e-services for physically challenged citizen segment. While e-services have been in use in Europe for a while, they have been catching up in India in a big way in large cities, only recently. The MC of Mumbai [MCGM, 2008] takes care of the upkeep of the city is one of the more tech savvy MC. There are several departments within the MC to handle different aspects of the city upkeep. It is important for the MC to know about the problems as and when they occur or come into existence in the city, so that the problem areas can be dealt with quickly and efficiently. For easier handling of city upkeep, the city is divided into wards. The city of Mumbai has about 24 wards. Any complaint relating to or originating from a ward is only handled by an officer associated with that ward. Complaint redressal gets significantly delayed if the complaint corresponding to one ward is routed to a different ward.

Efficient functioning of all the utilities and services in the area under MC depends on active citizen participation. Mumbai MC allows the citizens to voice their complaints using various interaction mechanisms. And a correctly routed complaint is handled promptly by the concerned departmental authority in that ward. Once a complaint is registered by the citizen, an appropriate departmental authority is notified about the complaint for action. The person complaining is notified of the status of the complaint. The chief modes of complaint registration mechanisms available to a person are (a) a visit to the local ward office, where a person in charge listens to the complaint and asks for some personal details and puts it across into an electronic form which is stored in a central database (b) through a contact center over a telephone, where the complaint is registered by a call center agent by typing the complaint into the system and more recently (c)

through a web portal interface [MCGM. 2008] where the user fills in the necessary details by logging onto the portal.

In all the cases the complaint is stored in a central database which is accessible to the concerned ward officer to handle. The ward officer can update the status of the complaint. The status of the complaint is available to the person who has placed the complaint through the portal to see 24×7 . While all of these modes have been made available for the citizens to lodge their complaints, the participation by the citizens has been poor in the case of (a) and (b) because of the amount of time involved in lodging a complaint for

different reasons. But these modes of complaints bare the web based complaint registration system have poor active citizen participation because of the difficulty in using the forum to lodge complaints. The web portal (Figure 1) has had a large number of users though the penetration of computers with Internet connectivity is not very high in India. On the contrary the mobile phone penetration is very high and is growing in India in general and significantly more in the city of Mumbai [Wireless News. 2007]. It makes sense to provide an easy to use mobile phone based interface to lodge complaints using their mobile devices. The most straightforward way to enable use of mobile devices to file complaint is to port the web interface into Wireless Markup Language (WML) so that it can be browsed by the WAP browser on the mobile phone. While this is not difficult, it is expensive in two ways (a) WAP enabled mobile phones are more expensive and (b) citizens need to pay the telecom operator for being on-line (accessing the complaint registration system through their phone). These are dampeners for active citizen participation.

The image shows a web browser window displaying a form titled "Lodge a complaint". The form has several sections with labels and input fields:

- Notes:** Fields marked with * are Mandatory.
- Define Nature Of Your Complaint:**
 - Select complaint type: A dropdown menu.
 - Select complaint subtype: A dropdown menu.
 - Description in brief*: A text area.
- Specify Location Of Your Complaint:**
 - House No: A text field.
 - Street 1*: A text field.
 - Area 1*: A text field.
 - City: A dropdown menu with "MUMBAI" selected.
 - House Name: A text field.
 - Street 2: A text field.
 - Area 2: A text field.
 - Pincode*: A text field.
- Landmark:** (Maximum upto 80 characters) A text area.
- Select ward*:** A dropdown menu.
- Name of the Ward Committee No.:** A text field.

At the bottom right of the form is a "Continue" button.

Figure 1. Snapshot of the portal to register complaints.

It is however important that active citizen participation is evoked only if the citizens are given an easy, cheap mode of lodging their complaints. In this paper we propose a novel SMS based natural language interface (NLI) to enable citizens to register complaints. The advantage of this system is (a) it requires no change in the already existing web portal to lodge complaints, (b) doesn't require the citizen to remember any specific information to file the complaint and (c) the SMS channel makes economic sense in India and sets tone for active citizen participation. In Section 2 we describe the web based system and describe its short comings, Section 3 describes the proposed system, and we conclude in Section 5.

2. BACKGROUND

The web portal interface [MCGM. 2008] to help people lodge complaints is a recent initiative of the Mumbai MC. The interface consists of essentially two types of information's (a) a set of drop down boxes where the user needs to choose from a select list of predefined options and (b) text box where the user is required to type in the complaint or the message. The interface consists of seven mandatory fields that need to be filled. The mandatory fields are 1) Complaint type (drop down menu; example, Drainage, Road and Traffic etc), 2) Complaint subtype (drop down menu which is based on the department selected; typically there are 9- 14 sub types for each selected complaint type), 3) Description (a text-box where the user needs to write the actual complaint), 4) Street (name of the street where the complaint is applicable), 5) Area (a description of the location, for example, near church), 6) Ward (drop down menu, user need to choose from a list of 24 wards), 7) Pin code (pin code of the area). Here the user needs to be aware of the ward name before lodging the complaint. Usually, people are unaware of the ward names and are only aware of the location names. The

optional inputs required by the system are (a) name of the person lodging the complaint, (b) address of the person lodging the complaint, etc. Once all the mandatory fields are filled up the system generates a complaint number and displays it on the web page. This complaint number can be used to query the status of the complaint at a later date.

