

Al-Marhum: A Grave Locator Mobile Application

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Abstract

The *Al-Marhum* app is a mobile application that allows users to easily and accurately locate the gravesites of their lost loved ones. The app provides a smooth cross-platform experience by integrating Google Maps for exact location pinning, combining Firebase backend services, and being designed with the Flutter framework. *Al-Marhum* addresses common issues encountered while navigating complex cemetery layouts by offering an intuitive interface for searching for grave data by name, date of death, or grave lot number. Additionally, the app includes Islamic religious content to help users spiritually during their travels. User feedback after testing emphasized the app's usability and effectiveness in lowering tension linked with grave placement. Future updates plan to extend the app with features including user-submitted photographs, historical cemetery information, and wider language support. Overall, *Al-Marhum* provides a dependable, culturally sensitive solution that bridges the gap between digital record keeping and real-world grave site navigation, allowing users to respect and remember their loved ones more easily.

1. Introduction

The Muslim cemetery is one of the symbols of the organisations related to the Muslim community. Nowadays, the unorganised management of Muslim cemeteries has become a major problem and raises difficulties in locating the graves and overlapping arrangements. In addition, the lack of land for funerals is also an emerging issue that has been raised by the rapid urban growth in most developing Asian countries, including Malaysia. Most Muslim graveyards that have reached the age of decades and above begin to be unrecognisable to the heirs to identify the exact location or position of the grave. To maintain their principal role as a resting place for the deceased, cemeteries require long-term planning, which is the long-term viability of urban cemeteries. Rules and standards must consider both management and regeneration issues.

Nowadays, the usage of smartphones has become extremely popular, and their popularity continues to grow; most people have gadgets to access digital information for various purposes. As a result, many religious individuals, particularly Muslims and Islamic groups, are utilising this chance to use mobile apps for preaching and learning Islam. Apart from that, families who act as the fundamental units of social support in communities, fostering unity and coherence, also can get the benefit from these mobile apps. It further strives to offer services and simple access to Islamic knowledge, putting spirituality within reach of the current generation. Therefore, the creation of grave locator applications is suggested in this project. Our society benefits from this method since it allows people to visit the graves of their family members. With this system, cemetery administration may more effectively and efficiently handle grave data and information, which can be updated regularly and handled

uniformly. This technique will indicate the precise direction to the grave and allow it to be marked. Visitors can arrive at the cemetery using the present system, but locating the burial still takes some time. Visitors can arrive at the cemetery even if the headstone's name is faded, but locating the burial will still take some time.

In Malaysia, many people do not remember how to track their loved ones' graves. Mostly, young people who asked directly at the gatekeeper to find their family graves, which is quite hard to tolerate because they can't track the graves mostly. Some do not know the difference between men's and woman's grave. Most frequently stated that people asked the grave diggers, "where's my mother and father's grave?". Apart from that, one of the few factors most people find hard to locate our grave site changes over time because of the surrounding that keeps on expanding the land and changing the landscape which confuses the exact location their loved one's grave. The problem of overcrowding and land shortage in Muslim cemeteries is also a factor in developing this cemetery management system[1]. Unmanaged cemeteries systematically have caused society to become less interested in visiting the cemetery. The issue of Muslim cemeteries is not only happening in Malaysia, but also occurs in foreign countries such as Indonesia, Vietnam, Germany, and Austria. A cemetery is just as important as any other basic facility. Visitors frequently struggle to find specific graves in large graves using traditional methods such as verbal direction, which can be time-consuming and emotionally taxing[2]. The absence of an efficient, technology-driven solution results in unnecessary frustration. This project seeks to address this issue by creating a reliable, integrated system that utilises a mobile application, enabling users to locate graves quickly and easily.

2. Literature Review

This overview shows the development of grave locator apps that help the convergence of technology and memorialization, making it easier to visit gravesites for personal and historical reasons. This literature review highlights the technological improvements, such as GPS and mobile application software, that make these applications possible, while emphasising user-friendly design concepts to accommodate various populations, especially Muslim people. It discusses ethical issues around data privacy and sensitive information management, as well as case studies of actual apps to evaluate their performance and user feedback. Furthermore, this system design involves several components, including the user interface design, database design, and system architecture. Finally, this analysis emphasises grave locator applications considerable impact on modern grieving behavior's and memorialization.

