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AppLERT: A Mobile Application for Incident and Disaster Notification for Metro Manila

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Abstract—The Philippines is battered by different natural and man-made disasters. It cannot be disputed that despite its magnificent and natural beauty, the country suffers from these devastations. Although the government has set in mitigation and prevention plans, little is put into consideration when the disaster happens. The paper focuses on the application of Information Communications Technology (ICT) in a form of an android based mobile application that gives victims the capability to seek help when a disaster or incident strikes. In addition, people can notify others of the danger ahead through AppLERT and Facebook so that they can avoid the area where the danger is through crowdsourcing. It seeks to help expedite the response time of the responding unit using the user's mobile phone built-in GPS.

Keywords—Android Application, Disaster Response, Crwodsourcing.

I. INTRODUCTION

In spite of the intrinsic wonders and beauty of the Archipelago of the Philippines, it cannot be disputed that it is one of the most battered country when it comes to natural disasters. Due to its location at the Western edge of the Pacific Ocean along the major seismic fault lines, the country is hit by frequent seismic activities. In addition, there is an average of 20 typhoons per year that enter the Philippine Area of Responsibility (PAR) in which almost half make landfall and inflict destruction. The country is particularly susceptible to the effects of climate change [1]. As an example typhoons Ondoy and Pepeng which entered the country in 2009 left nearly 1000 dead, displaced millions of others, damaged homes and infrastructures, destroyed crops and had caused the country a total damage amounting to an equivalent 2.7% of GDP [2].

In response to the different natural catastrophes that have stricken the country the Philippine government has initiated plans to mitigate the effects of natural calamities. The Hazard Mapping and Assessment for Effective Community-based Disaster Risk Management (READY) Project which addresses the problem of disaster risk management (DRM) both at the national and local levels. The project creates a systematic approach to community-based disaster risk management by means of: (1) scientific multi-hazard mapping as the first step to risk assessment, (2) community-based disaster preparedness, and (3) initiation of mainstreaming of disaster risk reduction into the development planning process of the local government units. The project targets 27 provinces in the country with high risk to natural hazards [3].

Natural disasters are not the only problems that strike the Philippines. The country is also prone to man-made disasters that are caused either by human negligence or accident resulting to property damages and sometimes causing several lives. These include but not limited to Civil Unrest, Explosion, Cyber Attacks, Nuclear power plant and nuclear blast, Radiological emergencies etc. [4]. An example took place on September of 2014 where a man-made calamity struck in Zamboanga City in the southern Philippines. Nearly 300 heavily-armed rebels of the Moro National Liberation Front (MNLF) pounced down on the city, burned down thousands of houses and took hundreds of innocent civilians as hostages. The assault left at least 100 rebels killed with more than 200 captured. On the government side, the death toll reached 23 where 8 of them were soldiers and 5 were policemen. A total of 167 soldiers and 14 policemen were wounded. The death toll to innocent civilians was placed at nine, with 57 reported as injured.[5].

And like any other third world countries, the Philippines is also susceptible to high crime rate. In the list for 2006, the three least-corrupt countries are from the developed world, while the three most corrupt countries are from developing countries. Therefore, it is logical to assume that developing countries are particularly vulnerable to corruption [6]. In the Philippines, the Philippine National Police (PNP) has claimed that there is a total of 60 percent decrease in crimes in Metro Manila but the number of crimes committed nationwide increased by about 46 percent during the first six months of the year (2015) as compared to the same period last year. Records from the PNP Directorate for Investigation and Detective Management (DIDM) showed that theft, car theft, physical injuries and rape were among the crimes that had a huge increase. The PNP said 885,445 crimes were reported from January to June, compared to 603,085 cases during the same period last year(2014) [7].

In a Global context, the United Nations International Strategy for Disaster Reduction (UN/ISDR) calculated that around 5,210 disasters were recorded in the world between 1991 and 2005. The consequences of natural and man-made disasters including the vulnerabilities to which

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populations are exposed can be mitigated if they are targeted proactively. Though eliminating risk is not completely possible, extensive experience and practice in the past few decades have proven that the damage caused by any disaster can be minimized largely by careful planning, mitigation and prompt action. In this context, Information and Communications Technology (ICT) can possibly play a pivotal role in disaster prevention, mitigation and management [8].

