BEESAFE: SAFETY APPLICATION WITH REAL-TIME LOCATION TRACKING

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Abstract

Smartphones are now extensively used for academic, entertainment, and communication purposes. It has several applications developed to cater to the wants and needs of every user. What people have overlooked is its capability to be a self-protection tool. With Google Map API and smartphones' location service, it became possible for people to utilize smartphones for self-protection. The researchers developed an application with a real-time location tracker and notification services to provide a tool to call for immediate help during emergencies. The project may sound irrelevant as the country is in the middle of a pandemic. As the researchers gathered information and data on the crime rates even during the pandemic, the researchers concluded that there is a need for the project. This project aims to make people feel safe and allow them to feel less worried as they can monitor the location of their family members and friends through location tracking. The proponents used the internet to gather information from statistics, related literature, and related studies. Google Forms became the tool for an online survey as it is the only available platform to connect with other people for the evaluation..

Keywords: Smartphones, Safety, Google Map, Global Positioning System (GPS), Tracking, Monitoring

The increase in crime rates in the country has become a challenge for the Philippine National Police to maintain security and order. It has also become one of the concerns facing every local, especially those living in larger urban cities. Out of all the regions in the country, the highly urbanized National Capital Region has the highest number of crimes. The average monthly crime rate was around 90 per 100,000 people as of 2018 (Sanchez, 2020). Related to the matter, more and more crimes against children have occurred in the country. One that often happened is kidnapping. From year to year, the number of child abductions continues to increase (Fahmi et al.,2018). With the growing cases of crimes everywhere, one might not feel secure when going outside and even at home. In such situations, they are helpless and do not have any way to protect themselves or inform their family members, neighbors, or a police station. Hence there should be a system to serve as self-protection tool to protect them all the time (Velayutham et al., 2016).

A perfect example of a system is Suraksha – a personal safety application developed in India. The developers used Fused Location API that uses a GPS sensor of a device that provides the latitude and longitude of the user's last location. The system with GPS allows a person to keep track on family members and friends, also allows the parents to monitor their children as the system lets the person know where exactly they are (Pros and Cons: Location Tracking, 2019). Other than systems with GPS, smartphones also formed the idea of technological innovations as a driving force to control and prevent crimes. It is estimated that more than 5 billion people have mobile devices, and over half of these are smartphones (Silver, 2019). The increase in numbers of smartphones users is pretty inevitable. The reason for this increase is the rapid development of mobile applications which makes smartphones more beneficial and efficient to the users. In addition, technological innovation including smartphones with mobile applications that uses GPS tracking and tagging has been one of the main driving

forces leading to the continuous improvement of crime control and crime prevention strategies (Anderez et al., 2021).

Consequently, the proponents aim to develop an android application that can be utilized as a tool for self-protection. BeeSafe has a feature where users can send an alert to their loved ones or circle members whenever the user feel unsafe or in danger. Circle members are the list of members who joined in a particular code. Every user has a unique code that can be shared with anyone. Through this code, the user can view the shared location of their members and these members will be notified when someone in the circle sends an alert. This project will also serve as a helping hand to every parent since their children can be monitored through GPS tracking. The proponents believe that this application can be a flexible tool for anyone's protection as BeeSafe is an application that is beneficial not only to children but for everyone of any gender.

Significance of the Study

This study aims to provide a tool for sending help alerts and to monitor person's current location. Also, it targets to help the following:

General Public. The primary beneficiaries – the application would help the people feel safe in public and crowded areas as it provides a tool for calling immediate help in case of emergencies. The application allows the people within the user's contact list to view the current location.

Parents. Having a child is a precious gift and keeping them safe is the number one priority.

Future researchers. This project will benefit future researchers as they can use this study as a reference. It will give them additional insight and knowledge in terms of developing an android application. Also, future researchers

can utilize the knowledge and information presented in this project.