The web portal while allowing the user to lodge complaints has some serious constraints. The user is restricted to choose from among the list of predefined drop down menus list. This poses a major problem in the sense that the user tries to fit his complaint into one of the predefined drop downs. This results in a wrong fit and the complaint being directed to the wrong department which in turn affects the time taken to resolve the problem (the incorrect choice is a result of too many Complaint type options in every Department option). The second major constraint is the need for the user to be aware of the ward number, additionally the user needs to have access to a networked computer. The mobile interface system proposed in this paper tries to overcome these issues to provide an easy to use interface. The need for a networked computer is removed by facilitating lodging the complaint through a mobile phone; the need to select the correct Complaint type and Department is removed by enabling the user to pose a complaint in natural English; the need to know the ward number is removed by the system determining the ward number based on the location and landmark details entered by the user (more recently we are using GPS when available on the phone to determine the ward number from the latitude and longitude information).

3. SYSTEM DESCRIPTION

The proposed mobile natural language based interface system emulates the functionality of the web portal based complaint filing system. The architecture of the system is shown in Figure 2. The users use the mobile phone and do not need to access the web portal interface directly. The user sends his complaint in 160 characters to a predetermined short code. The SMS complaint in natural English is routed to the system (Natural Language Complaint processing system block in Figure 2). The system then interpret the complaint query using natural language processing (NLP) techniques to determine the nature of the complaint (the Department and the Complaint Type) and other details (location, land mark, ward number). Once these information has been inferred by the system, it sends the information to the MC complaint handling system in a compatible format (as a HTTP, hypertext transport protocol, request) to [MCGM. 2008]. The response of the MC complaint handling portal is fetched (a hypertext page) and is parsed to determine the complaint number. This complaint number is then sent as a SMS to the user. In the event the complaint is incomplete in the sense of not having all the information that is required to generate a complaint number; the proposed system gets into an interaction mode (see arrows marked 3 and 4 in Figure 3). In this mode, the system generates a set of dynamically generated SMS queries to seek the required information from the user. Once the system has the required information, it is sent to the MC complaint handling system.

The complete block diagram of the system is shown in Figure 3. The system makes use of the already available web portal interface [MCGM. 2008] to complaint filing platform and assist the citizen to file his complaint using his mobile phone. The system enables complaint filing by sending an SMS from any mobile phone to a pre-determined short code (a special number which is usually shorter than a regular mobile number, so that it is easy to remember). The system enables the user to send his complaint in natural (free of format) English (arrow 1; Figure 3). The input to the system is a free format English SMS. The system internally analyzes the SMS complaint using a set of natural language processing techniques to determine if the complaint has all the information required. If yes (arrow 6; Figure 3) it send the information in a form understandable by the MC complaint portal and sends back a complaint number to the user (arrow 6, 7, 8; Figure 3), else (arrow 2; Figure 3; the SMS sent by the user is such that a complaint number can not be generated using the MC web portal interface system), the application intelligently generates queries and send it to the user as SMS (arrow 3; Figure 3). The user responds to the SMS (arrow 4; Figure 3). This interaction can (path 3, 4, 5; 3) happen more than once.

All the information gathered, in addition to the free form complaint sent by the user is used to lodge the complaint with the web- based MC complaint registering system and the generated complaint number is sent back to the user (path 6, 7, 8; Figure 3) as a SMS for his reference and tracking of his complaint.

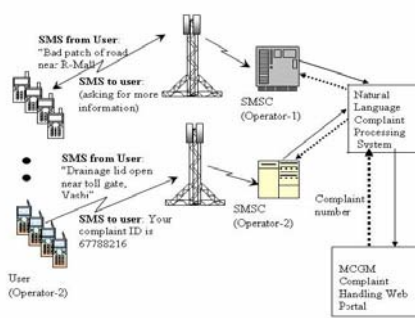


Figure 2. Architecture of the proposed system.

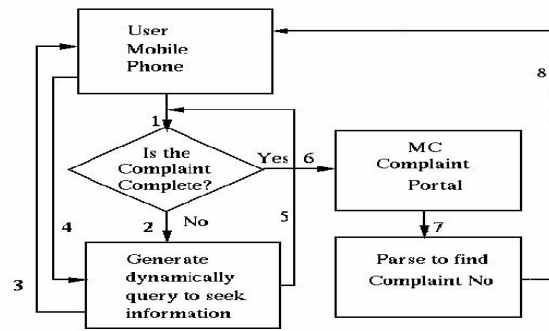


Figure 3. Block diagram of the novel NL based system.

