# **CHAPTER 1**

# **INTRODUCTION**

## **Rationale of the Study**

In the second quarter of 2012, a total of 4210 vehicular crash-related injury cases were reported in the Philippines (ONEISS, 2012). Fifty-one percent of those cases were caused by motorcycle accidents (ONEISS, 2012). Ten of the sixteen, roughly sixty-three percent, dead-on-arrival cases were motorcycle riders. In the first quarter of 2013, the percentage of motorcycle accidents to total vehicular accidents increased to fifty-nine percent, despite the fact that there were less vehicular crash-related injury cases reported (ONEISS, 2013). The percentage of dead-on-arrival motorcycle riders increased to sixty-seven percent (ONEISS, 2013). These findings emphasize the rising number of vehicular accidents relating to motorcycles.

The age group for fifty-four percent of total people involved in accidents were ages 20 until 44 (ONEISS, 2013). Meanwhile, as reported by the statistic group Nielsen, young adults between the ages of 25 and 34 have the highest smartphone penetration at eighty-one percent (Nielsen, 2013). The age group that uses smartphones most frequently – 25 to 34 years old – as well as the age group of people involved in vehicular accidents – 20 to 44 – are roughly the same.

Smartphones have increasingly become more sophisticated and powerful with the inclusion of sensors such as accelerometers, gyroscopes, cameras, and microphones (Robin et al., 2010). Additionally, the leading mobile operating system, as of 2013, with fifty-three percent of smartphone users, is the Android operating system (Nielsen, 2013).

The researchers utilized these sensors as well as the open-source Android operating system to develop an application that will detect the occurrence of a vehicular accident, specifically motorcycle accidents. The application detects external forces on the smartphone using the accelerometer, determines the orientation of the smartphone using the gyroscope, and, if an accident is detected, sends a message to specified contact numbers. The general objective of the research is to be able to notify immediate contacts of the person involved in the accident.

## **1.2 Statement of the Problem**

### **1.2.1 General Objective**

The study aimed to design an application on smartphones using the Android operating system as a post-vehicular accident detection system.

### **1.2.2 Specific Objectives**

1. Determine the different scenarios of motorcycle accidents
2. Implement existing algorithms to detect changes in forces applied to the smartphone and its orientation
3. Develop motorcycle accident detection application
4. Test and Evaluate application

## **1.3 Significance of the Study**

Motor vehicle accidents will always be present in every day commute. Although steps may be taken to reduce the overall percentage of accidents, one can never completely diminish its occurrence. Many of these accidents may also result in injury to the driver of the vehicle or the passengers, leaving them unable to call emergency dispatchers or their loved ones. In addition, the time between the accident and when an immediate contact is notified has significance in determining whether a person will suffer prolonged injuries. Quick response to an accident, or at least notifying an able person such as a family member, can help reduce such injuries. Therefore, this research benefits:

**Motorcyclists** The majority of motor vehicle accidents are related to motorcycles. Many of these accidents also resulted in dead-on-arrival cases. A family member that is notified of the accident may be able to transport the driver or passenger of a motorcycle to the nearest hospital if injuries are minimal and if allowed by medical authorities.

**Youth Demographic** The majority of motorcycle accidents occurs with younger age groups; people who are in their mid-20s to early-30s. Although there may be many reasons why measure of central tendency point to this age group, there is also other statistic that states most users of smartphones also revolve around the same ages. A younger motorcyclist is more likely to benefit from an “accident detection” application.

**Close Relations** Immediate family members and close friends will be notified of any positive detection and they may take appropriate action; whether to contact emergency dispatch, travel to the accident site themselves, or provide any other additional support. Being aware of any accidents can help ease family members.

**Computing Field** A motorcycle accident application will be made available for future improvements. This can be a starting point for future researchers who want to improve upon the application, such as integrating it with systems for emergency vehicle dispatchers.

## **Scope and Limitation**

The researchers expected the following topics and preconditions to be within the scope of the research: Statistics show the Android operating system is now the leading operating system for smartphones. A wider audience, those using Android, can benefit from an accident detection application if and when the application is developed. In addition, it would take a much larger team and effort to test and develop an application for both the Android OS and Apple’s iOS, the operating system for iPhones; effort that is outside the time constraint allowed to the researchers. Therefore, the Android Operating System was the foundation of this application. The official Android SDK available from the Android Developer website was used, as well as the standard Android installation on the smartphone.

Motorcyclists are the most prone to motor vehicle accidents, even accidents resulting in fatalities. Therefore, the scope of the research is set around motorcyclists, and *not* all motor vehicles; meaning cars, trucks, public utility jeepney (PUJs), etc. are excluded from the research. It requires too much effort to test the application within the setting of a car, a truck, a PUJ, etc. The researchers focused their efforts surrounding the leading reported cases of motor vehicle injuries, which are motorcycle accidents.

In the event of an accident, the application is able to locate the coordinates of the user and transmit those coordinates to the designated contacts using Google Maps.

The researchers assume that the users of this application will be under a data plan, or own adequate “load”, to allow the transmittal of SMS and mobile data. There are a variety of data plans accessible to the public that allow for a fair amount of data to be used. “Globe [Telecom] has provided subscribers various PowerSurf plans with data caps ranging from 20MB up to 1GB depending on their prices” (Noda, 2013).

The researchers assumed the following as limitations of the proposed study:

Many owners may still be using smartphones with an older version of the Android Operating System. These phones may or may not have the hardware to support the latest Android OS version. Therefore, the researchers assumed that users of the application will have hardware capable of supporting the more recent versions of the Android Operating System, arbitrarily from version 4.0 (“Ice Cream Sandwich”) and beyond.

If the smartphone were to be damaged during an accident and rendered incapable of use, the application will not be able to function as intended.

Areas of the city may or may not be included under the user’s data plan coverage or GPS coverage

During testing, the smartphone was subjected to physical manipulations with either a dummy or a participant. However, no live testing (using actual motorcycles in motion) was conducted due in part to the safety of the participant.