A comparative study of Smart Phone Emergency Applications for Disaster Management

S.Mythili[1], E.Shalini[2]

[1]PG Scholar, Dept. of ECE, Bannari Amman Institute of Technology, TamilNadu, India
[2]Assistant Professor, Dept. of ECE, Bannari Amman Institute of Technology, TamilNadu, India

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Abstract - *Catastrophic disasters cause failure of conventional wired and cellular communication systems where it collapses completely or partially. Communication during disaster times is crucial for both survivors and rescue forces. There are various technological applications are available in the smart phones for emergency management. In this paper we provide a comprehensive overview of existing emergency applications by evaluating its operations, benefits and limitations. It provides an alternative direction to vanish the conventional problem having manual intercession and reporting emergencies*

Key Words: Smart phone, Crisis management, Android applications, Emergency call, Network coverage

1. INTRODUCTION

A chaotic world has become a ground for numerous natural disasters and man-made disasters. Natural disasters like Tsunamis, flood, earthquakes, hurricanes and storms or human caused events like large scale terrorist attacks or nuclear disasters, traditional communication systems can be totally destroyed and make the poor communication. This situation makes the rescue operations extremely difficult to help the trapped survivors. Getting 'Right data at a right time' is a tough challenge in case of any pre and post crisis situation because "A minute delay in seconds may cost someone's life" there. A remedy for this is the development of Smartphone technology.

The number of smart phone users in India is estimated to reach around 204.1 million by the end of 2016. Smartphone attracts the users and increasing its popularity in world-wide due to its powerful processing and wireless network capabilities. It enables users to communicate and share information in easily convenient way. Apart from its in-built features many additional android applications are developed which helps the society flexibly by providing proper gathering of data and information exchange process as a corner stone for everything.

In an emergency, an individual who is already in crisis seems to be helpless to report the emergency to a response team. It believes that using latest tool and technology like smart phone provides a better way for it. The role of smart phone technology in emergency management has involved in tracking emergency zones, along with users' location via enabling the GPS. By using Internet connection, users can send and receive updates related to any disaster situation. Modern smart phones have computational platform with embedded sensors to detect the location through maps, to sense the strength of geomagnetic field and automatically updates with the response teams.

In this paper, we critically evaluate the prospects of smart phones and emergency applications which can respond efficiently and effectively in the risky situations and the emergency management systems which in turn inform in a timely manner using the ad-hoc network which can be created on-the-fly.

2. COMPARATIVE ENVIRONMENTS

2.1 Emergency Call

In the early days, emergency call is the facility that enables users to make a call at instant of any emergency using normal phones. In the early days, Public Telephone Network has a single emergency service number to call for the local assistance in case of emergencies like need for ambulance, police, fire service etc. Later the emergency number may be anything from the phone contacts in addition to the traditional three digit number can be saved in prior this makes its features in an enhanced manner to support the android mobile users in a smart way in case of critical situations. The mobile phones users can dial emergency numbers even when the phone keyboard is locked and even if the phone has no SIM card, emergency number is typed instead of the PIN or there isn't a network signal (busy network). Some of the pre-programmed emergency numbers are 112, 911, 118, 119, 000, 110, 08, and 999. If the user make a call using emergency number then a local emergency call setup takes place and the network operator direct the call to emergency help desk to reach the victims who likely to need the emergency service by having the location information.

It gives the public a more streamlined and simpler service, and also enables new possibilities for the emergency services to do their job better with closer cooperation and coordination than before.

This is the generic service available in all mobile phones which can be helpful and utilized by the survivors who are under the crisis at times.

2.2 Communication App Design

The Emergency call alone is not sufficient to share the information and to get help. The Smartphone is the only tool which can make use while in emergency situation. There are ample of applications available for proper line of emergency communications. In the collapsed environment and infrastructure fewer environments is created which supports the users to get access to the Internet using the cloud based model.

2.3 FEMA

The Federal Emergency Management Agency (FEMA) app is generally used to create emergency awareness among the public and it is confined with the preparedness information for different types of disasters. It also facilitates with an interactive checklist for emergency kits, a segment to plan for emergency meeting locations, and holds the information about being safe and recover[1]. It shows a map with FEMA Disaster Recovery Center locations and shelters. It gives a way to local public safety and it provides necessary resources and policy guidance to support the victims and rescue workers. It helps the public through social media via status or email alerts. This FEMA app can be supported in Android, BlackBerry, i-Phone and i-Pad.

