

Development of Notification System for Traffic Accidents in Thailand

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Abstract—The traffic accidents are concurrent in several countries, which contribute to the mortality rate. In this work, notifications system for traffic accidents were developed by a mobile application (app). This application can help the police, fire brigades and the nearest hospitals to support the people who suffered the accident. As data collection for the creation of the software functions, a survey was carried out with users. The functions applied in the application were programmed with the Dart language and generated under the flutter tool in order to be able to distribute it on different platforms such as Play Store and AppStore. The results obtained were the most anticipated since the application fulfills its function, thus reducing deaths and improving the speed of attention to traffic accidents and thus saving a life that is in danger.

Index Terms— Application, Accident Traffic

I. INTRODUCTION

Nowadays, traveling is a major problem when unexpected events occur during the journey, such as flooding, road construction, or local festivals causing traffic accident. Travelers can only know about events when they encounter them, hear about them from people nearby, or see the news on TV. This lack of precise information on where these events are happening, thus wasting time in traveling. For these reasons, managing traffic accident and planning routes to avoid congestion in intelligent transportation systems (ITS) has become one of the main focuses of management research. To address this issue, individuals in various locations can become aware of events when others report them or use mobile devices to take pictures, provide descriptions, share locations, and access the internet. By developing an application that allows travelers to encounter and report events occurring in different areas.

Traffic accidents have been one of the main causes of the human death rate over for decades. There are several the traffic accidents were not treated in time, taking patients to critical conditions and even causing death. Also mention that passersby are not always aware of all the help centers that are close to them, this causes them not to know where to call or alert when an accident occurs that requires immediate attention. According to the authors [1], proposes the development of a panic button to immediately alert the relatives of the injured person about these traffic accidents. Any passerby can use this tool to alert family members and help centers. The author mentions that this tool will contain all the patient's data, such as blood type, personal data, location, close relatives, among others.

Regarding the aforementioned, this research developed a mobile application that capable of immediately notifying traffic accidents to the nearest centers according to the

geographical location of the mobile device. The alert will be sent to aid centers such as the police, hospitals and firefighters, and thus those involved obtain the fastest attention from the nearest center. Any passerby can use this application on their mobile device and anyone can alert the centers.

The mobile application must be scalable and must be developed on multi-platform technologies to have a single code and this can be implemented in different operating systems. The mobile application must make use of cloud computing to reduce costs, have instant access to data and high scalability, thus allowing more clients to be connected and make their requests [3]. The information system must alert safely and reduce the margin of error so that doctors can make better documentation, thus keeping medical care running.

The objective of this research work is to ensure that this application can be used by any passer-by to be able to report traffic accidents to the nearest help centers and thus give immediate support to people who suffer accidents. Users will not need special permissions to use the application, nor will they have confidential information about patients. Another important aspect is that it is compatible with all current mobile devices and with any operating system.

The most important thing for the development of the mobile project is that can provide help to people who suffer a traffic accident, so that passers-by who use the application can provide immediate help to the injured.

To design and develop an application that can alert users about their location and traffic incidents on pedestrian paths, report incidents through photo capture, describe what has happened, provide coordinates, categorize incidents, receive news updates, traffic events, traffic congestions, road constructions, weather conditions, road closures, warn of dangers, parking information, accidents, and flooding based on incidents encountered by users. Users can also investigate traffic accident by categories and areas clearly and promptly.

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II. RELATED WORKS

The research work focuses on a study of the notification system of traffic accidents through a mobile application to help people who occur or witness an accident. There are an application or emergency call to help the injured, so they can notify the nearest health centers and be able to provide support to passersby and injured.

A car accident, there are several preparations to provide first aid, a proposes a mobile tool that has a panic button to alert or notify the relatives of the injured in traffic [1]. According to the author, the application has the necessary information to allow any passerby to be the first to help in this situation. In addition, [4] proposed an emergency happens. The citizens can be very helpful to notify and provide support to people involved in an accident or crisis for collect information quickly and easily in which it can be transmitted through different communication channels either with GPS, WIFI or cameras that can help in an emergency.