Though several literatures have focused on the prevention and reduction of disasters, few have touched on responding to disasters that are already taking place. Questions arises like what can someone do when a disaster strikes, when he/she becomes a victim of a disaster, or merely a witness of it? This paper focuses on the development of an android based mobile application that enables users to ask for help during a disaster and notify the other users through the mobile application and facebook. The application makes use of the different capabilities of a smart phone such as GPS, camera, social network interaction and Internet connectivity to track, seek help, and notify others of the danger ahead. This overpowers the conventional way of calling a response unit for help. The process of getting help from a response unit would be expedited as it lessens the needed input. The paper seeks to answer (1) what can a victim do if he/she is caught in a middle of a disaster or incident, (2) how to lessen the disaster response time to impede any escalation of danger on the part of the victim, (3) how to inform others of areas that are currently experiencing disaster or incidents and (4) how can an android based smartphone help users/victims when disaster or an unforeseen incident takes place.

II. REVIEW OF RELATED LITERATURE

In 2011, it was reported that nine (9) out of ten (10) sold Smartphones in the Philippines are running in an Android based according to the Singapore-based research firm from GfK. This is most likely due to the increasing affordability of smartphones, particularly in the developing markets where local smartphone manufacturers have made their way visible in the market. This has led to consumers switch from their basic feature phones to own a powerful smartphone[9].

Most applications that are used by users are in their Smart phones are Social media applications. Nowadays, it is no longer used as ways to keep in touch with friends, family and colleagues. It has now been used in times of crisis. Citizen-side information generation and dissemination activities are increasingly playing a vital role in disaster preparation, warning response and recovery. Because the public are using social media during emergency events, most emergency managers have also begun to incorporate their use into their activities. A recent survey of members of the International Association of Emergency Managers on the FirstResponder.gov found out that over 95% used Facebook or other social networks for day to day personal activities, about half used it in emergencies; and about 43% used Twitter to gather information from the public and to communicate with the public during emergencies [10].

Information and Communications Technology (ICT) have been increasingly used by several Governments to promote active participation among its citizens. Through Mobile and Wireless technology (m-government), citizens can make urban incident reports in their neighborhood to the local administration. In this context, citizens can use incident reporting tools as self-service applications allowing the citizens to produce and consume services electronically without direct contact with the local administration. Although most m-government applications concern an urban environment (such as traffic jams, parking availability in town, and WiFi access), applications have been used even in rural areas [11]

Mobile technology offers several opportunities for the government to obtain citizens' feedback about their environment. The current generation of mobile devices includes touch screen interaction, Global Positioning Systems (GPS), and camera. By means of the smart phones, it provides users/citizens with the means to report incidents by specifying, for example, the location (such as selecting the location on a map), sending a precise location identification (such as using GPS), or simply providing a proof of the incident (such as taking a photo). With the technology on hand, the ability to seek and get help quickly during a disaster no longer poses a constraint to the user.

Aside from the ability to seek for help, it can also be used to inform other users of the impending danger that they might come across or is about to happen near their area.

Crowdsourcing platforms for disaster management have drawn a lot of attention in recent years [12]. By leveraging the power of crowds, users would be able to provide warnings on specific areas where danger is imminent. This would help other users avoid areas that are currently critical.

An example of a mobile application that enables crowdsourcing took place in Indonesia. With the extensive flooding in 2002, 2007, 2012, and 2013 which adversely affected a huge number of residents and the regional economy, Indonesia's Special Capital Region of Jakarta sought to improve its disaster-response capability. In December 2013 rolled out a Disaster Information Management System (DIMS) created by Fujitsu. By installing an application provided by BPBD DKI Jakarta on the residents' smartphones, residents of affected areas can easily send information to the system concerning observed river levels and flood conditions. They can indicate river and rainfall levels in three stages: (1) notice, (2) warning, and (3) flood. Citizens can also include photographs and descriptive text, which are transmitted with automatically generated timestamp and GPS data. The system then plots all reports received from residents on a single map of the city. Citizens can view this map in the app to check river levels in areas of interest and the current flood conditions around their own homes and nearby areas, as reported by fellow residents [13].