2.4 u-Rep

To report and resolve man-made and natural disaster is by deploying MANET communications approach in absence of pre-existing network. u-Rep is an abbreviation of "You Report" is a prototype solution. It allows civilians to report their problems by taking a snap and geo-tag the photo using GPS functionality available in smart phones. This location information gives a detailed view to pin-point the problem existence and assists to repair since it has a link with official restoration services. u-Rep can be extended to serve other functions such as request to help and offer assistance to people in need, and also gather statistical data to analyze and help the public to prevent damage in future events[1].

The integration of a mobile communications app with a MANET provides support for real-time information reporting and also presents a pathway for reporting back to users on the status of service restoration. u-Rep is a promising way to help authorities during extreme weather events. It offers a fast method of data collection, support for

mobile communication, and is very useful with a mobile ad-hoc network.

2.5 Help Me

It is an i-phone application for aid requests in crisis situations, when Internet connection is not available, between smart phone users situated in close proximity. This app introduces a good approach by using ad-hoc network for emergency communications. Here, Request-reply exchange takes place between the users who are having their own user profile and a personalized application created by the server. Hop by Hop basis communication method takes place in this opportunistic network scenario[2]. It follows forwarding mechanism which enables the system to extend the reach of each user well beyond the local vicinity. This app finds the suitable neighbors for successful routing of information by proper classification and matching process according to the requests. It conveys the information of all happening events and about missing persons occupied in the disaster area.

2.6 Tsunami Alert

The pre-installed warning system may not function properly during the disaster due to some destructive activity. So this app assists the people during disaster by giving some information of disaster preparedness. This app provides earthquake alert (time, location, and magnitude), location of shelter, Tsunami propagation information (travel time, propagation movie, and maximum wave height map) and then tsunami information along with evacuation tips (characters of tsunami, location of virtual earthquake fault, tsunami evacuation route).

2.7 Fire Ready (FR)

This app has been launched by Fire Service Commissioner in 2013. It is an official government app. It notifies the users with fire dangers by sending photographs of it. Here the user must create a zone to receive specific location notifications on a user's device when incident occurs. The public is alerted by warnings which carry the information about the incidents and fire activities and how the fire may affect them as a whole. Bushfire activity is the most dangerous one which needs some precautionary measures.

2.8 Quake SOS

It is a free app designed for emergency situation management. It is a combination of emergency alert system which provides earthquake information and SOS call for victims. If the user is trapped in the earthquake location then they can notify their contacts whether they are safe or not using this app. It contains all the earthquake databases and shares the information like when and where the

earthquakes have occurred. It is automatically updated and gives current information which is useful for the users.

2.9 First Aid Application (FA)

This app is developed to give first aid guidance to the survivors trapped in emergency locations. In general Google API is used to find the best suitable path to reach the hospital at the earliest possible way. This functionality is taking place in FA to find the shortest path to reach the hospital from the affected area. It also helps users to get precautionary measures by giving first aid guidance before reach the hospital. The first aid guidance service includes the information regarding muscles, skin, or material injuries. By using smart phone's global positioning system (GPS) and this application asks the patient for radius searching and at last the most appropriate directions to the selected clinic or hospital will be displayed as an output [8].

Table -1: Smartphone applications and its pros and cons discussion

Emergency Applications	Discussion
FEMA	FEMA app facilitates the user with emergency helpline number and provides upgraded information about the pre- and post- crisis and its situation. The role of this app is passive and informative only, and has no linkage or connection to official reporting or restoration services. The FEMA Disaster Reporter is not a pro-active method to seek assistance; rather, it is simply a way to provide more data to the public during times of emergency. The Disaster Reporter does not aspire to do all that the u-Rep app implements.
u-Rep	The support in u-Rep for specific localized utility companies to log in and have additional functionalities moves u-Rep one step further and makes it stand out when compared to FEMA's Disaster Reporter and other more static offerings.
Help Me	In this app delay is taking into account for faster response in such situations. Local adjustable settings in ad-hoc network enable users to determine the amount of information they are willing to receive. It is used to recognize the missing and misplaced persons through stored information in user's mobile device.
Tsunami Alert	This app is considered to be a good option while people suffering by earthquake. It facilitates the user by efficient disaster response by its warning message along with the timely information to anyone and anywhere.
Fire Ready	This app is not supported for i-phone and i-pad users. This app is available and accessible in different shapes depending upon need or requirement. This is in need for fire detector also.
Quake SOS	Quake SOS app provides latest and real-time disaster information. This app requires fair signal strength to work.
First Aid Application	This app facilitates the user to have precautionary measures before reaching the hospital.

