A Mobile Application for Women's Safety: WoSApp

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Abstract—The safety of women is a concern of increasing urgency in India and other countries. The primary issue in the handling of these cases by the police lies in constraints preventing them from responding quickly to calls of distress. These constraints include not knowing the location of the crime, and not knowing the crime is occurring at all: at the victim's end, reaching the police assuredly and discreetly is a challenge. To aid in the removal of these constraints, this paper introduces a mobile application called WoSApp (Women's Safety App) that provides women with a reliable way to place an emergency call to the police. The user can easily and discreetly trigger the calling function by shaking her phone, or by explicitly interacting with the user interface of the application via a simple press of a PANIC button on the screen. A message containing the geographical location of the user, as well as contact details of a pre-selected list of emergency contacts, is immediately sent to the police. This paper describes the application, its development, and its technical implementation.

Index Terms—Humanitarian Technology, Women's Safety, Smartphone Application

I. INTRODUCTION

A report compiled by the World Health Organization in 2013 stated that 35 percent of women around the world have been victims of sexual violence[1]. The National Crime Records Bureau of India reported that a woman is assaulted in the country every three minutes[2]. The police are not able to help, as information about the crime does not reach them in time, if at all.

With the number of criminal acts towards women increasing at such an appalling rate, it is evident that a method is required from the technical community to ameliorate the situation.

WoSApp is an attempt to provide women safety by enabling them to place an emergency call to the police in a quick, discreet way. The use of the application is divided into three steps: input of emergency contacts, triggering of the alarm, and transmission of an emergency message and call to the local police. The message contains the user's current geographical location, as well as details of the user's emergency contacts.

At the police station's end, a system is set up to receive these messages and calls, and automatically plot the location of the crisis on a Google Maps interface. The police can quickly dispatch officers from the station nearest to the user, and transmit the message to the emergency contacts.

The Mangalore Police Station (Karnataka, India) has expressed support for this initiative, and has dedicated a helpline to the emergency calls placed using WoSApp. The application was developed for Android devices, and is planned to be extended to other platforms in the future.

This paper describes the development and usage of the application, as well as its technical implementation and future prospects and proposals.

The remainder of the paper is organized as follows. Section 2 describes related work in mobile applications targeted at improving women's safety. Section 3 describes the problem statement and its solution. Section 4 details the application development process. Section 5 traces a typical use case for the application, from application download to the police station interface. Section 6 discusses the proposal to merge WoSApp with Project Jagriti, a crowdsourcing application for the reporting of child abuse[3]. The paper then closes with Conclusion, Future Work and References.

II. RELATED WORK

There has been prior work with the goal of improving women's safety, including work in mobile applications. Below are discussed briefly three applications with a purpose similar to that of WoSApp.

A. iMace[4]

This mobile application produces a high-pitched alarm upon shaking of the phone, and notifies friends and law enforcement of the location of the attack. It also sends a snapshot of the same using wireless networking techniques.

B. VithU[5]

This mobile application sends a message to pre-selected contacts when the power button of the phone is pushed twice. The message contains the user's GPS location, and is sent out every two minutes with updated coordinates.

C. Nirbhaya[6]

This mobile application sends a message with the user's GPS coordinates to a list of emergency contacts when a button on the app screen is touched. The coordinates are updated and resent with every 300m change in location.

Although other applications that aim to provide safety to women exist, WoSApp stands apart in that it has a direct tie-up with the local police, which can be extended as the area of use of the application expands. Additionally, it is free of charge and open-source, allowing improvements and customizations to be made easily for speedy replication of the application in other jurisdictions.

III. PROBLEM AND SOLUTION DESCRIPTION

A. Motivation

Every day, women are assaulted, molested and violated on the streets of their own cities. Violence against women happens all over the world, particularly in developing countries. This violence can take many forms: physical, sexual, or psychological.