On the international governments have developed an emergency notification system in which you can obtain updated and accurate information from the beginning of the accident and in turn notify how many people were affected by the accident, in order to provide you with a better support for the victims.

[2] has developed several technology-based solutions to reduce traffic accidents during emergency response. For example, several vehicles now have an integrated system that detects crashes and notifies Emergency Management Systems (EMS) seconds after the incident. Automatic Accident Notification (ACN) systems built into some vehicles provide paramedics with information about an accident prior to their arrival at the scene. These systems are typically available in modern automobiles and are activated when the air bag is deployed (for example, the Ford SYNC 911 assist system) or the fuel pump emergency shutoff is activated. In some cases, the system is activated even without the deployment of an airbag, using sensors placed around the vehicle (for example, the GM On Star system). Some of these systems send a distress message to the police with the location of the victim when an accident is suspected. In some cases, car occupants are also connected by phone to emergency medical hot lines until help arrives.

Therefore, an electronic device is proposed to install in the vehicle capable of detecting when the driver is unable to control the car. This device is also capable of sending text messages and obtaining the exact location using GPS. When the device detects an accident, it sends SMS to the driver's family [5], the ambulance, the police and the pre-installed numbers of nearby hospitals.

According to [6], most people are very busy and have little rest, and this lack of rest is the reason why someone would be drowsy and indicates that more than 60 percent of adult drivers are drowsy. a third have fallen asleep, for this reason it uses technology and implements an application capable of monitoring the person's heart rate, and if the heart rate falls below a certain range, alarms will be activated to wake up. The device to use is a watch with a heart rate sensor, the results of this means are that the watch will alert the driver and he will make the decision to continue or stop to rest.

The authors discuss how people used Twitter or Skype to share positions, texts and photos and to keep in touch with their families. One of Ich Iguchi's most interesting findings was the impressive amount of information shared on Twitter that forced the Japanese government to open a specific

account for this event and promote the use of predefined hashtags [4]. Consequently, to avoid connectivity problems, Wi-Fi hotspots in fast food restaurants, hotels, public infrastructures and even private flats were temporarily opened. In this way, citizens had the possibility to collect a large amount of information, which included not only text messages, but also photos, videos and GPS positions.

[5] mentions, that an application can help to avoid an accident and prevent and thus save lives from danger. According to the author's information [6], this device will help reduce traffic accidents, and even before they occur, since it has sensors that prevent collisions or accidents.

Mention the author [7], that several studies found that human factors are the main reason for traffic accidents, with speeding being the main factor. In Tanzania, 74% of accidents that occurred in 2010 were caused by human factors. Other factors include vehicle mechanical and road conditions.

Likewise, another of the authors talks about the literature review that has been conducted on the nature of road maintenance management perspective [8]. These reviews include road defects and knowledge of the mobile application and its implementation in the road maintenance and control management system. This document aims to inform about the development of an Emergency Accident Alert mobile application to send an accurate alert and accident notification to the emergency call center [9].

The author [10], states that around 1.3 million people die each year and 50 million suffer a permanent disability due to traffic accidents and all these causes are related to unsafe driving. The application developed collects data during the trip and recognizes excessive speed and sudden acceleration, fuel consumption and sudden braking. By using this application, drivers learn to drive more safely.

The author argues on a methodology and mobile application to monitor, analyze and recommendations of the driver based on behavior and prevent traffic accidents using a personal smartphone to be able to monitor the driver's behavior, phone cameras and built-in sensors such as WIFI, GPS and microphone are used, The methodology supports the following dangerous driver online states: distraction and drowsiness, as well as a dangerous offline state related to a high pulse rate [11], implement the system for Android smartphones.

Finally, in the entire review of the literature saw that several authors of several articles developed and implemented an app where it shows a help to the injured or that prevent traffic accidents and thus take care of the lives of others, since this way we can save a life and our application in which it was developed is for passers-by who witness an accident to notify the nearest help centers and thus they arrive immediately at the scene of the events in which the health specialists will help them.

III. METHODS

In this section, the implementation of the methodologies was carried out. The methodology that was implemented is the System development life cycle. we apply technological tools to develop the prototype of the mobile application. The application can notify traffic accidents through an emergency or alert button, to help the injured and also contact the nearest aid centers, since the most frequent reasons why these accidents occur are due to speeding, distraction and alcohol consumption.