3. STATISTICAL ANALYSIS

In a critical circumstances, number of users use their smart phones are represented in percentage. 50% users use their smart phones in emergency situations including local accidents, 14% users use their smart phones to notify the emergency management authorities to get help in case of any disaster, 8% users use their smart phones for medical emergency, 5% use their phones for emergency helpline like

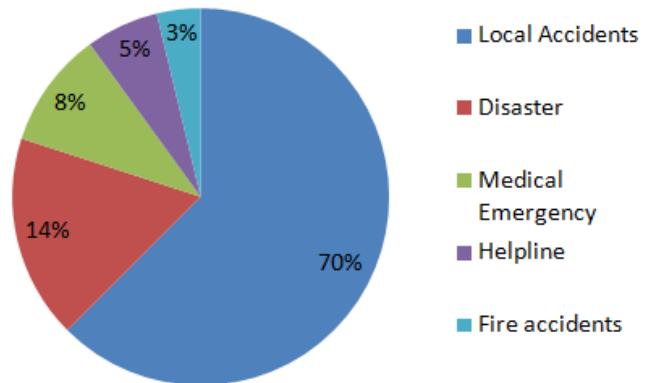911 or HELP ME emergency app, 3% users use fire applications [4].

Chart -1: Usage of Emergency Applications [4]

3. CONCLUSIONS

Smartphone acts as a powerful tool and can be used as a way for emergency communication. Energy source is the important factor that has to be considered to enhance the performance and functionality of smart phone. The discussed applications are expected to be a "proof of concept" for the importance of smart phones. Some of the emergency applications are web collaboration tool. This might be a drawback for the app technology when we use it in emergency case. In near future this drawback can be overcome by the Developers by utilizing the at most coding features and techniques applicable in Android studio, J2ME etc. The Combination of MANET approach and mobile makes the disaster recovery more efficient, both in monitoring occurred damage and its scope in coordinating apposite recovery and relief missions. The ultimate integrated approach of a mobile app with MANETs can ultimately save human lives and reduce the time needed for critical service to be restored.

REFERENCES

[1] Allan Goncalves, Carlos Silva, Patricia Morreale, "Design of a Mobile Ad Hoc Network Communication App for Disaster Recovery," International Conference on Advanced Information Networking and Applications Workshops, 2014.

[2] Osnat (Ossi) Mokryn Dror Karmi Akiva Elkayam Tomer Teller, "Help Me: Opportunistic Smart Rescue Application and System," The 11th Annual Mediterranean Ad hoc Networking Workshop (Med-Hoc-Net), 2012.

[3] Jaziar Radianti, Julie Dugdale, Jose. J. Gonzalez, Ole-Christoffer Granmo, "Smartphone Sensing Platform for Emergency Management," Proceedings of the 11th International ISCRAM Conference – University Park, Pennsylvania, USA, May 2014.

[4] Hafsa Maryam, Qaisar Javaid, Munam Ali Shah, Muhammad Kamran, "A Survey on smartphones systems for emergency management," International Journal of Advanced Computer Science and Applications (IJACSA),vol.7,No. 6, 2016.

[5] A. Al-Akkad, A. Zimmermann, "Involving Civilians by Smart Phones during Emergency Situations," in ISCRAM Conference, 2011.

[6] Teaching Zhuang, Paul Baskett and Yi Shang, "Managing Ad Hoc Networks of Smart phones," International Journal of Information and Education Technology, Vol. 3, No. 5, October 2013.

[7] Kefei Cheng and Qiqi Li, "Smart Phone for Mobile Communication Community," International Journal of e-Education, e-Business, e-Management and e-Learning, Vol. 3, No. 5, October 2013.

[8] http://emergency20wiki.org/wiki/index.php/Smartphone_Apps

BIOGRAPHIES

Mythili S is currently pursuing her M.E. Degree in the department of Electronics and Communication Engineering from Bannari Amman Institute of technology, Sathyamangalam, Tamilnadu, India. She received her B.E. Degree in the department of Electronics and Communication Engineering from Anna University, Chennai, Tamilnadu, India. Her area of interest includes Wireless Ad-hoc, sensor and Body area networks. Related to the core interest, have enthusiastically presented the papers in three National conferences and a state-level conference and thirst for research leads herself to publish the papers in reputed Journals.

Shalini E is currently working as an Assistant Professor in Bannari Amman Institute of technology, Sathyamangalam, Tamilnadu, India. She received her M.E. degree in the stream of communication systems from Bannari Amman Institute of technology, Sathyamangalam, Tamilnadu and B.E. Degree in the department of Electronics and Communication Engineering from Anna University, Coimbatore, Tamilnadu, India. Her research area includes Wireless networks and Electromagnetic Field

Theory. Her passion towards work made her to actively present the papers in eight National conferences and one International conference and published four papers in international Journals like IJLRST, IJCA, IJAIEM etc.