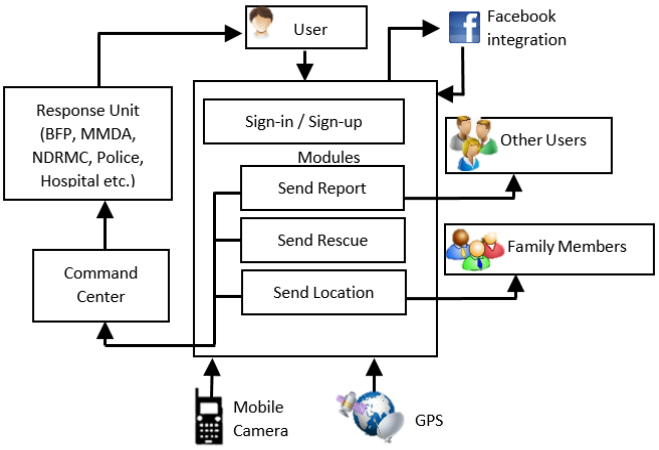


Fig. 1. The System Architecture

III. SYSTEM ARCHITECTURE

The system architecture depicts the different interactions between the users, the mobile application, and the different capabilities of the smart phone which play a vital role when getting help during a disaster or incident. To use the mobile application, the user has to register using his/her Facebook account. Reports sent by registered users will be posted as news feeds on Facebook and directly to the AppLERT application via their smart phones. The GPS built on the smart phone of the user will allow rescuers to locate exactly the victim. The mobile camera on the other hand can be used to take pictures of the incident as send it as part of a report.

A back end called the command center will be formed that will receive, validate and contact the responding unit when a report is sent. The center will be responsible for the validation of the users and the different warning flash feeds that appear on the mobile screen of the users.

IV. SYSTEM FEATURES

The AppLERT android based mobile application allows user to report incidents and disasters for immediate rescue. The mobile application is composed of three main modules. These are 1.) Send Report Module, 2.) Send Rescue Module and 3.) Send Location to Family Module.

A. Send Report Module

The Send Report Module allows users to send a report to the command center of any disaster which took place in their area. The report includes the type of the disaster, the description of the incident, an optional picture/s or video of the scene and the address of the incident (based on GPS data). Upon validation, other users of the application will be able to see these reports in their home screen to warn them of the current incident taking place. This may include an incident which already took place and is already being attended by proper authorities. By means of crowdsourcing, all users will be updated of the incidents taking place near their area.

B. Send Rescue Module

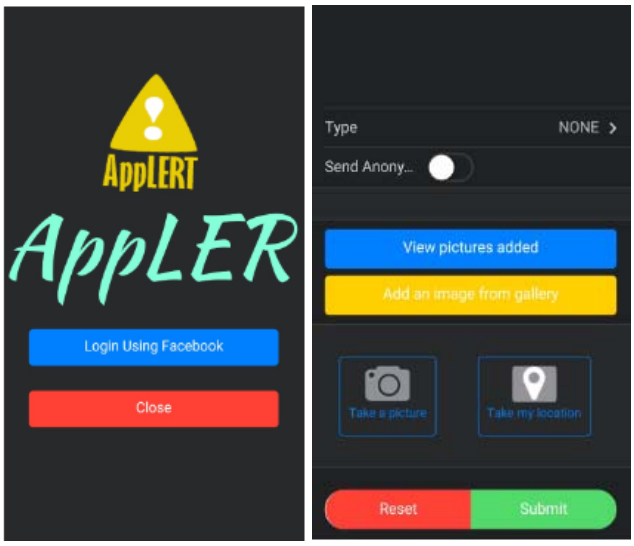
The Send Rescue Module will give way for proper authorities to be deployed immediately in the scene. The user will send a report of the scene which includes type of the disaster, the description of the incident, an optional picture/s of the scene and the address of the location (based on GPS data). All the data to be send are optional. If this option is used without any data, an SOS will still be forwarded to the command center. Once the command center receives the report, it will automatically call the appropriate agency near the vicinity of the incident for quick response. The GPS data will be continuously forwarded to the command center to determine the location of the user if in case movement takes place.