A. Scope

An application designed for sharing daily event coordinates offers the following functionalities:

- Registration through Google login for users.
- User profiles can be customized.
- Users can share events by creating posts, where they can include topics, descriptions, photos, and location details.
- Ability to delete posts.
- Viewing posts in Google Map format.
- Ability to click on a Marker in Google Map for post details.
- Direct navigation to events via Google Map application.
- Enlarging photos to full screen with a simple click.
- Exploring other users' profiles.
- Liking posts.
- Commenting on posts.
- Saving posts.
- Reporting inappropriate posts.
- Filtering posts by categories like News Feed, Events, Traffic, Weather, and more.
- Filtering posts by date and time ranges.
- Specifying the location of mobile devices.
- Location search during post creation.
- Viewing own profile.
- Accessing saved posts.
- Accessing application details.
- Sending comments to the developer.
- Setting the language preference

B. Program specification

1. Hardware Specification:
 - HP Notebook Computer System
2. Software Specification:
 - Operating System
 - Android Operating System
 - Microsoft Windows 10 Operating System
 - Application Programs
 - Android Studio Program
 - Google Chrome Program
 - Android Emulator Program
 - Flutter Framework
 - Database Management System Software
 - Firebase Realtime Database (NoSQL)
 - Firebase Firestore Database (NoSQL)
 - Firebase Storage

C. Steps for program development:

- User login functionality is achieved through Google sign-in, utilizing the Firebase Authentication API for accessing and retrieving user information. This allows users to log in using their Google Sign-in account.
- The creation of a post upload feature enables users to post and upload content, such as images of traffic jams, which are stored on the Cloud Firestore API.
- Posts and comments made by users are displayed as markers on a map based on the geographic coordinates provided during post creation. Data retrieval involves utilizing the Cloud Functions API to interact with Firebase Firestore and Firebase Realtime Database APIs. Information retrieved includes post data, like counts, number of commenters, and poster profile

details. Clicking on a marker on the Google Maps map triggers a Bottom Sheet Dialog button displaying detailed post information.

- Likes and comments by users are stored in the Firebase Realtime Database API.
- The final step involves testing the developed application on a mobile phone to evaluate its functionality, identify and rectify any errors. Gathering user satisfaction and performance data over a specific timeframe aid in the further analysis and enhancement of the application.

D. Use case Diagram

Use cases are created to support visual modelling of functional requirements. Use cases are now extensively used approaches for capturing functional requirements. The use case below, Figure 1, represent the structure of the application.

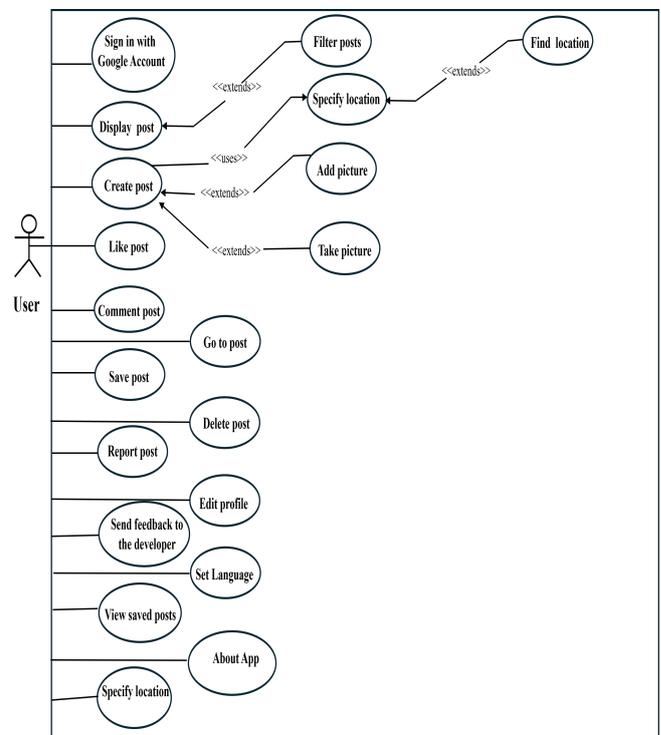


Fig. 1: The structure of the application.