Physical assault on women involves the use of force to injure or endanger them. Forms of sexual assault include rape, human trafficking and forced sexual exploitation, genital mutilation, child marriage and intimate partner violence. Psychological abuse results in psychological trauma, which could manifest as chronic depression, anxiety, or post-traumatic stress disorder. The above all have severe consequences on a woman's physical and mental well-being.

A United Nations report in 2014, surveying previous findings, revealed that over 1 in 3 women worldwide have been victims of either physical or sexual assault[1]. 4.5 million people are victims of forced sexual exploitation, of which 98 percent are girls and women[7]. It went on to report that women in cities, primarily in developing countries, are twice as likely to be attacked in any form than men[8]. Even in the European Union, about 50 percent of women have been sexually harassed since the age of 15[9].

In India, a study conducted by the National Crime Records Bureau from the Ministry of Home Affairs of the Indian government showed that over 44500 women and 33500 children were assaulted in 2012[2].

B. Problem Statement and Choice of Solution

The aim of this project, therefore, is to effectively build a strong platform for woman and child empowerment in our society. We endeavored to achieve this by creating a mobile application that:

1) Has a straightforward user interface for speedy use
2) Ensures the alert message is sent to the police
3) Allows the user to activate said alert discreetly
4) Monitors locations where crises are taking place and reports the same to the police (who in turn notify the user's emergency contacts)

The choice of creating a mobile application to achieve the problem statement was due to the fact that a mobile phone is normally carried on one's person, more so than a separate hardware device that could be misplaced. Additionally, in an uncertain situation, WoSApp's discreet trigger leading directly to an official police helpline is a more feasible solution than explicitly attempting to place a call to a friend or family member.

IV. APPLICATION DEVELOPMENT

A. Software Development Process Model

The development of WoSApp followed the Rapid Application Development (RAD) model proposed by James Martin[10]. Three main properties of the RAD model are listed below:

1) Fast development and delivery
2) Low cost of development
3) Acceptable quality end-product

The model uses iterative, evolutionary prototyping, which suited the circumstances of development well. The high speed of development and the consistent deliveries enabled the team to collaborate amicably with the Mangalore police.

The application was divided into two components: a front-end user interface and a back-end functional unit. The user interface was developed in HTML/CSS and JavaScript, with native platform code in Java waiting for the user to engage the alert mechanism. The back-end was implemented using PHP and JavaScript, alongside MySQL for database querying. These two components were then fused seamlessly, communicating via JSON.

B. Interface Design

The user interface of the application was designed keeping in mind the need for simplicity. The use of the application was intended to be straightforward, as it would be accessed primarily in times of crisis, apart from the initial entering of emergency contacts.

The home page of the application has three distinct buttons: PANIC, Configure Settings and About. The Configure Settings button takes the user to a settings form, wherein she can input her name, phone number, and the name and phone numbers of her emergency contacts.

The simple form allows the user to easily enter the required details. The bright, clear-cut buttons on the home page, color coded for emphasis, facilitate speedy use. It is worth noting that in most use cases, the user would not open the application and press the PANIC button on the user interface, but would instead shake her phone to activate the trigger subtly.

The interface at the police station has a Google Maps map that can be zoomed in to detect the exact location of the user in distress. It maintains records of the phone number, coordinates and the emergency contacts of each user who had triggered the alarm. The active records are highlighted, and all records can be edited or deleted by the police if so required. Database records can also be added, exported and searched through.

C. Technologies Used

The development of WoSApp made use of the technologies below:

- HTML/CSS and JavaScript for the front-end user interface, and

- Java for native platform code to enable waiting for the trigger

- PHP for server-side processing and for integration with the database

- MySQL for management of the database

- JSON for communication between front-end and back-end of the application

- PhoneGap API for necessary plug-ins

- Android SDK to build an application supported by Android

D. Technical Implementation

The user interface of the app was coded in HTML/CSS and JavaScript. The PhoneGap API from Cordova[11] was used for plug-ins to implement the existence of the application as a background service (Red-Folder[12]), to enable shake detection (A. Gibson[13]), to send the emergency message to the police (Apache Cordova[14]), and to place the emergency call. For the trigger mechanism, native Java code was used.

