**Universiti Teknologi Mara**

# ROADGUARD: GPS-BASED ACCIDENT DETECTION AND SOS ALERTS IN REAL-TIME

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# ABSTRACT

Road accidents in Malaysia claim the lives of approximately 1.35 million people annually, with an average of 3,700 people every day. In road accident events, providing accurate location data is the most critical detail for first responders as it allows them to reach accident sites quickly, reducing any medical delay that could jeopardize victims' chances of survival. Malaysia's Emergency Response Services, (MERS) 999 however, depends greatly on human communications to relay essentials information like accident locations and other victim details. This reliance on human communication rather comes with a lot of inefficiency during emergency situations where the callers might face struggle speaking properly due to shock, panic, language differences, as well as lack of geographical knowledge. These factors hinder effective communication, causing missing or inaccurate information, preventing crash victims to receive quick medical aids. To tackle these challenges, this project proposes RoadGuard, a mobile application developed using Android Studio and Firebase, designed to improve emergency response times by utilizing GPS technology for real-time accident reporting directly to MERS 999. Through fast and accurate GPS location of accidents, RoadGuard is able to provide crash victims with quick medical aids, enhancing their survival rates. RoadGuard enables its users (both accident witnesses and victims themselves) to report accidents and send SOS alerts directly to MERS 999 with a single touch, automatically transmitting their GPS data. RoadGuard introduce an alternative way of accident reporting without needing for human communication. Beyond its role in emergency response, RoadGuard also serves as a data collector that gather data on accident-prone areas, providing insights to road safety authorities for necessary improvements. The system also includes a web dashboard for admin and emergency operator use, enabling live monitoring and operator responses. Testing was conducted on a real Android device, and usability was evaluated using the System Usability Scale (SUS) through five participants. The results showed strong user satisfaction, with most users agreeing the app was simple, consistent, and effective.

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# CHAPTER 1

# INTRODUCTION

This chapter will act as an introduction to the project: RoadGuard mobile application by providing the background of the study that will lead to problem statement, research questions, research objectives, scope, significance of study, expected outcome, and limitations of the project.

## 1.1    Background Study

Road safety is a critical concern globally, with millions of accidents occurring each year. Despite efforts in overcoming these areas, significant gaps and difficulties still persist. Ehsani, Michael, and MacKenzie (2023) highlight that these challenges come from risky infrastructure design, lack of vehicle safety, and lack of providing fast and effective care for crash victims. These obstacles underline the complexity of creating a truly safe driving environment. In Malaysia, the Ministry of Transport reports similar alarming statistics where 1.35 million lives are claimed in road accidents annually, or 3,700 people every day on average. The economic impact of road crashes is also significant for most countries, estimated to amount to roughly 3% of their Gross Domestic Product (GDP) (Ehsani et al., 2023).

Based on Official Portal of Malaysia's Government, Malaysia Emergency Response Services (MERS) 999 is system that unifies the emergency services of five agencies: the Royal Malaysian Police (RMP), the Fire and Rescue Department of Malaysia (FRDM), the Department of Civil Defence (DCD), the Malaysian Maritime Enforcement Agency (MMEA), the Ministry of Health Malaysia (MOH), into a single Information and Communication Technology (ICT) platform. The main function of the system is to handle and channel emergency information and calls through a single