The Development of Mobile-based Search and Discovery Application for Missing Persons

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ABSTRACT

A person is considered missing when they leave their home or place of residence without anyone knowing exactly where they are. Generally, families who experience a loss will publish photos of the missing person on several social networks, such as WhatsApp, Instagram, and Facebook, or make a direct announcement. These announcements are often posted in unsuitable locations, such as walls or electricity poles, which, in the end, can damage the visual appearance of the surroundings. On social media, this method is considered less effective because it will be covered by other posts, and announcements posted over time will disappear due to weather factors such as rain and wind. Based on the problems that have been described, the author proposes a solution using information and wireless technology in the form of a mobile application created using the Java programming language in the Android Studio IDE development environment and utilizing the Firebase database. This application is used to search for information as a special application that contains information about search and discovery of missing person so that information dissemination is more effective and efficient.

General Terms

Android Studio, Java, Firebase.

Keywords

Mobile-based application, Search, Discovery, Missing Persons, Information Systems.

1. INTRODUCTION

Missing-person cases are a very common occurrence in society. In particular, children, elderly people with dementia, depression, and people with mental disorders are consistently missing [1]. A person is considered 'missing' when there is no information to confirm their whereabouts, so it is unknown whether the person is still alive or dead. The person who became 'missing' was previously known to be alive, but currently there is no certainty about his living condition by his family or those closest to him [2].

Searches and investigative efforts are often carried out to find missing people and determine their fate. Police and rescue agencies are often involved in search efforts, while family and friends usually play a role in providing information and support during the search process. It is important to act quickly when someone is thought to be missing, as time can be a key factor in finding them safely.

There are frequent cases of missing people. Usually, relatives who experience a loss only upload photos of the missing person to social media sites such as WhatsApp, Instagram, and Facebook or make announcements manually. The announcement is posted in inappropriate places, such as walls and electricity poles, which can be an eyesore. On social media, this method is considered less effective because it will be covered by other posts, and announcements posted over time will disappear due to weather factors such as rain and wind. These efforts could be a solution, but they are less efficient because there is no special information service center to find people who have disappeared.

In the development of communication tools, the very important role of mobile technology, such as cell phones, in disseminating information, both for business and personal purposes, is increasingly greater. Easy access to information, anytime and anywhere, is increasingly becoming a priority. Currently, cell phones have become something common and familiar to most people [3].

This research aims to build a mobile-based search and discovery missing persons application as the main source of information that contains missing information in the form of missing people. It is hoped that this application can help the public find information about searching for and discovering missing persons so that information dissemination is more effective and efficient.

2. RELATED WORK

In research conducted by Noelannah Neubauer, Christine Daum, Antonio Miguel-Cruz, and Lili Liu with the title Mobile Alert app to engage community volunteers to help locate missing persons with dementia, which discusses a notification system that broadcasts information about missing persons with dementia or mental disabilities, The method used is to involve community members such as neighbors and shop owners (Community ASAP) who can complement efforts and rescue efforts by becoming 'extra eyes' for people who are reported missing. Volunteers will usually choose their home and work addresses as specific locations. Volunteers are members of the public who are willing to 'watch' for missing people; they are instructed to report seeing someone matching the description of someone reported missing. Community volunteers receive alerts based on geographic preferences [4].

Ahtasham Ansari, Aditya Singh, Abhishek Sagar, and Komal have conducted other research entitled Android-based Application: Missing Person. This research discusses the missing person complaint application. With this application, government officials and local communities can try to find missing people in their area. This project uses the face recognition method in its application. Facial recognition works by storing facial coordinates in a two-dimensional array and then matching these points with the facial points of the person being searched. If at least 70–75 percent of the points match, then it is declared a matched face. This is a process that uses an Android phone to upload images into the application; the results obtained are based on facial recognition. The author uses the Dlib library and Python face recognition to compare the faces of stored faces and found faces. This system ensures 70–80 percent results based on facial comparisons of missing persons [5].