The back-end of the application was implemented using PHP, JavaScript and MySQL for database querying. It consists of a portal that receives the encoded text message sent from the user's phone and stores it in a database. The database is queried and the GPS coordinates are plotted on a Google Maps interface. To alert the operator, an audio alert system is included at the receiving portal.

An open-source model was followed while developing this application, allowing rapid implementation and deployment elsewhere of the platform developed without the need to reinvent the entire system.

V. USE CASE FOR THE APPLICATION

There are four main phases of operation of the application: input of emergency contacts, activation of the service, immediate transmission of the emergency message and call, and response from the police station.

A. Input of Emergency Contacts

When the user opens the application for the first time, she is asked to enter her emergency contacts so the same can be stored. The emergency contacts can be chosen from the existing contact list, or can be entered anew. Thereafter, the application will run as a background service which can be triggered in case of an emergency.
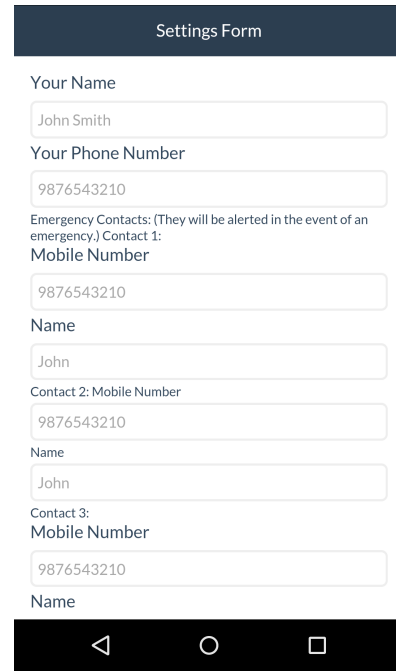

Fig. 1. Screenshot of WoSApp's Contact Input Activity

B. Activation of Service

The triggering of the application is simple and swift. On shaking the phone 40 times consecutively (within about 8 seconds) or on pressing the PANIC button, the background service immediately spawns a new process which handles the sending of the emergency message. After this time period, the count is reset.
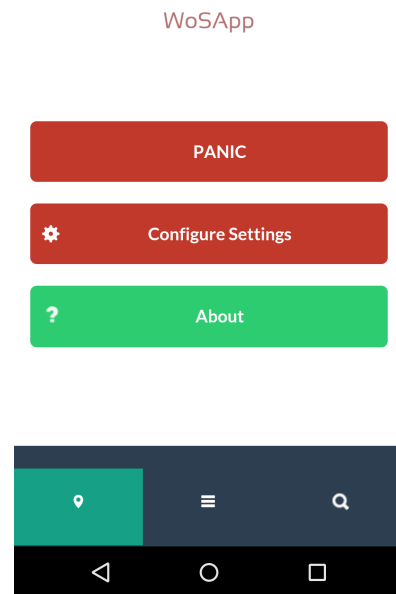

Fig. 2. Screenshot of WoSApp's Home Activity

C. Transmission of Emergency SMS and Call

When activated, the application automatically sends a message to the police via SMS, containing the user's current geographical location and the list of pre-selected emergency contacts. The police then pass on the message to the emergency contacts. SMS was chosen over mobile data as the mode of communication as it is more reliable, functioning even in areas with limited mobile connectivity.

Immediately after the message is sent, the application automatically places a call to a dedicated helpline provided during the initial phase of the application by the Mangalore Police (or a suitable local police station when the application grows beyond the Mangalore area); the call will be taken and recorded to use for clues or as evidence. The call is placed after the message has been sent to ensure the lines of communication are not blocked before the user's location is made known to the police and hence to emergency contacts.

