Delivery of Warnings and Alerts during Emergencies

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Abstract— India has unique geo-climatic conditions. This has made it vulnerable to various natural disasters. Earthquakes, Floods, droughts, cyclones and landslides have been a recurrent phenomenon, leading to a massive loss of human lives and a significant economic impact. In recent years, the Government of India has brought about a paradigm shift in the approach to disaster management, taking a holistic approach to address this challenge. An important aspect of this approach is disaster awareness by utilizing ICT. In this paper, we describe an Early Warning and Alert System that can be used by the Disaster Management authorities for communicating with the public. This system can be used to broadcast emergency information such as disaster alert warnings provided by local or national governments using technologies like Java, Android, and leveraging the mobile communication networks. The objective is to send timely and understandable SMS Alerts and also ensure that the message has actually been opened and read by the person receiving it.

Index Terms — Disaster Management, Early Warning, Mobile, Communication Networks, SMS Alerts etc.

1 INTRODUCTION

Natural disasters in India have been a recurring phenomenon since the past. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought. The actual figures depicting loss of lives is truly overwhelming. In the decade 1990-2000, an average of about 4344 people lost their lives and about 30 million people were affected by disasters every year [1]. The loss in terms of private, community and public assets has been tremendous.

In recent years, the Government of India has brought about a paradigm shift in the approach to disaster management, taking a holistic approach to address this challenge. An important aspect of this approach is disaster awareness by utilizing ICT [2]. The approach has been translated into a National Disaster Framework [3] covering institutional mechanisms, disaster prevention strategy, early warning system, disaster mitigation, preparedness and response and human resource development.

In a holistic sense, the term Early Warning includes the whole range of actions and operations right from planning, monitoring, analysis term early warning includes the whole range of actions and operations right from planning, monitoring, analysis, fixing of early warning alert thresholds, decision making, dissemination of early warning alerts and continuous improvement in early warning practices. The effects of the disasters can be mitigated to some extent or minimized in certain cases, if the communities threatened by them are forewarned about the impending disaster and are prepared to face them.

With the huge growth in science and technology, it has now become very easy to continuously monitor the disaster prone areas for threats. However, just giving out a threat signal and its severity is not enough. Mass communication of these threat signals to all the people in and around the danger prone areas is a must. Proper measures must be taken to ensure that each person is notified on a timely basis about the impending disaster and its amount of threat it possesses. Earlier mechanisms of media based (radio, TV, newspaper) warnings are not real-time and limited in reach. With the advent of mobiles and cloud, it is now possible for DMAs to setup a continuous communication channel with the public improving the effectiveness of communication and reduce potential post disaster problems (e.g. disease outbreaks). Such a use of technology can complement the existing early warning mechanisms

2 NEED FOR AN EFFECTIVE SYSTEM

Communication is the most important phase in disaster preparation and disaster management. Fortunately today, there are innumerable modes of communication available right from the simple ones like television, radio, newspapers, to the more advanced ones like telecommunication, social media, electronic media, etc.

While the modes of communication are increasing day by day, what is most important is that the communication is authentic, not based on hear-say or rumours and not intended to spread panic among the people; but to provide them help and support.

It is very necessary to have a simple, easy to reach, and easy to understand medium of communication that ensures effective delivery of alerts in a language that everyone can understand easily and act accordingly.

This project aims at devising an Early Warning and Alert System that uses SMS messages [4] to convey disaster related information to the public. This information includes the areas likely to be affected and a tentative time when the impending disaster may strike so that the concerned people can be prepared for it well in advance.

In order to make these alerts understood by each and every

person, multiple languages [5] are used while sending the SMS. English and Hindi being the default language for every location, additional messages will be sent in the language local to the area where it is being sent. Hence, it ensures that language does not become a barrier while conveying such important information.

Also, it ensures that the message is not only sent but also opened and seen by the person receiving it. An additional text to speech option is made available for people with reading disabilities. This option starts reading the message content aloud. Such a feature can hugely benefit blind people.

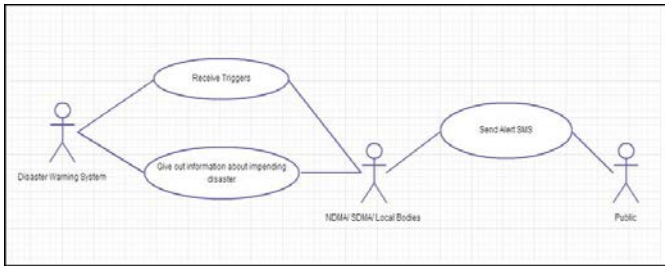

Fig. 1. Use-case on Dissemination of Early Warning Alerts during Disasters

3 OBJECTIVES

The following objectives about the system were kept in mind throughout the duration of this project:-

1. The system should be simple, easy to use.
2. Communication is authentic and not based on rumours.
3. Communication is in a language that is easy to understand by everyone.
4. The message content is direct and simple to understand.
5. To devise a system keeping in mind the various kinds of end-users, their limitations (if any), and their disabilities (if any).