3. RESEARCH METHODS
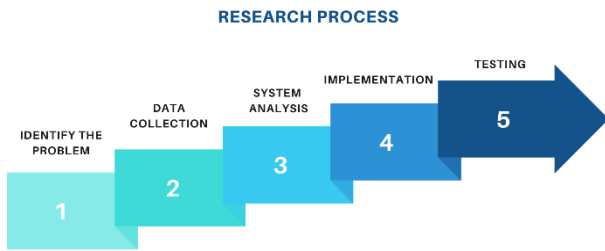
Figure 1 shows how the research process was carried out.

Figure 1 Research Process

The following is an explanation of Figure 1:

3.1 Identify the Problem

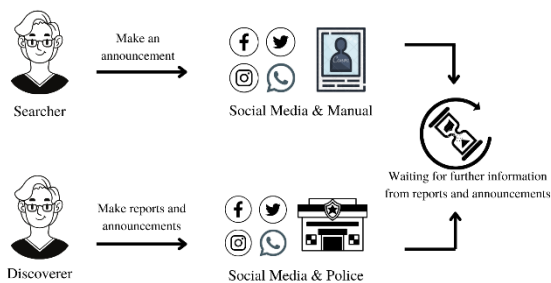Through analysis of the current system, the author identifies problems, which can be seen in Figure 2.

Figure 2 Current System Flow

Figure 2 illustrates the current running system. Individuals facing a loss will share photos of missing persons on social media platforms or make direct (manually) announcements. Those who find missing individuals post updates on social media and report them to the police. Announcements are often placed in inappropriate locations, such as walls and electric poles, disrupting the surrounding view. On social media, this method is considered suboptimal as it may be overshadowed by other posts, and announcements physically posted over time may disappear due to exposure to weather conditions like rain and wind.

3.2 Data Collection Procedures

Data collection is the process conducted to gather information that will be used in this research, and the data is obtained through the following methods:

3.2.1 Observation

Observation refers to the technique or method of observing actual and normal conditions. Generally, observation involves direct and detailed observation of an object to obtain accurate information related to that object.

3.2.2 Literature Review

The literature review method allows the collection of information from various sources, such as reference books, journals, articles, websites, and literature related to the research topic. These sources aim to support the resolution of issues identified during the research.

3.2.3 Documentation

The documentation process is a method of data collection that involves obtaining various documents, including reports and other documents obtained from social media platforms such as WhatsApp, Facebook, and Instagram, as well as announcements related to the search for and discovery of missing persons. This documentation is carried out to ensure that the implementation of activities in the research aligns with the desired expectations.

Figure 3 Data Example

Figure 3 is an example of data sourced from the internet. This data includes information that needs to be entered into the Search and Discovery application for missing persons, including name, characteristics (age, gender, height, etc.), additional information, and family contact.

3.3 System Analysis

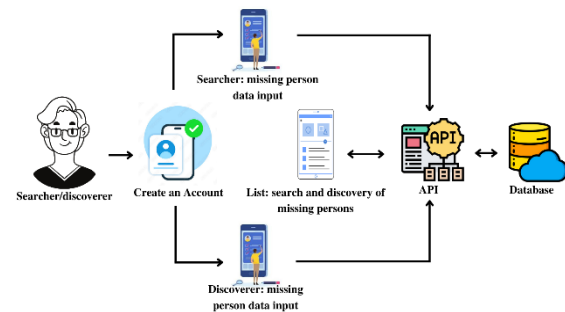Figure 4 is a system architecture that describes how the system works.

Figure 4 Architecture Diagram

Figure 4 illustrates that users who have lost their relatives and those who have found missing persons can make announcements through the application, which specifically contains information related to the search and discovery of missing persons. In this system, users need to create an account and log in first, then make announcements by entering the personal data of the missing person into the application, which is stored in a database connected by an API (Application Programming Interface). Subsequently, the application can display a list of missing persons, and a list of discovered missing persons can appear on the application.