2.1 Grave Locator Application

The advance of technology has transformed how people navigate around them, including how they locate and visit graves. Grave managers and visitors often struggle with finding gravesites and locating other important information in a cemetery, especially in large or crowded burial grounds. To address this issue, technology experts have developed various cemetery mapping solutions, including web-based graveyard locators integrated with mobile devices. The need for efficient grave management and accessibility for visitors has been a challenge for many years. Traditionally, a paper-based system was used to manage burial records and plot locations, making it difficult to keep track of burial sites and provide visitors with accurate information. This led to confusion and frustration among grave visitors and mismanagement of cemetery records [3][4].

2.2 Grave Mapping Technology

Grave Management is one of the oldest professions and has evolved to match the changing needs of death care. Now grave is amid yet another big shift, as need to modernise becomes essential to their success. At its most basics, digital mapping cemetery creates an electronic representation an entire grave including its grounds, roads, buildings, and gravesites. This map can easily be updated as new graves are laid out, for a near-real-time view that benefits visitors and cemetery operators alike. Digital mapping can be as simple as showing where the plot is located on a particular property, or it can be as involved as providing information about the deceased and their relationship to each other, historical data, and displaying images of monuments. The simplest way to create a digital map is to use Google Maps, a web mapping service developed by Google. Although, the intermediate way is by using drone mapping which emphasises high quality images cemetery map in less than a day. Also, it helps to deliver data accurately for every plot memorial garden, building and monument. But, the most advanced and complete technology is also known as Geographical Information System (GIS). This will create far more complex records than a Google or drone-based map, providing sleek, modern interface. As you look to strengthen and protect your cemetery business for the future, you need the ability to quickly and accurately map every part of your cemetery and have a clear view of available inventory. Digital cemetery mapping allows you to realise the benefits of digital transformation across every part of your business [5].

2.3 Data Privacy in Apps

Data privacy is a vital concern in developing grave locator, given the sensitive nature of the information involved. This underscores the importance of data privacy in grave locator apps, highlighting the need for the responsible data management to protect users and maintain their trust. The 2018 article shows that the location privacy separated in three important aspects to users: spatial information (position), temporal information (time) and identity. The importance of data location is high due to its ability to link disparate datasets and provide a much more complete profile of an individual or organisation [6]. In this case, users must be informed about the data is collected or being used. This clear consent mechanisms should be implemented to ensure users have control over their information. Based on previous research, privacy is among one of the biggest concerns regarding collection of location data for contact tracing purposes, in line with what other studies have found [7]. Ultimately, this measure is essential to protect the user data from unauthorised access or breaches. Where possible, data should be anonymised to protect the identities of both users and the deceased. This reduces the risk of sensitive information being exposed. Also, by inserting ethical practices, they should be prioritised as well as building trust for user management to safeguard data and respecting the emotional contexts of users interacting with memorial information.

2.4 Case Study of Existing Apps

Three existing systems are studied and analysed to get more information to develop the *Al-Marhum*. The existing systems studied include Find a Grave, iCemetery, and ePusara.

2.4.1 Find a Grave

This application is an app for the user to search the burial information and gravestone image among the online memorials' volunteers have logged at Find a Grave. This application was developed by Ancestry.com in 2013. This application is being made for iOS and Android users. This application has various functions, but it is a simple and direct system in order to search for the cemetery. The function of the system is that the user can search for the grave using the person's name or the year of birth and the year of death. The user can also search using the cemetery location. Users can add a memorial to the grave note for the deceased person into the system. The user can upload a picture of the grave into the system, which can be shared through social media. This app also helps the user find cemeteries near them, and it will show the cemetery's location on the map. Find A Grave is a mobile application that requires volunteers to enter information into the system. For the proposed system, the only way to add information to the system is by the administrator. That means the proposed system is more organised.