Related Literature

There has been a huge advancement in the Operating System since the most recent couple of years. Back in the days, the early stages of cell phones are the black and white phones but with the passage of time, cellphones were developed onto the next level which is now we call smartphones (Muhammad F, 2015). Over 80% of the people of today's generation have smartphones, including children at the age of eight below. (Sucitra.M, 2017) The year 2018 is the first year the number of smartphone users exceeded the number of phones without an operating system**.** (Alanezi et al., 2020). The most used mobile operating system of smartphones is Android that is powered by the Linux Kernel. It is expected to gain much popularity, as it is the first platform that is robust. The Google team developed Android that allows the use of Java language in writing managed code. It uses a custom virtual machine to optimize hardware and memory resources in a smartphone. All the applications have equal access to a phone's capabilities providing users with various mobile applications and services**.** (Yarrabothu et al., 2015).

Smartphones with mobile applications are considered essential for a modern-day lifestyle. Hence the number of cellphone users has skyrocketed in this decade (Sweidan et al., 2017). Smartphones are already proven useful even without the integration of mobile applications. However, mobile applications have made smartphones more efficient. Mobile applications are usually accessible through application stores such as App Store for Apple and Play Store for Android.

Smartphones are becoming more and more ubiquitous and being utilized in many fields of our daily lives nowadays (H. Guo et al, 2015). Smartphones are commonly used for entertainment such as watching videos, listening to

music, taking pictures, browsing, using social media, etc. However, with the integration of GPS and mobile applications, smartphones can be a reliable tool for self-protection. Over the years, cruel news of molestation and eve -teasing against women. Women are not as physically strong as men which leads to the success of molestation. As we consider the issue about the safety of women and how smartphones with mobile applications and GPS services can be utilized, we are now obliged to create an application to utilize the smartphone in an efficient way (Moolpani et.al, 2019).

In the study called "Women Safety Device and Application – FEMME", the researchers developed a security device specifically designed for women in emergency and distress as a preventive measure to crimes against women. FEMME is a personal safety product design to keep people safe all the time. The device and the mobile application they developed is a guide that aids the people to take preventive measures as soon as possible during unsafe situations such as being stalked while waking, attempted physical assault, unsafe neighbors, and domestic violence. In this project, an Android Application is used to find the location and send the location to the group of people stored on the phone, send SOS, and track the phone (Monisha, D et. al., 2016).

Most application today use Global Positioning System (GPS) provide location information; for example, social network site like Facebook allow users to share their location with friends and family, another common example are application that allow users retrieve weather forecast data based on their current location (J. Samual, 2015). The smart phone is only the medium via help can access, because Smartphone are definitely and easily involved like a body part in our day-to-day life and it also provide location of victim by using GPS (Global Positioning System) to bring help (Domde, Dhole, Rekhate & Goel, 2017). The concept of GPS is rooted in the field of location management. It is possible to track or monitor anyone's location with the use of GPS

(Beyens et. al, 2016). The GPS technology integrated with mobile helps make it possible to trace one's current location. For instance, if a person is missing during the organizational tour or outdoor visit, or in situations that a person is in danger, anyone can locate the missing person with the use of a smart location tracker deployed in the Android Operating System (S. Sandosh, 2019).

In the study called Suraksha: An Android App for the Safety of Women, the researchers developed an application to ensure that any women can be safe with the use of mobile application with GPS. A single click on the button inside the app turns on the GPS of the phone and sends the coordinates along with alert message to the contacts. The researchers concluded that the application they developed will be efficient especially to women as the application can be proven effective if used properly. (add another related literature)

Objectives of the Study

The application's objectives are divided into two types: the general objectives and the specific objectives which will be discussed below.

General objectives of the study

The project's primary goal is to make a person feel safe and protected using smartphones and mobile applications.

Specific Objectives of the Study

The following are the specific objectives of BeeSafe: Safety Application with Real-Time Location Tracking:

1. To make a person feel safe when in public or crowded areas.

2. To track and monitor the real-time location of family members or friends.
3. To help the authorities quickly locate the location of the person in need through the alerts sent by the users which includes the last location of the person in need