3.3.1 Use Case Diagram

Use case diagrams are the first step in the system modeling process. This diagram is a model representation for understanding the functional requirements of the system, where each use case is illustrated as the core of a scenario carried out by the parties involved (actors), within the system boundaries, and connected using line notation [6].
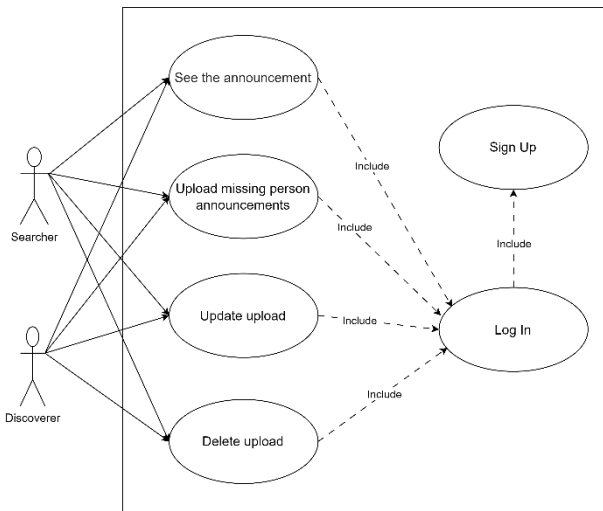
Figure 5 Use Case Diagram

Figure 5 is a use-case diagram that shows user activities regarding the application. Users are required to register first to use the application, after that, they can access the application by viewing the list of missing people searched and the list of missing people found. Users can make uploads related to searching and discovering missing people, then update or edit uploads that have been uploaded and delete uploads that have been made.

3.3.2 Squence Diagram
Squence diagrams show how objects interact in a use case by explaining the level of object activity and communication messages sent and received between these objects [7].
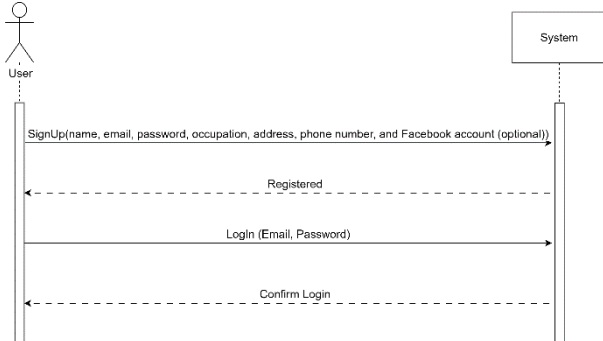

Figure 6 Squnce Diagram SignUp & Login

Figure 6 shows that users must register before using the application. The data required to create an account is: name, email, password, occupation, address, phone number, and Facebook account (optional). After the account is successfully registered, the user can log in using their email and password.
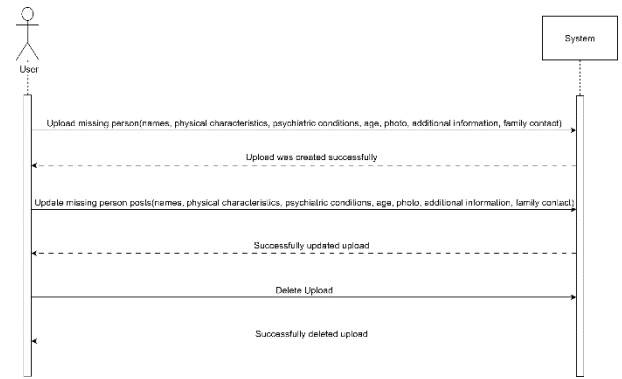

Figure 7 Upload Missing Person Search

Figure 7 asks people who have experienced the loss of family or relatives to upload data regarding the missing person. The data required is name, physical characteristics, gender, mental condition, age, photo, and so on. If the upload is successful, the public, as searchers for missing persons, can see the upload as an announcement. Successfully created uploads can be updated and deleted by the user.
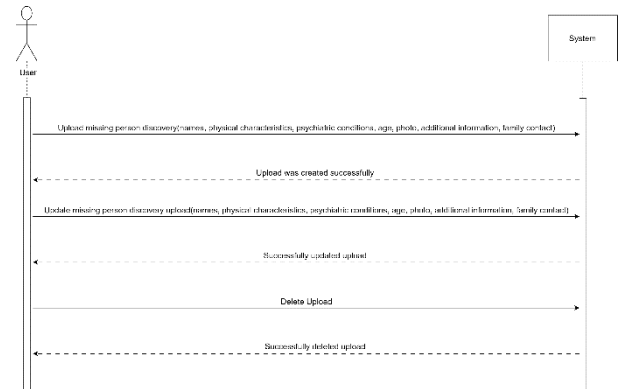

Figure 8 Upload Missing Person Discovery

Figure 8 asks people who find missing people to upload data regarding the missing people they find. The data required is name, physical characteristics, gender, mental condition, age, photo, and so on. If the upload is successful, the public, as searchers for missing persons, can see the upload as an announcement. Successfully created uploads can be updated and deleted by the user.