To ensure that the message is not only delivered on a timely basis but also opened and read by the people receiving it.

4 PROPOSED SYSTEM

[A] SMS Application

A JAVA windows application to facilitate sending of Alert SMS from a computer to mobile phones. It uses j-SMS API [6] to connect with the GSM modem attached to the PC through a serial port and to establish an SMS Gateway to enable sending of SMS from PC to mobile [7].

The application supports sending SMS in multiple languages like English, Hindi, Marathi, Telugu, Tamil, and Kannada.

The user can choose the message text from a list of default templates in various languages and simply editing the related information.

[B] Alert App

A mobile application was developed for the end users to alert them on receiving message from the Disaster Management Authority.

The main aim of this application is to get the person's complete attention whenever an SMS is received with its originating address matching with that of the Disaster Management Authority. It uses combined features like flashing of the screen, a unique alert tone and vibration to attract the person's attention. This combination ensures that this application is beneficial even to users with disabilities.

Currently, this application is built for mobile devices running on Android Operating System. It runs on any Android device higher than version 2.2. It has been tested successfully on devices running Android 2.3 - Gingerbread and Android 4.0.4 – Ice Cream Sandwich. The application also includes a feature to convert the message text into audio using e-speak Text to Speech [8].

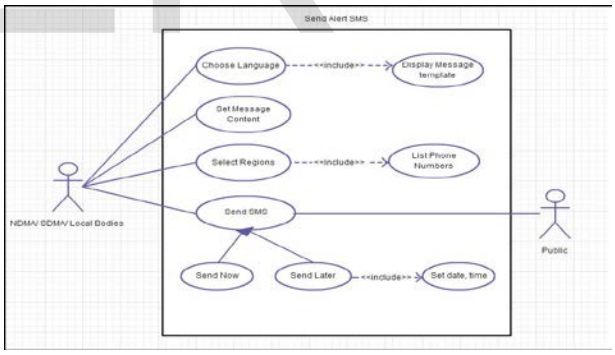

Fig. 2. Use-case for Sending SMS Alerts

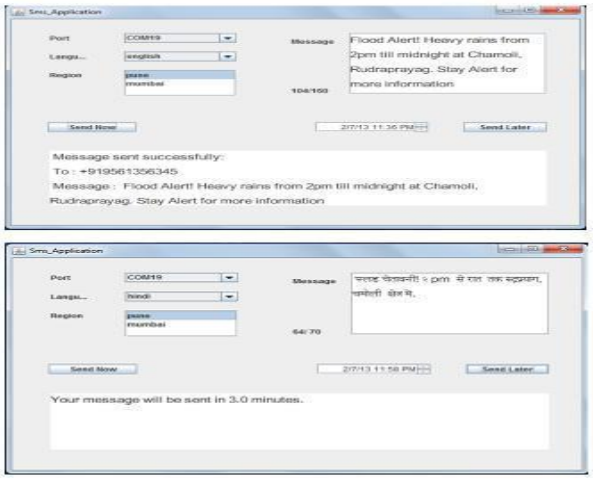

Fig. 3. User interface of SMS Application

TABLE I- FEATURES OF SMS APPLICATION

Feature	Description
User Interface	-Easy to use by anyone, anywhere. -Support Scheduling time for sending later
Warning message in English	A single plain text SMS or concatenated text SMS using jSMS api.
Warning message in Hindi	Send as a Unicode text message using jSMS api.
Warning message in regional language	-Send as Unicode text message using jSMS api. -Languages supported: Marathi, Telugu, Tamil, and Kannada.
Database Connectivity	-Store user data such as phone number and region -Store basic message templates in all languages.

"<Disaster> alert! From <time> to <time> at <list of areas>. Stay alert for more information."

"<disaster> चेतावनी! <time> से <time> तक <list of areas> क्षेत्र/ क्षेत्रों में. अधधक जानकारी के लिए सतकक रहना. "

Fig. 4. Message Templates in English and Hindi

5 CONCLUSION

The future scope of this project includes finding an alternative to character limit for sending Unicode messages through SMS so as to facilitate sending English, Hindi and the regional language message all combined into a single message. It also involves creating the Alert Application as platform independent application so that it can be implemented on all mobile devices.

Summarizing the whole project, its main uses can be listed as follows:-

1. Quick and easy communication between the government and public.
2. Brings out transparency in the whole system.
3. Complements television, radio and other primitive means of communication.
4. Suitable for people in both rural as well as urban areas.
5. Language no more a barrier.

TABLE II- FEATURES OF ALERT APP

Feature	Description
Notification Sound	To notify the user that there is an important unread message
Vibration	
Flashing of screen	
Once clicked, Display the message	Retrieve the message content and display it
Text to speech	Read out the message aloud

Fig. 5. Alert App on an Android phone

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