Conceptual Framework

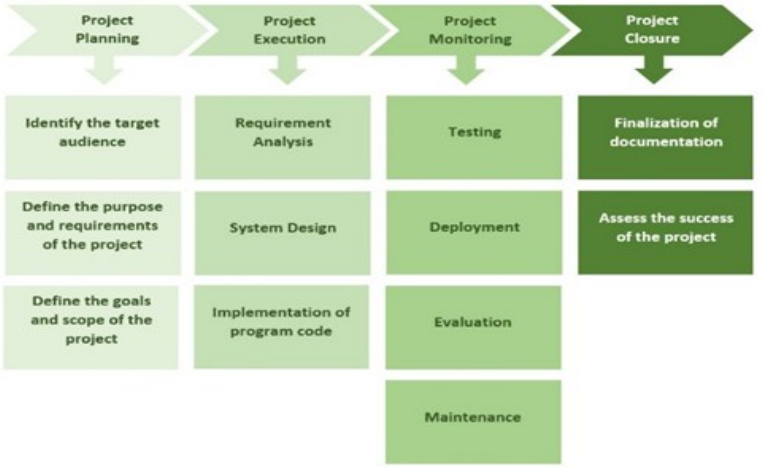

Figure 1. Conceptual Framework

According to the conceptual framework project begins with planning, in this phase the proponents gather information and data for the proposed system to assess the feasibility, plan, and schedule. This also consists of identifying the target user, the proponents should know first who are the beneficiaries as the application developed. Define the purpose and requirements of the project as well as the goals and scope. After the planning, second step is the project execution where requirement analysis, creating system design or workflow and implementation of the program code will be accomplished. Third, project monitoring, in this step the testing, maintenance, evaluation and deployment of the application is done. Maintenance will be needed to make sure that the application is working smoothly and to keep the

system healthy and to avoid future system problems. Last step will be the project closure where the researchers finalize the documentation of the research to be able to assess the success of the project

Methodology

This research employed descriptive or quantitative research method and waterfall modeling in developing the application named BeeSafe: Safety Application with Real-time Location Tracking. Descriptive research method allows research to be conducted in the respondent's natural environment, which ensures that high-quality and honest data is collected.

Sampling Procedures

The study used Waterfall modelling which involves a rigid structure that demands all system requirements be defined at the very start of a project, only then can the design and development stages begin. This is a classical model used in system development life cycle to create a system with a linear and sequential approach. It is divided into different phases which are the requirement analysis or gathering and analyzation of data, implementation or coding, testing, maintenance and deployment. Every phase has to be completed before the next phase starts and there is no over-lapping of the phases.

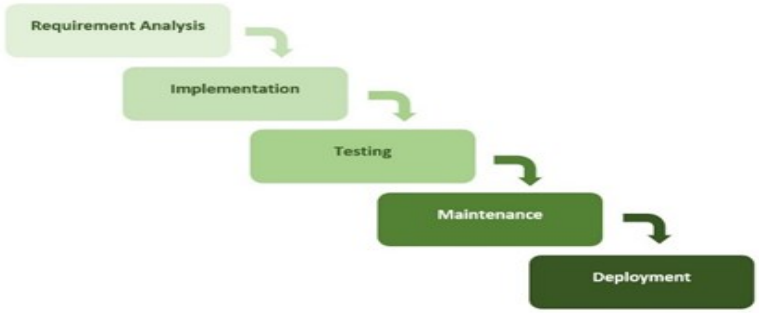

Figure 2. Conceptual Framework

The project begins with the first phase: requirement analysis which consist of identifying the target users, purpose of the project, goal and scope. This is followed by executing and implementing the codes, system design and structure. After the second phase, testing of the application is performed to certify that all codes are working and ensure that the implementation is parallel to the user experience together with the application design. The fourth phase which is the maintenance, help to keep the application compatible with the latest changes in mobile technologies for a better user experience. For the final phase, in the deployment stage, the application is now ready to launch and try by others.

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Research Instrument

The developed system was tested by seventy-nine (79) respondents which is categorized as Parents, Students, Authorities, Teachers/Professors and Others which includes: Government Employee, Nurse and EWB

INDICATORS	SA 5	A 4	N 3	D 2	SD 1	MEAN	INTERPRETATION
1. Do you think this mobile application will help lessen the problems and crime in the community?	3.92	0.81	0.04			4.77	Strongly Agree

Continuation

INDICATORS	SA 5	A 4	N 3	D 2	SD 1	MEAN	INTERPRETATION
2. Do you think this application is helpful for friends or families who are worried about the safety of where their loved ones are?	4.24	0.61				4.85	Strongly Agree
3. Do you think this mobile application will help the authorities in responding to emergencies?	3.73	0.81	0.15			4.69	Strongly Agree
4. Do you think this application will provide great help in terms of investigation for missing persons?	3.99	0.76	0.04			4.79	Strongly Agree
5. Does the application give your accurate real-time location?	3.86	0.76	0.11			4.73	Strongly Agree
6. Does the application work well?	3.67	1.01	0.04			4.72	Strongly Agree
Total						4.76	Strongly Agree

Employee. The main research instrument used in the study was the questionnaire developed based on the ISO/IEC 25010:2011 Systems and Software Quality

Requirements and Evaluation (SQuaRE) to assess the function and quality of the application. The ratings and technical comments and suggestions from the experts were used to further enhance and refine the developed system.