3.3.3 Activity Diagram
Activity diagrams are visual images that visualize the sequence of processes or activities that occur in a software system [7].
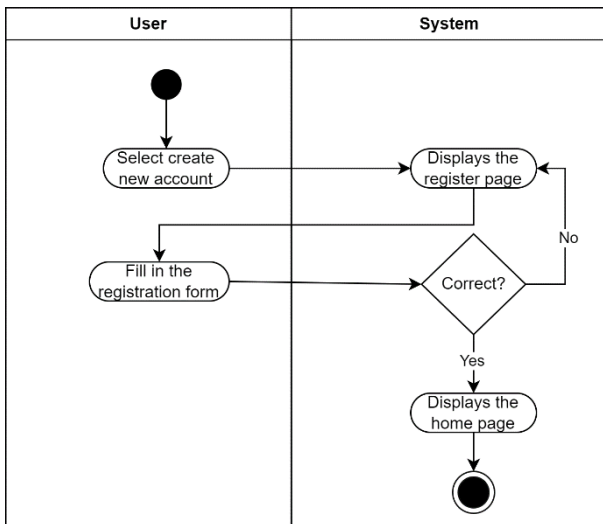
Figure 9 Activity Diagram SignUp

Figure 9 explains the working stages of an application. For further use of the application, people are required to create an account or register to be able to enter the application.
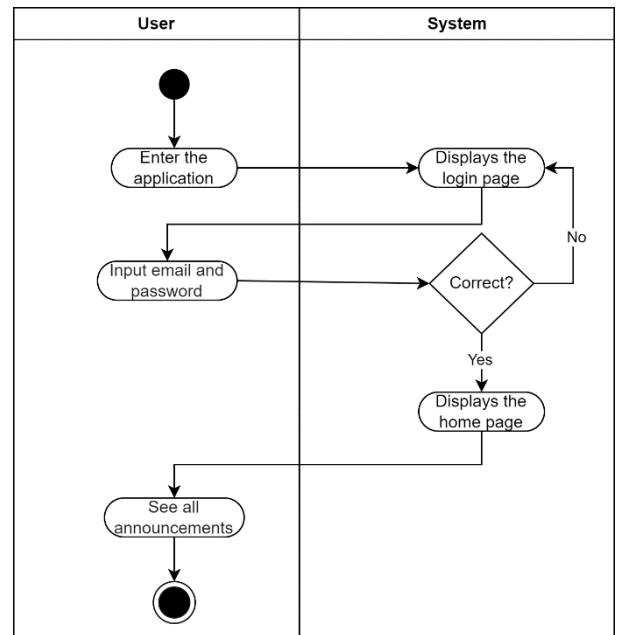

Figure 10 Activity Diagram Login

Figure 10 shows that users can log in using the email and password they created when registering. If the email and password are correct, the user will be directed to the main page, which displays missing person announcements.