2.4.2 iCemetery

This application is being built to provide a fast and easy way to search for loved ones in selected cemeteries across Canada. 42-Bit Solution Inc. is developing this application. This application is being made for Canadians and only for the IO's users. In this system, the user can only search the grave across Canada by entering the person's last name and first name. The use also benefits specific direction towards the grave if the user clicks on the view on map in the application. This application only has one function: to search for and know the grave's location. The proposed system has various functions, including searching for the grave location, booking for the cemetery and booking for the tombstone. This mobile application can be a guideline for me to make the 9 proposed systems, as the proposed system is to make a direction towards the grave. Even though this system only has one function, it can greatly help.

2.4.3 ePusara

This web application is being built by Jabatan Agama Islam Wilayah Persekutuan (JAWI). This ePusara JAWI website is a special site for website visitors to obtain various information on the management of cemeteries in Kuala Lumpur. Various functions in this system are very helpful in developing the proposed system. First, the main function of this system is to search for the location of the grave. The user needs to fill in some information about the person, including full name, IC number, Lot number and date of death. The location of the grave in the system is based on cemetery maps. The system also provides a list of Islamic cemeteries in Kuala Lumpur, management of 10 remains of dignitaries, a guide to managing funerals, and administration and management. Regarding booking the tombstone and grave lot, this system only provides the form for the user. This means the user needs to submit the form to the Jabatan Agama Islam Wilayah Persekutuan. Compared to the proposed system, it can help users book the tombstone as well as the grave lot, which this ePusara does not have. This system will be the prime guideline, as this system and the proposed system have similarities.

3. Methodology

This section provides a complete explanation of the system development technique used to create the *Al-Marhum* application. The technique is divided into phases, each with specific tasks aimed at progressing the project from start to finish. Relevant work products were created for each phase to document deliverables and help with project tracking. Furthermore, relevant tools were used throughout the development process to increase efficiency and ensure the quality of the results. This structured approach established a clear framework for controlling the development process in a disciplined and effective manner.

3.1 Planning Phase

The project's Planning phase was designed to lay the groundwork for a clear and structured approach. The basic concept for the *Al-Marhum* app was reviewed and refined with the project supervisor in in-person meetings and online sessions using Google Meet. During this phase, existing grave locator applications were analysed to find flaws and areas for development. The key outcomes of this phase included identifying the project's objectives, scope, and goals, which were detailed in the Project Proposal. A Gantt Chart was also constructed to plan the tasks and provide deadlines.

3.2 Requirement Analysis Phase

During the Analysis phase, the emphasis switched to identifying the system's specific requirements. The user needs acquired before were thoroughly examined to identify the basic capabilities of the *Al-Marhum* app. Both functional and non-functional requirements were established to help guide the design and development process. A key contribution was a Comparison Study of Existing Apps, which gathered information from academic articles, official websites, and other online sources. This study focused on how the suggested app will solve the constraints noted in existing solutions.

3.3 Design Phase

The design phase began with obtaining precise requirements, which were then followed by creating the system modules on paper to outline the general structure of the app. The user interface and experience concepts were realised using the Flutter framework, which allowed for the efficient and practical creation of each screen and its functionality while maintaining a responsive and consistent UI. Firebase was used in data modelling to store and manage application data securely. The data architecture was built to provide real-time synchronisation, scalability, and dependable data retrieval, resulting in seamless interaction between the UI and backend services.

3.4 Implementation/Programming Phase

The design was transformed into a working application through coding during the Implementation phase. A functional prototype of the *Al-Marhum* grave locator app was developed using Flutter to support cross-platform deployment, while Firebase managed the backend database and user authentication services. Unit tests were written and executed using Flutter's built-in Testing Framework to ensure each component functioned correctly and was free of errors.

3.5 Testing and Validation Phase

The app's ability to precisely record and present location data on Google Maps is ensured by geolocation testing. This includes ensuring GPS accuracy, proper placement of memorial sites, and dependable location-based searches. Validation also resolves concerns such as weak signals and incorrect data in order to ensure a smooth and trustworthy user experience.