Results and Discussion

INDICATORS	SA 5	A 4	N 3	D 2	SD 1	MEAN	INTERPRETATION
7. Does the application easy to use	3.67	1.06				4.73	Strongly Agree
8. Do you think this mobile application will help you in case of emergencies?	4.05	0.71	0.04			4.8	Strongly Agree
9. Do you think using this mobile application will make you feel safe when you feel like you're in danger?	3.86	0.81	0.08			4.75	Strongly Agree
10. Do you think this mobile application is useful?	3.86	0.86	0.04			4.76	Strongly Agree
11. Do you think this mobile application is user-friendly?	4.18	0.61	0.04			4.83	Strongly Agree
12. Do you think this application will be a great help to you and the community?	4.17	0.61	0.04			4.83	Strongly Agree
Total						4.78	Strongly Agree

INDICATORS	SA 5	A 4	N 3	D 2	SD 1	MEAN	INTERPRETATION
13. If this application is available in-app store/play store, are you going to use this mobile application?	3.92	0.76	0.08			4.76	Strongly Agree
14. Will you recommend this mobile application to others?	4.05	0.61	0.11			4.77	Strongly Agree

Continuation

	INDICATORS	SA 5	A 4	N 3	D 2	SD 1	MEAN	INTERPRE-TATION
15.	The app has clean and simple presentation	3.99	0.76	0.04			4.79	Strongly Agree
16.	The app's capa-bilities meet my requirements.	3.86	0.81	0.08			4.75	Strongly Agree
Total							4.77	Strongly Agree

INDICATORS	SA 5	A 4	N 3	D 2	SD 1	MEAN	INTERPRE-TATION
Reliability						4.76	Strongly Agree
Usability						4.78	Strongly Agree
Efficiency						4.77	Strongly Agree
TOTAL						4.77	Strongly Agree

For the first category, the reliability, the overall mean is 4.76, which means that most of the respondents strongly agreed that the mobile application provides a good consistent quality or performance.

In the second category, the overall mean is 4.78. This means that most of the respondents that answered the questionnaire have strongly agreed that the application is usable, this includes the user interface of the app and graphics.

For the last category, the computed overall mean is 4.77. This means that most of the respondents strongly agreed that the application is efficient.

After computing all the three categories, the overall mean resulted in the score of 4.77. Based on the resulted mean and interpretation, most of the respondents found that the application is reliable, usable and efficient.

Conclusion

Based on the results of the study and the evaluation of the respondents of the system, the following conclusions were derived.

- The application is a great help to lessen the problems and different crimes in the community.
- Helpful application for families and friends who are worried about the safety of their loved ones.
- It gives the accurate real-time location of the user.
- The application is useful, works well and user friendly.
- It makes the person feel safe when the user feels like in danger.

Recommendations

The future researchers can further enhance the capabilities and functions of the project by the following recommendations:

- Improve the notifications by making the application receive notifications even when not running.
- Develop another method of receiving alerts. For instance, SMS or Short Message Service to assure that the alerts will be received even without using internet and not running the app.
- Improve the location sharing by making the application automatically record and update the users' location in the database by using time intervals.

- Expand the functions through adding features such as recording videos and audios which will later serve as an evidence for some circumstances. Another feature is setting the allowed location, if the user went to a different route or location, the application will notify the circle members. This is for the parents to use the application more efficiently.