Figure 11 Activity Diagram View Announcements

Figure 11 shows the process of viewing missing person announcements, where searchers or missing person searchers must log in first to be able to see the announcement.
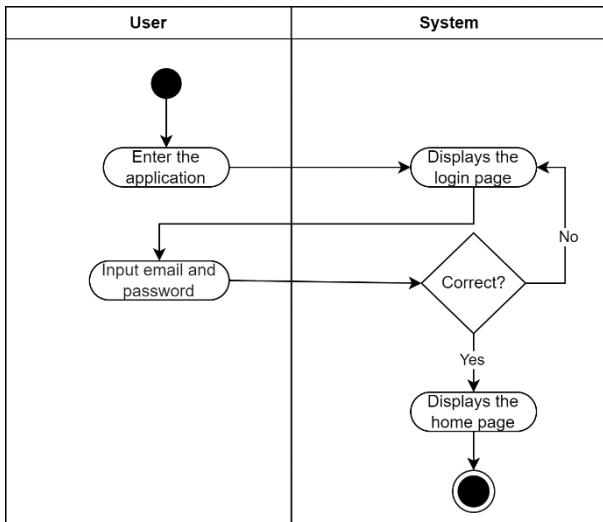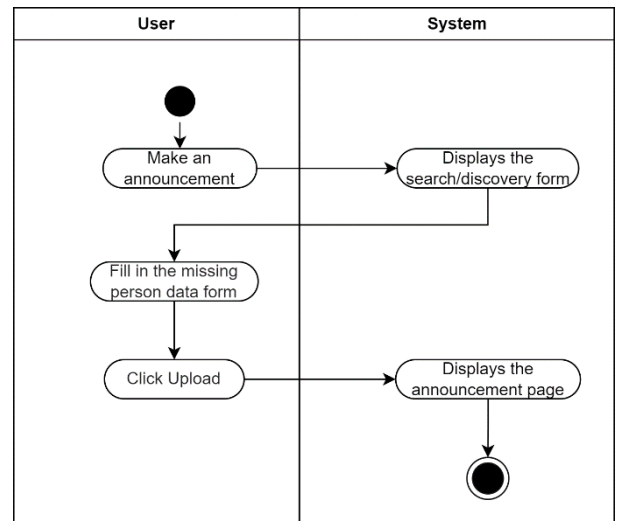

Figure 12 Activity Diagram Makes an Announcement

Figure 12 shows the process of creating announcements that will be displayed on the application. The activity begins when the searcher or discoverer of the missing person clicks on the megaphone icon in the application, and then the system responds by displaying the missing person data form. The searcher or discoverer inputs data on the form and uploads it to the system so that missing person data will be displayed on the main page, which contains a list of announcements.
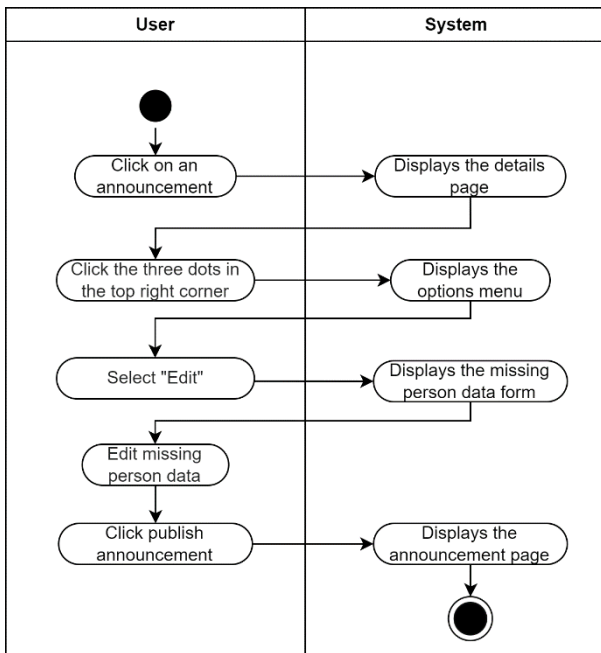
Figure 13 Activity Diagram: Edit

Figure 13 shows the process of editing an upload or announcement if there are errors in the data that has been previously entered.
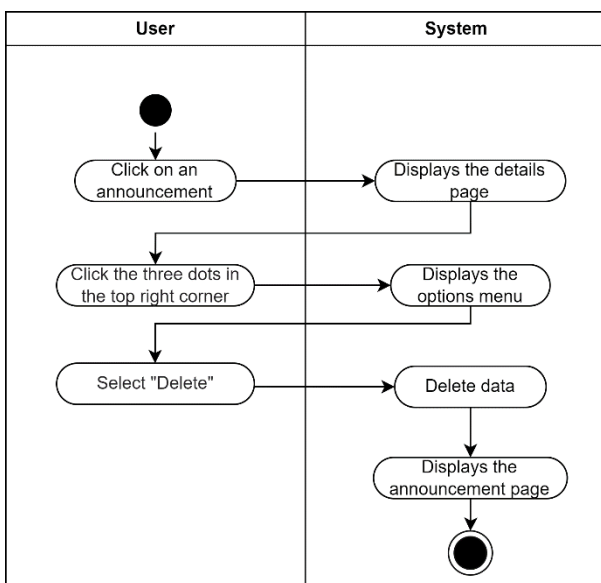

Figure 14 Activity diagram: Delete

Figure 14 shows the process for deleting an upload or announcement.