3.6 Deployment Phase

During deployment, the emphasis changed to creating an APK file for early internal testing and demonstrations. This APK was not meant for quick app store submission but for a select group of users to test the app's essential functionality. The APK and a Google Form survey were given for testing to gather user feedback. This method allowed for a practical evaluation of the app's operation and usability, assisting in identifying significant issues and gathering suggestions. The comments gathered influenced future enhancements and adjustments prior to a wider release or formal app store submission.

4. Result and Discussion

This chapter provided an overview of the application's creation, testing methodologies, and major conclusions. Users mostly used the grave search and location functions, which received favourable comments for their ease of

use and culturally appropriate design that adhered to Islamic customs. The study emphasised the significance of cultural sensitivity in how users interacted with gravesites, underlining the need for such considerations in app design. Minor flaws were detected during usability testing, which were then fixed to improve the overall user experience. These findings gave useful insights into the app's functional efficacy and cultural appropriateness, which will guide future developments.

4.1 Welcome Page

The *Al-Marhum* app's Welcome Page features a clean and appealing design with a patterned background and the warm greeting, "Welcome to *Al-Marhum*." It prominently displays two large buttons New Record and My Records, allowing users to add new grave records or view current ones swiftly. The bottom navigation bar allows quick access to the Search, Dashboard, and Profile sections, allowing for effortless moving throughout the program, as shown in Fig. 1.



Fig. 1 Welcome Page of *Al-Marhum* App

4.2 New Record Page

Fig. 2 shows that the New Record page offers a simple and organised form for adding deceased information, grave site, and record data. The possibility of pinpointing the grave's position on an interactive map improves accuracy and user convenience.

Fig. 2 New Record page of *Al-Marhum* App

4.3 My Record Page

Fig. 3 shows the My Records page displays saved records and encourages visitors to add new ones via a prominent button. These pages offer rapid data entry and simple record administration, ensuring a smooth user experience.

Fig. 3 My Records page of *Al-Marhum* App

4.4 Grave Lot Map Location Page

The Grave Lot Map position page uses satellite images and GPS technology to properly depict the user's current position. Users can use the interface to pin their exact grave lot to the map, making it easier to identify grave sites precisely and visually. The map's zoom options and clear labelling improve navigation and usability. This feature enhances the app's functionality by giving a geographic context for grave data, allowing users to more easily discover and manage grave sites in real-world settings. The map interface dramatically improves the app's usability and user experience, as shown in Fig. 4.

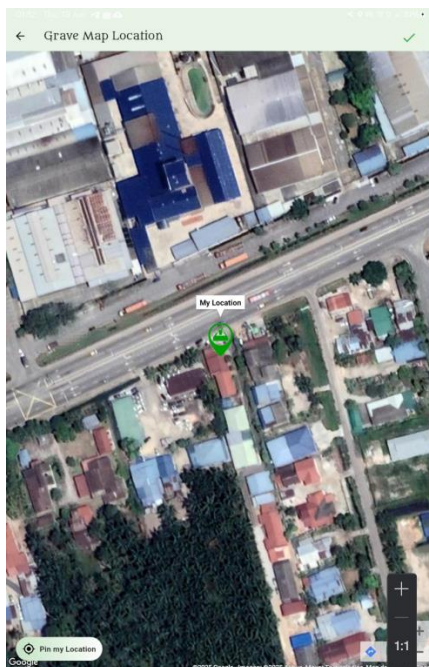


Fig. 4 Grave Map Location page of *Al-Marhum* App

5. Conclusion

The *Al-Marhum* grave finder app is an important and successful answer to the widespread problem of identifying the final resting places of loved ones. By cleverly integrating Google Maps for location pinning, Firebase for a dependable backend, and Flutter for a seamless cross-platform experience, the app significantly eliminates the stress and difficulty of traversing foreign cemeteries. It successfully carries out its fundamental objective by providing users with an easy, accessible, and efficient tool for finding and visiting graves.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: study conception and design: Ahmad Aminudin bin Zainudin; data collection: Ahmad Aminudin bin Zainudin; analysis and interpretation of results: Ahmad Aminudin bin Zainudin, Shamsul bin Mohamad; draft manuscript preparation: Ahmad Aminudin bin Zainudin. All authors reviewed the results and approved the final version of the manuscript.

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