References

Alanezi, Mafaz & Zebari, Hisham & Birfkani, Saad. (2020). Family GPS Tracking for Android. AL-Rafidain Journal of Computer Sciences and Mathematics. Retrieved from https://www.researchgate.net/publication/341553708_Family_GPS_Tracking_for_Android/

Anonymous (2019). *Pros And Cons: Location Tracking.* Spring Wise. Retrieved from https://www.springwise.com/pros-cons/location-tracking

Beyens, Kristel & Roosen, Marijke. (2016). *Suspects Being Watched in Real Time: Introducing GPS Tracking in Belgium.* Retrieved from https://researchportal.be/en/publication/suspects-being-watched-real-time-introducing-gps-tracking-belgium

Domde, Aishwarya. (2017*). SecureU Emergency System using GSM and Android Application.* Retrieved from https://www.ijraset.com/fileserve.php?FID=6326.

F. Fahmi, B. Siregar, S. Evelvn, D. Gunawan and U. Andayani, "Person Locator Using GPS Module and GSM Shield Applied for Children Protection," 2018 6th International Conference on Information and Communication Technology (ICoICT), 2018, pp. 194-198, doi: 10.1109/ICoICT.2018.8528720.

H. Guo et al. (2015) *Guardian Angel: A Smartphone Based Personal Security System for Emergency Alerting*. Retrieved from https://ieeexplore.ieee.org/document/7518231

Laura Silver (2019). *Smartphone Ownership Is Growing Rapidly Around the World, but Not Always Equally.* Pew Research Center. Retrieved from https://www.pewresearch.org/global/2019/02/05/smartphone-ownership-is-growing-rapidly-around-the-world-but-not-always-equally/

Martha Jean Sanchez (2020). Crime in The Philippines - Statistics and Facts. Statista. Retrieved from https://www.statista.com/topics/6994/crime-in-the-philippines/

Monisha, D. & Monisha, M. & Gunasekaran, Pavithra & Radhakrishnan, Dr.Subhashini. (2016). *Women safety device and application-FEMME*. Indian Journal of Science and Technology. Retrieved from https://www.thedrum.com/opinion/2020/05/01/advertising-gaming-and-tv-similarities-and-differentiators.

Moolpani C et.al (2019), *Suraksha: An Android App for The Safety of Women.* Retrieved from http://www.sersc.org/journals/index.php/IJFGCN/article/view/28664

Mr Joshua Samual (2015), *Implementation of GPS Based Object Location and Route Tracking on Android Device*. Retrieved from www.ftms.edu.my/journals/index.php/journals/ijise

Ortega Anderez, Dario & Kanjo, Eiman & Anwar, Amna & Johnson, Shane & Lucy, David. (2021). The Rise of Technology in Crime Prevention: Opportunities, Challenges and Practitioners Perspectives. Retrieved from https://www.researchgate.net/publication/

349125315_The_Rise_of_Technology_in_Crime_Prevention_Opportunities_Challenges_and_Practitioners_Perspectives

R. Velayutham, M. Sabari and M. S. Rajeswari, "An innovative approach for women and children's security based location tracking system," 2016 International Conference on Circuit, Power and Computing Technologies (ICCPCT), 2016, pp. 1-5, doi: 10.1109/ICCPCT.2016.7530325.

S, Sandosh. (2019). *Smart Way Tracking to Identify Individuals Location Using Android System with GPS.* Retrieved from https://www.researchgate.net/publication/331988239_SMART_WAY_TRACKING_TO_IDENTIFY_INDIVIDUALS_LOCATION_USING_ANDROID_SYSTEM_WITH_GPS

Sucitra.M (2017). *Child Tracking System Using Smart Phones Without Expenditure of Money*. Retrieved from http://ijceng.com/gallery/38-cej-2403-f.pdf

Sweidan, S. , Saifan, R. , Darabkh, K. , Abu-Kaff, S. and Al-Ali, S. (2017) Kids' Tracker: An Android Application for Tracking Children. Retrieved from https://www.researchgate.net/publication / 322098358_Kids'_Tracker_An_Android_Application_for_Tracking_Children

Tahir Muhammad (2015). *Global Positioning System (GPS) Based Location Finder on Android.* Retrieved from http://www.divaportal.org/smash/record.jsf?pid=diva2%3A822283&dswid=2284

Yarabothu, Ravi Sekhar & Thota, Bramarambika. (2015). Abhaya: An Android App for The Safety of Women. Retrieved from https://www.researchgate.net/publication /287201587_Abhaya_An_Android_App_For_The_Safety_Of_Women