4. RESULTS AND DISCUSSION

4.1 Assumptions

This application aims to assist the public in making announcements about missing persons. Users can easily create search announcements for missing persons and notify others about the discovery of missing persons through this application. The app allows the public to actively participate in search efforts and helps reunite missing persons with their families.

4.2 Hypotesis

Based on the assumptions that have been obtained, the proposed hypothesis is "The Development of Mobile-Based Search and Discovery Application for Missing Persons.

4.3 Run an Experiment

In the development of the application, the author utilized Android Studio, an Integrated Development Environment (IDE) specifically designed for creating mobile applications that operate on the Android operating system [8]. The application development process involves the use of the Java programming language, and the user interface or layout is created using XML.

4.4 Implementation

The implementation of the system that has been planned and completed is coded in the form of a mobile device. The following is the application design.
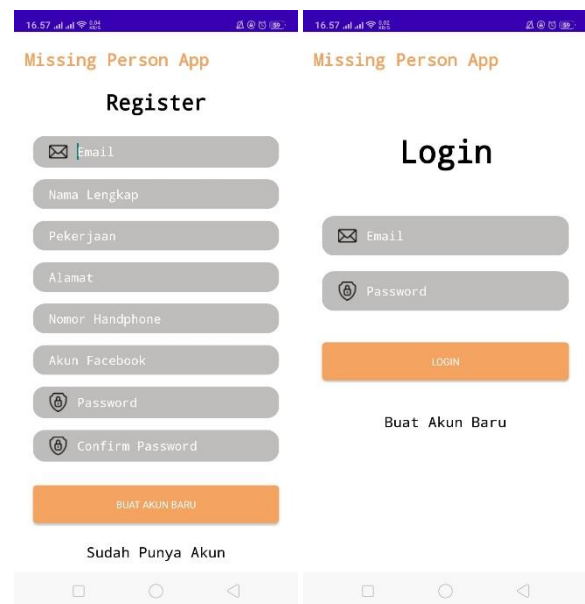

Figure 15 Register and Login

Figure 15 is a display for registering and logging into an account. Searchers and the discovery of missing persons are required to register in order to log in and access the application.
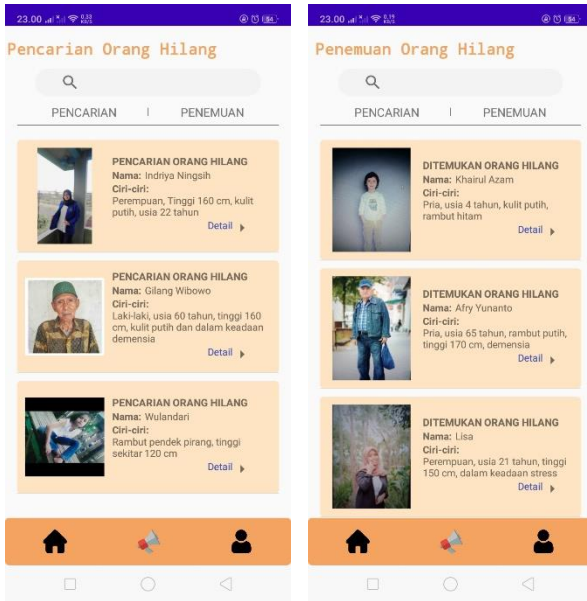
Figure 16 Home Page