C. Send Location Module

The Send Location to Family is an added feature which allows registered family members to receive the user's location based on GPS Data. If the user is in imminent danger, he/she can use this feature to allow his/her current location be sent to his family members before his/her cellphone's data is cut off due to cell site communication problems (extreme weather, earthquake, poor signal) and battery drainage. This would give the family members the exact location of the user before his/her signal is lost for faster response. The same data will also be sent to the command center as a form of SOS.

The home screen of the application will include disaster reports sent by other users and flash reports sent by the command center on impending disasters. The latter includes reports but not limited to public storm signal, tsunami, fire etc. Disaster reports are those sent by other users through the Send Report Module. This allows users to know incidents occurring near their vicinity. To provide integrity to the reports sent to the command center, the user has to register by means of his/her Facebook account.

V. SCREEN SHOTS



(a) *(b)*

Fig. 2. *Log-in Module*

The images above are the (a) Log-in screen of the application (b) and the report module used for sending help. Users will have to log-in by synching their Facebook account to the application. When the user clicks Register/Login Using Facebook, the Facebook Integration screen approval will appear.

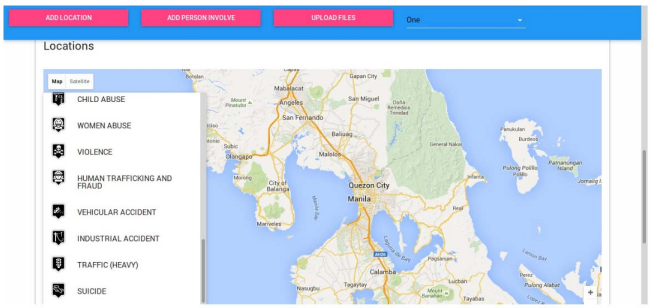


Fig. 3.0 *The Web A*

Figure 3.0 represents the web application that are seen by the administrator or the command center. All reports provided by the users are seen in the map in real time. Respondents will be able to determine immediately where the help is coming from therefore reducing the time spent in disaster response.

VI. RESULTS AND CONCLUSION

Smart phones and social media play a vital role in our lives today as it permits connectivity in the community regardless of space. As previously mentioned, Smart phones are increasingly used throughout the Philippines due to the increase of local manufacturers of smart phones whose prices are far less cheap than those of its counterparts abroad.

The AppLERT was built using Android SDK and Laravel with ReactJS. The app was eventually installed in an Debian 8 for testing running in a Cherry Mobile Flare S4 ANDROID OS VERSION Lollipop. The smartphone was selected primarily because of its GPS capability. The web application on the other hand was programmed using Laravel and ReactJS. It utilizes the Goggle Map API for the visualization of the map. Initial testing revealed it is able to determine the correct location of the user.

The AppLERT, if utilized can help the community in times of crises, ordeal whenever disasters or incidents take place. The application can serve as a medium that permits the victim to get help from the responders provided that an internet (data) connection is available. By giving emergency responders the right information using multimedia data (picture) and the inclusion of GPS tracking data, finding the victim and saving him/her from more harm that might come while waiting for a response unit will be lessen. In addition, the Facebook integration will allow more readers notice incidents taking place in an area so that it can be avoided. The posts will be seen through newsfeeds covering the area where the disaster/incident is taking place.

The Literature has provided us that smartphones can now be used to save lives. GPS tracking is now an essential part of any smartphone devices in the country that permits proper identification of areas where a victim in need of help is.

In some studies and existing applications regarding emergency management also revealed that having an additional multimedia information to deliver comprehensive reports on incidents would greatly assist emergency manager in making a better assessment of a disaster situation and perform efficient and timely responses correspondingly. Furthermore, due to its portable and ease-of use characteristics, mobile devices have been proven to be a must-have utility in disaster management areas, especially when considering quick emergency response.

VII. RECOMMENDATIONS

As for the recommendations, the system can be integrated with real time mapping for emergency incidents not only locating a user in need but also allowing posting of warnings/reports of incidents occurring along streets and places allowing them to get to safety through the app and Facebook. The Mapping can provide visualization techniques applied in emergency cases and other common environments and phases where they are needed.

For future works, it is greatly suggested the testing of the application in a community to see the effectiveness and efficiency of the system. The paper has presented a development of an application which could be utilized during disasters. Integrating such platform, as indicated in literatures, could be used as part of a bigger disaster preparedness and mitigation planning.

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