E. Context diagram

The purpose of the context diagram is to analyze the application's local time data alongside dynamically displayed time coordinates shared within the application's observations (Fig. 2).

F. Entity Relationship Diagram

Entity Relationship Diagram, or ERD, is a graphical representation of an entity-relationship model that illustrates the design of a database and the relationships between data entities. This is exemplified in Fig. 3

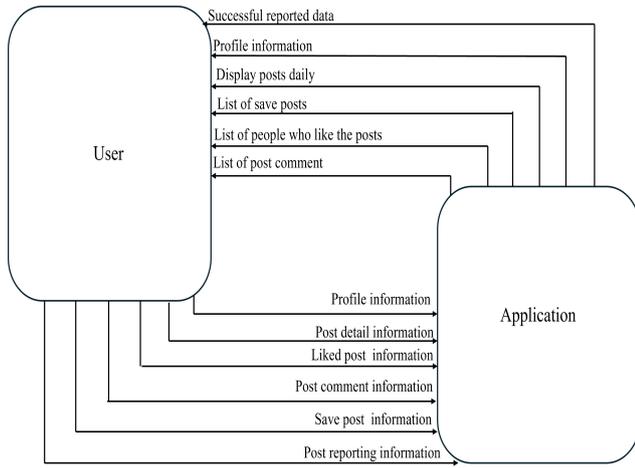


Fig. 2: Context diagram

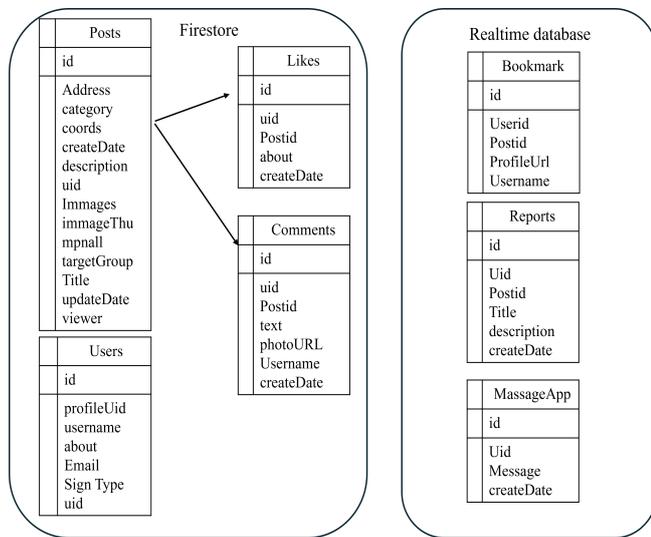


Fig. 3: Fire base entity relationship diagram

G. Data dictionary

A data dictionary is a formal document that presents detailed information found in a database, including entities such as posts, likes, comments, users, bookmarks, messages, and reports as showed in Table 1-7, respectively.

Table I
Posts entity details

Table Name: Posts		
Field Name	Data Type	Description
postId	string	Collect post ID
address	string	Keep name and address of the posted coordinates
category	string	Keep post categories
coords	geopoint	Keep post coordinates
createDate	timestamp	Keep the creation date
description	string	Keep post description

uid	string	Keep the user ID that posted
images	array	Keep image reference for posts
imagesThumbnail	array	Keep post image reference small
targetGroup	string	Keep the target group you desire to view your posts
title	string	Keep the post title
updateDate	timestamp	Keep the date of post
viewer	number	Number of viewers of the post

Table II
Like entity details

Table Name: Likes		
Field Name	Data Type	Description
id	string	Keep the liked id
uid	string	Keep ids of people who like the post
postId	string	Keep ids of the post that liked the post
createDate	timestamp	Keep the date that people clicked "like"

Table III
Comments entity details

Table Name: Comments		
Field Name	Data Type	Description
id	string	Keep the comment id
createDate	timestamp	Keep the comment date
photoURL	string	Keep the comment's picture
text	string	Keep the comment
uid	string	Keep the user id that left the comment
username	string	Keep the name of the people who left the comment