Figure 16 is a home page that contains the announcement of the missing person made by the search and discovery of the missing person.
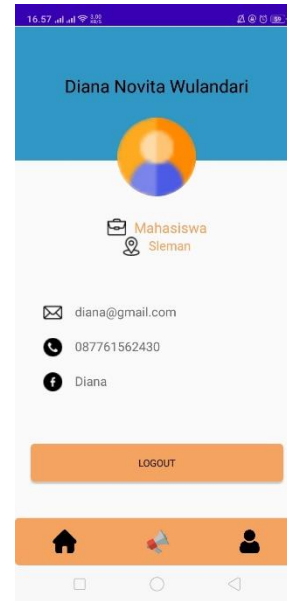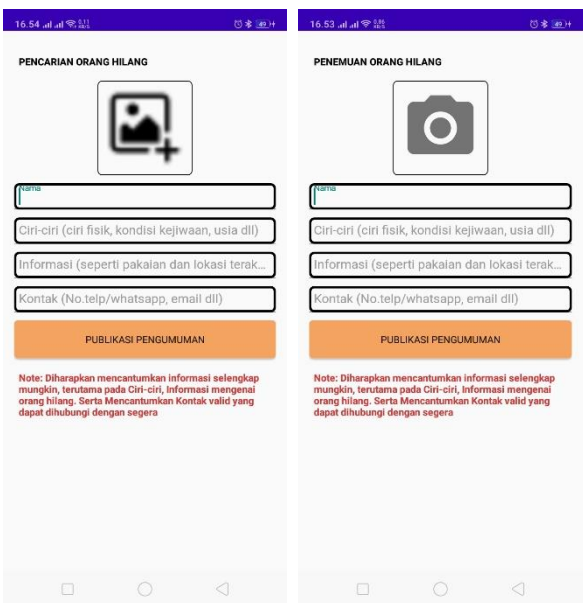

Figure 17 Announcement Creation Page

Figure 17 is a page to create or upload announcements to the application, which will later be displayed on the home page. The data needed in making announcements are photo, names, characteristics in the form of physical characteristics, psychiatric conditions (depression, dementia, or mental disorders), age, or an estimated age. Then there is added information in the form of last clothing before loss, the time and location of the person who was lost or found, or other information.

Figure 18 Profile Page

Figure 18 is a page to read user information that has been registered in the application.

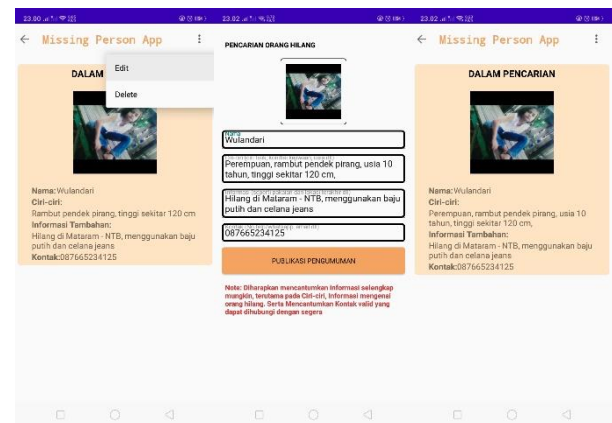**Figure 19 The Announcement Editing Page**

Figure 19 shows the announcement editing process. By clicking on one of the announcements, you will be directed to the details page, clicking three dots in the top right corner, select "Edit" then display the Edit page to update the data on the database and display the latest data on the home page and detail page.
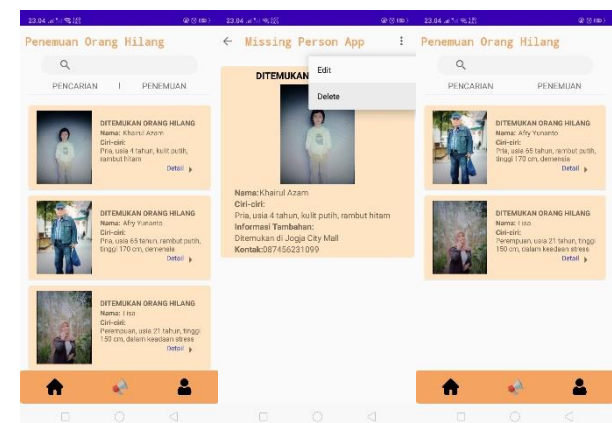

Figure 20 Page for Deleting Announcements

Figure 20 shows the result of deleting an announcement. By clicking on one of the announcements, you will be directed to the details page, clicking three dots in the top right corner, and selecting 'Delete' to remove the data from the database and the homepage.

