

## Mobile application to tackle infection disease in Indonesia

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### CITATION

Bas LA, Al Faruqi AS, Harefa RK, et al. (2024). Mobile application to tackle infection disease in Indonesia. *Journal of Infrastructure, Policy and Development*. 8(4): 3329. <https://doi.org/10.24294/jipd.v8i4.3329>

### ARTICLE INFO

Received: 17 November 2023

Accepted: 28 December 2023

Available online: 15 March 2024

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**Abstract:** Infectious diseases often occur, especially as diseases such as COVID-19 have claimed many lives in the years between 2019–2021. That’s why it’s called COVID-19, considering that this infectious disease outbreak started in 2019, and its consequences and effects are devastating. Like other countries’ governments, the Indonesian government always announces the latest data on this infectious disease, such as death rates and recoveries. Infectious diseases are transmitted directly through disease carriers to humans through infections such as fungi, bacteria, viruses and parasites. In this research, we offer a contagious illness monitoring application to help the public and government know the zone’s status so that people are more alert when travelling between regions. This application was created based on Web Application Programming Interface (API) data and configured on the Google Map API to determine a person’s or user’s coordinates in a particular zone. We made it using the prototype method to help users understand this application well. This research is part of the Automatic Identification System (AIS) research, where the use of mobile technology is an example of implementation options that can be made to implement this system.

**Keywords:** infection disease; mobile application; public health data; health monitoring

## 1. Introduction

The spread of infectious diseases to humans, especially in Indonesia, is a concern that the Indonesian government needs to be aware of to control its spread, which, of course, can disrupt public health. Based on data from the Ministry of Health’s Directorate for Prevention and Control of Infectious Diseases, several infectious diseases commonly attack humans in Indonesia, such as respiratory tract infections, diarrhoea, dengue fever or malaria, worms, tuberculosis, skin diseases, diphtheria and others. The Directorate of Prevention and Control divides the eradication of infectious diseases into nine work teams, namely: tuberculosis work team, HIV work team as a sexually transmitted disease and infection, hepatitis work team as a digestive tract infection, neglected tropical disease work team, arbovirolosis work team, malaria work team, zoonosis work team, disease work team resulting from bites of venomous animals and poisonous plants and respiratory tract infection work team. With the formation of this working team, public health monitoring related to infectious diseases in Indonesia can be handled as early as possible by the government through the Ministry of Health.

Apart from that, the coronavirus or COVID-19 is an infectious disease and the most disturbing respiratory infection disease during the period between 2019–2021.

At that time, the number of sufferers exposed to the coronavirus increased along with the increasing number of deaths, where the recovery rate for sufferers was a small percentage and was overshadowed by the spread of the infectious virus, which was a scourge at that time. The main obstacles that cause the rapid development and spread of contagious diseases are people's non-compliance with health protocols and the lack of vaccines that can cure them completely. Looking at the experience of the COVID-19 incident, when this infectious disease spread, people certainly face various difficulties in their daily lives, especially in activities outside the home. People can no longer work freely to fulfil their daily needs and cannot travel for specific purposes. The community is overshadowed by the increasing number of people infected with shocking and strange infectious diseases in 2019. The sudden number of deaths of people around them also supports it.

The Infectious Disease Application that will be created aims to help the community and government manage and reduce the spread of infectious diseases and detect the spread as early as possible. This application for the spread of contagious diseases was created to respond to the needs of the community regarding the spread of dangerous infectious diseases and, of course, accompanied by monitoring the spread of these contagious diseases and reducing their spread as early as possible to reduce the number of victims affected by this infectious disease as early as possible. It is hoped that this mobile application can provide information and developments on the spread of contagious diseases, especially in Indonesia, along with a summary of the areas in the zones where infectious diseases spread in the unitary territory of the Republic of Indonesia. This application can help people monitor in advance if they are going to travel to a place, and from the start, they can watch the zone they are visiting as a green, yellow, or red zone. If a spot has a red zone, the public will inevitably know about infectious diseases that arise in a particular location and can prepare earlier to avoid the red zone location. Suppose they are also going to travel to the red zone location. In that case, they will pay attention to the health protocols that must be carried out and implemented as early as possible if they are forced to travel to that area in urgent conditions. For the government, of course, it will be beneficial to monitor the spread of this infectious disease and implement health protocols that can be understood and obeyed by its citizens so that the spread of contagious diseases can be observed as early as possible and ultimately can be reduced as early as possible (Shamsabadi et al., 2022).

Apart from the exact location, this application also contains information on the number of people infected with infectious diseases in a particular area. For example, suppose someone wants to travel to the province of East Java. In that case, they should get information as early as possible about what infectious diseases are present in that location and what health guidelines and protocols are being guided by the government to reduce the impact of its spread, which the public must adhere to when travelling to the area. Locations infected with infectious diseases (Mehraeen et al., 2022). It is hoped that the web-based application being built can provide additional information, such as how many people have contracted infectious diseases, how many have died and how many have recovered.

This application will also provide an idea of which areas are least and most infected. This will, of course, ultimately help decision makers, namely the government,

in this case through the Ministry of Health, to carry out mitigation approaches to reduce the spread of infectious diseases, reduce the number of victims and assist the community in implementing health protocols to prevent the spread of contagious diseases (Mehraeen et al., 2023).

This research will create a mobile-based application that is expected to help government programs, primarily through the Ministry of Health, in fighting infectious diseases in society from all aspects of their management and appropriate handling so that the government can maximize the welfare of the community, especially in terms of healthy community life. This application will display and handle the spread of infectious diseases using web API data in real-time (Mohammadi et al., 2023). It will show the spread of infectious diseases in various regions so that it can help the community and government overcome the spread.