Table IV
User entity details

Table Name: Users		
Field Name	Data Type	Description
id	string	Keep user id
about	string	Keep a description about the user
email	string	Keep user's email
name	string	Keep user's name
profileURL	string	Keep user profile pictures
signType	string	Keep the login type name
uid	string	Keep uid of the login type

Table V
Bookmarks entity details

Table Name: Bookmarks		
Field Name	Data Type	Description
Id	string	Keep bookmark' s id
postId	string	Keep the post' s id
profileUrl	string	Keep the poster profile pictures
userId	string	Keep the poster' s id
username	string	Keep the name of the poster

Table VI
Message App entity details

Table Name: MessageApp		
Field Name	Data Type	Description
id	string	Keep the comment id
createDate	timestamp	Keep the date when the comment was submitted
message	string	Keep the message
uid	string	Keep the sender id

Table VII
Reports entity details

Table Name: Reports		
Field Name	Data Type	Description
createDate	timestamp	Keep the report date
description	string	Keep additional descriptions in the report
postId	string	Keep the reported post id
title	string	Keep the reported topics
uid	string	Keep user' s id for reporting

IV. RESULTS

This study design and develop an application which is a comprehensive application designed for sharing location-specific event information along travel routes, allowing users to report and access a wide range of events such as traffic congestion, road construction, weather conditions, closures, and traffic accidents. Users can conveniently post events by providing photos, descriptions, coordinates, and categorizing them, with a news feed feature included. The app facilitates easy event exploration by category and location, ensuring clear and swift access to relevant information. Key features of RuPost include the ability to log in via Google accounts (Fig. 4), create posts with topics descriptions (Fig. 5), photos (Fig. 6), locations (Fig. 7) and like post (Fig. 8). Users can engage

with posts by commenting and filtering them based on categories and time frames such as today, yesterday, and the past week



Fig. 4: Sign in by Google accounts



Fig. 5: Create posts and comments



Fig. 6: Create posts and comments



Fig. 7: Create posts by location

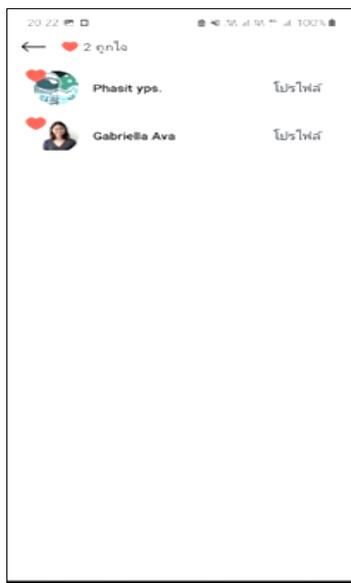


Fig. 8: Liked post

V.CONCLUSION

The application can help drivers and people who carry the application with them can be saved and rescued in the shortest possible time or before it happens and thus do not lose their lives. Since the App provides a support for people, and at the same time an improvement to prevent traffic accidents and that there are no deaths thanks to the technology that now everyone can have, be it a modern cell phone, tablet, GPS and Wi-Fi. This work gave good results for reducing the lack of attention to the injured people, that have been treated as soon as possible, thus reducing their entry into a critical state, and passers-by were the first to request help. The purpose of the request is to an emergency notification. The software developed can still be improved to optimize functions and add new functions in future versions and thus later become an App in which it provides support to all the people. It is suggested that further research be carried out in order to implement artificial intelligence in future improvements.

The application is designed to enhance user safety and community engagement by allowing users to easily report coordinates and hazardous events along their travel routes. The platform aims to foster a community where users can share and explore activities across various locations. Users can share activities along with location coordinates, enrich their posts with photos and descriptions, and interact with others by commenting and liking posts. The application integrates with Google Maps to help users discover events in different locations through an interactive map. It also allows reporting of inappropriate content, which will be reviewed and addressed by moderators. Users can provide feedback and suggestions directly to developers through the application for continuous improvement and development. The application is developed using Android studio and flutter written in Dart language, with firebase serving as its database for efficient performance and ongoing enhancements.

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