4.5 Structure of Database

Firebase Database is a nonSQL database storage service that allows storage of various types of data, such as strings, longs, and booleans. Data in the database Firebase is stored in the form of a JSON tree object structure, which is different from the SQL database, which relies on tables or lines. This non-SQL database does not adopt a table or row format [9].
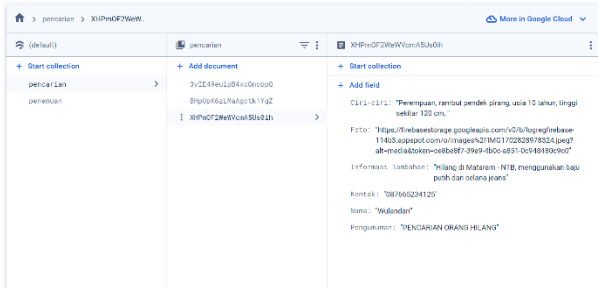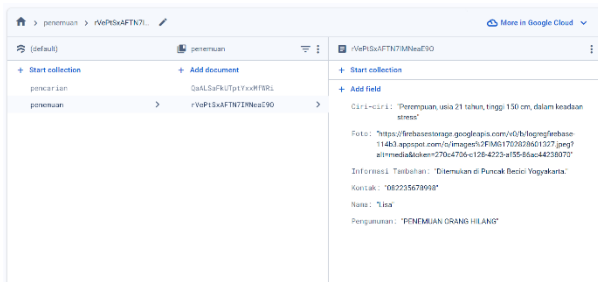

Figure 21 Missing Persons Search Database

Figure 22 Missing Persons Discovery Database

Figure 23 User Profile Database

Figures 21, 22, and 23 show the data that has been input into the application, which is then stored in the Firebase database.

4.6 Application Testing

Testing of the Search and Discovery Missing Persons application is carried out using black box testing. Black box testing is a type of software testing that is focused on its functionality. The main purpose of black box testing is to detect functions that are not running correctly, errors in the interface, problems with data structures, performance problems, and errors in the initialization and termination processes [10].

Table 1 Black Box Testing Results

Page Testing	Test Scenarios	Expected Results	Results
Registration Page	Click the text "Create	Displays the registration form	Succeed

		New Account"	
	Press the "Create New Account" button	Kembali ke halaman login	Succeed
		The "Successful Register" toast appears	Succeed
		Registration Data is added to the database	Succeed
Login Page	Fill in Email and Password	Log in to the application with the registered email and password	Succeed
	Press the "Login" button	Displays the Home page	Succeed
		Displays the "Logged in Successfully" toast	Succeed
Home Page	Click the home icon	Displays search and discovery announcements for missing persons from the database	Succeed
Missing Persons Upload Page	Click the megaphone icon	Displays the missing person data form	Succeed
	Click the add photo icon	Add photos from camera and gallery	Succeed
	Click the "Publish Announcement" button	Add data to database and home page	Succeed
		Returns the home page	Succeed
Edit and Delete Uploads	Click "Edit"	Displays the profile edit page	Succeed
		Edit forms and change photos	Succeed
		Updating data on the database and home page	Succeed
	Press the "Publish Announcement" button	Returns to the home page and displays the updated data and the data in the database has been updated	Succeed

	Click "Delete"	Delete data on database and home page	Succeed
Profile Page	Click the profile icon	Displays the profile page	Succeed
		Displays user data from the database	Succeed
	Press the "Logout" button	Log out of the account and display the Login page	Succeed

Based on Table 1, the results of testing the application system using the black box method show that the application operates as expected, carrying out the functionality as desired.

5. CONCLUSION

The author has successfully developed a mobile-based search and discovery application system for missing persons, which can be utilized by the community to create announcements regarding missing persons. The announcements can involve both the search and discovery of missing persons, enabling the public to use the application as a dedicated source of information.

When users make announcements, they include as much information as possible. This information can include a name, physical characteristics, age, and mental condition, as well as the location and time of the missing or found person. There is also contact information such as an email and telephone number to contact the searcher and discoverer of missing people, making it easy to be contacted by other users related to the announcement.

This application has user-friendly features, making it easier for people to use. For further development, you can incorporate additional features such as splash screens, notifications, location pins, and verification for the search and discovery of missing persons once they have been found. These features aim to enhance the application's functionality, maximizing the system with necessary features according to users' needs.

6. REFERENCES

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