D. The Police Station Map Interface

The police station has a Google Maps interface which pinpoints each location where an emergency is taking place at that point of time. This allows the authorities to take swift action and dispatch policemen from the police station nearest to the location of the user. This feature facilitates rapid response times, which is critical in cases involving women's safety.
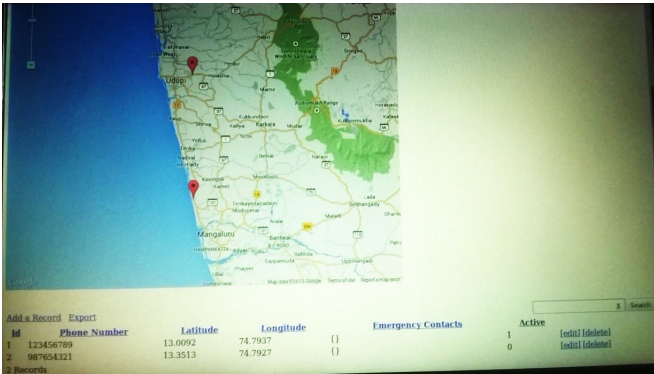

Fig. 3. Photo of the interface at the police station, taken during development

VI. MERGE WITH PROJECT JAGRITI

After discussions with the Police Commissioner and Superintendent of Police of Mangalore city (Karnataka, India) it has been decided to merge WoSApp with an application developed in a previous work from 2014 called Project Jagriti[3]. Project Jagriti is a combination of an application and a web portal that provides users with a simple, easy-to-use platform to report child labor and child abuse. Incidents reported go to the Child Welfare Committee of that district (a government-appointed body).

WoSApp will be linked to Project Jagriti via a "Report Child Abuse!" feature, which allows the user to report cases of child abuse and child labor: the primary aim of Project Jagriti.

VII. CONCLUSION

This paper described a mobile application we have developed to promote women's safety: WoSApp.

WoSApp is a straightforward method for a woman to place an emergency call when in a crisis. All the user must do is shake the phone repeatedly, and an emergency message containing her GPS coordinates and pre-selected emergency contacts is immediately and automatically sent to the police, after which a call to a dedicated police helpline is placed. No user intervention is required whatsoever, in case it cannot be easily given. The police receive an audio alert and the location of the crisis is plotted on a Google Maps interface at their station.

This clear-cut sequence of events ensures that help can be provided to women in crises as quickly as possible. Our application ensures that questions regarding the user's location or whom to contact, as well as confusion at police stations regarding where the officers must be dispatched from, do not arise.

As college students, we strongly feel that it is our moral responsibility to give back to society in the best way we can, and that desire shines strongly through the application we have created. We are committed to reaching as many women and children as possible via these abuse-prevention services in the hopes of truly making a difference.

The beta version of the application was circulated in our college and was received well by the female students. They found the concept reassuring and the application interface easy to use.

VIII. FUTURE WORK

Apart from linking WoSApp with Project Jagriti, we have multiple plans for the further development of our application.

Firstly, once the application is being used in greater capacity, a real-time database will be compiled of reported cases that will be used for analytics to evaluate the relative safety of different areas. These areas will be displayed on a map in the application, in case the user wants to check the safety of an area before she visits it.

Secondly, the app will be able to send messages to the emergency contacts as well. At the moment, the message is sent only to the police, who then decide whether to inform the emergency contacts based on the legitimacy of the call. This intermediate step could be bypassed, if allowed by the protocol followed by the police in that area.

Thirdly, the trigger will be changed. Currently, the emergency message and call are automatically triggered by shaking the phone 40 times consecutively, within about 8 seconds. Although the accidental occurrence of this event is unlikely, it is still possible, so we plan to change the trigger to shaking the phone 40 times consecutively while holding down either volume button of the phone, or similar.

Finally, we plan on extending the platform support of WoSApp to iOS, Windows and Blackberry OS (it is currently supported only by Android). The application could also be

extended from women and child safety to a generalized emergency SOS broadcast, with support from the police in terms of providing corresponding helplines.

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