A typical scenario is when a user sends a SMS to a predetermined short code with the complaint information in free English (for example, Garbage has not been lifted from under the flyover in Mulund). The system analyzes the complaint SMS for completeness. An SMS is deemed complete if all the required mandatory fields required to lodge the complaint are identifiable in the complaint SMS. This results in two scenarios, namely, (a) the complaint SMS in complete and (b) the complaint SMS is incomplete.

Scenario - 1: Lodged Complaint Complete

User: Sends an SMS complaint

System: (a) Files the complaint with the web-based complaint lodging system, (b) obtains a complaint number from web based complaint system and (c) sends the complaint number as a SMS to user.

Data Flow: 1 - 6 - 7 - 8 (see Figure 3)

In Scenario 1 there is no interaction with the user after the initial complaint SMS has been sent by the user. The user is able to lodge his complaint through a single SMS. While in Scenario 2, the system interacts with the user. In this case more than one SMS is required to be sent by the user to register his complaint.

Scenario - 2: Lodged Complaint is Incomplete

User: Sends an SMS complaint

System: (a) Identifies the "missing fields" in the user complaint, (b) Intelligently generates and sends one or more SMS requesting information from the user. For example, SMS "1" for "Smelly Garbage", "2" for "Garbage not picked up"

User: Responds to one or more SMS through selection

System: (a) Assimilates all the information from all the responses and then files the complaint with the web-based complaint lodging system, (b) obtains a complaint number from web-based complaint system and (c) sends the complaint number as a SMS to user.

Data Flow: 1 - 2 - 3 - 4 - 5 - 3 - 4 - 5 ... - 6 - 7 - 8 (see Figure 3)

3.1 Functional System

The mobile interface allows the user to lodge a complaint in natural English. The system tries to decipher the mandatory details required to file a complaint using a set of natural language processing techniques. The natural language complaint processing is based on a minimal parsing system (for details see [Sunil Kopparapu. et al, 2007]). The essential idea is to extract a key concept and a set of key words from the natural language complaint query using ontology specifically crafted to this application domain. The ontology is hand crafted by a team of linguistic and domain experts. More specifically, the entire stop words (Stop words are words that by themselves do not give any extra information to the message) are initially removed from the query SMS. The system then checks for any spelling mistakes in the complaint and corrects it. Using an ontology and domain specific knowledge the SMS query is parsed to determine the nature of complaint and the department. The location and the landmark details are picked up from the query

with the help of Mumbai specific location knowledge base the landmark and the location details are used to determine the ward number details using a location – ward number knowledge base.

4. EXPERIMENTAL RESULTS

The system has been prototyped and has been tested by a select number of 25 users to check the functional experience of the system. The details collected in this experimental phase (especially the nature of SMS complaints) are being used to refine the natural language interface (for example, [Sunil Kopparapu. et al, 2006 a], [Sunil Kopparapu. et al, 2006 b]) of the system in terms of updating the knowledge base. In the experimental case a set of 200 complaints were filed by 25 users. About 80% of the queries were such that the users gave all the details in the first SMS query. It has been noted that initial queries from the user needed interaction (step 2, 3, 4, 5; Figure 3) while the later ones did not need any interaction (step 1, 6, 7, 8; Figure 3). This is understandable that the user learnt what the system needed and accordingly gave in sufficient information to enable a single SMS to file their complaint. An analysis of the performance of the system in terms of being able to determine the complaint type and the department was about 95%; the analysis was done by a person who was not part of the team involved in the building the system. One of the outcomes of these experiments was that people tend to use words which are in their native language (example “khara” for garbage). These have been incorporated in the ontology supporting the system.

5. CONCLUSION

We have proposed and built a SMS based novel mobile interface for users to lodge complaints about the city. The system is accessible to everyone who owns a mobile phone and is available 24 × 7. The system uses the back-end infrastructure of the MC to lodge a complaint but gives the user the flexibility to file his complaint by sending a free format natural English complaint. The natural language processing based system is capable of analyzing the query and extracting the required information from the SMS to file a complaint. In the event of the complaint SMS being complete, the system generates a complaint number (actually generated by the backend system) and send this complaint number to the user through a SMS. In the event the complaint is incomplete, the system poses SMS questions to the users asking for specific information (through menu choice). In this case the system uses all the information given by the user to file the complaint (the initial SMS and the subsequent responses to the system generated queries). The minimal processing system [Sunil Kopparapu. et al, 2007] by design allows the system to be configured for other native languages. We plan to enable people to lodge their complaints in their local languages as and when SMS in Indian languages becomes more easy!

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