## **2. Previous related research**

At the end of 2019, Chinese researchers Pan (2020) created a new type of private-oriented digital technology application aimed at and used by the public to help individuals, especially citizens in China, assess and be aware of the risk of infection. This application was developed based on community diagnostic data, which records the movement of the spread of the COVID-19 disease in preventing transmission between humans. Apart from that, this application provides information about infectious diseases, which educates the public about living healthily and being free from contagious diseases. Ultimately, it is hoped that the community and government can work together to overcome this infectious disease (Pan, 2020). Our study differs from the study that conducted by Pan (2020). We are not only focused on COVID-19 but also on other diseases.

Lim et al. (2020) created the Lopinavir/Ritonavir application, which is used to monitor and treat patients infected with pneumonia, which causes transmission of a tertiary infectious disease which in 2019 spread very seriously among the Korean population, as happened in other countries. Regarding the transmission of infectious diseases that occurred in 2019. This application was developed to monitor the spread of patients and the community in Korea in terms of the spread of acute respiratory infections. With this application, ISPA sufferers in Korea are monitored and given educational guidance so they can quickly contain its spread and speed up the recovery of sufferers as soon as possible (Lim et al., 2020). Our study is not only focused on Lopinavir/Ritonavir but also on other diseases.

Furthermore, Convissar et al. (2020) developed an application that records and records lung ultrasound, provides diagnosis and speeds up the healing process for lung disease patients. This application offers a potential role for care activities for lung ultrasound patients besides providing comfortable and practical bed facilities. The initial evaluation is carried out following the management and monitoring of the progress of infectious disease sufferers with confirmed or suspected contagious disease infections (Convissar et al., 2020). This efficient application helps the public monitor the movements of infectious disease sufferers, starting from when they start suffering, during treatment until they begin the recovery period for patients suffering from contagious diseases. Our study differs from Convissar et al. (2020). Our study is

wider as it is intended to record several cases across the country.

Mahajan et al. (2020) developed an application called SIPHERD, which is intended to monitor the progress of infectious disease sufferers by monitoring their progress data. The data that appears includes data on confirmed contagious diseases, the number of people who have recovered and the number of people who have died due to infectious diseases, the data of which is constantly updated every day. This research also shows how this application records people affected and infected by contagious diseases, including analysing the impact of lockdowns that close a city location. Furthermore, numerous examination tests for infectious disease sufferers are carried out daily. In the end, it is hoped that this application can monitor the movement of the number of sufferers per day against predictions and exclude scenarios where the infection is controlled more quickly. The development of this application shows that the increase in the number of infectious disease sufferers at high speed every day during infectious disease spread significantly impacts the spread of contagious disease. Apart from that, implementing health protocols and standards that maintain distance between residents, limiting social activities and avoiding mass gatherings is very supportive in reducing the impact of the spread of this infectious disease (Mahajan et al., 2020). Our study is not only focused on COVID-19, but also on other diseases.

A study by Whitelaw et al. (2020) used and applied artificial intelligence (AI) to create learning prediction models and perform fast virtual filtering to display output quickly and accurately. Planning and handling the impact of the spread of infectious diseases is detected as early as possible to prevent the spread of infectious diseases and reduce the effects of spread which is difficult to avoid due to the difficulty of organising the community to comply with rules and protocols to prevent the spread of infectious diseases. Furthermore, AI can detect the use of drugs obtained by patients suffering from contagious diseases and predict their estimated growth and reduction for the next few years. Predicting drug use using AI is brilliant and helps reduce the spread of infectious diseases. Furthermore, it is hoped that this research can also trigger drug manufacturing planning to predict when an infectious disease of a different type begins to spread (Whitelaw et al., 2020). Our study did not focus on AI, however, we are focusing on data integrity and visualization.

Furthermore, Nindrea et al. (2020) used and downloaded Google Trends data to monitor the movement of infectious diseases in Indonesia. This data is combined with data on the movement of contagious diseases taken via the Ministry of Health of the Republic of Indonesia API (WHO, 2020). These two data are combined and used to monitor infectious diseases in one or several regional locations in Indonesia. They are used to monitor and manage data on contagious diseases per province in Indonesia. Our study is not only used data from Google Trends. We develop an application so that the data can be entered and managed by the government.

Real-time monitoring systems built on this research have significantly impacted the development of healthcare monitoring and therapeutic interventions at all levels of society. The patient monitoring system is considered the essential mobile health service that helps patients carry out daily life activities by monitoring signs of the spread of infectious diseases and, as early as possible, starting to implement the necessary health protocols to reduce the impact and spread of contagious diseases. Furthermore, several technologies, such as the Internet of Things (IoT) and iCloud

computing, have recently been integrated into the electronics-based healthcare sector to provide elastic real-time clinical solutions (El-Rashidy et al., 2020). Deep learning algorithms, such as the Neural Network algorithm, are applied to improve the performance of infectious disease detection and monitoring. The contagious disease application developed is part of a computerised tool that can help the public increase awareness and overcome the transmission of infectious disease viruses in various places by continuously monitoring real-time data in the application (Stormi et al., 2019). Our study has not used IoT or cloud computing yet, however, data integrity and data visualization are the focus of our study.

Furthermore, society needs accurate data regarding the current spread of infectious diseases because this data can show the development and expansion of contagious diseases. Data on infectious diseases in an area becomes a barometer for people when travelling outside the region or domicile where they live. This will, of course, be useful for every individual in anticipating exposure to infectious diseases and implementing protocols implemented by the government to reduce their spread to the community (Fadhil et al., 2020). Various efforts have been made by both the government and the community, as well as observers of the spread of infectious diseases, to reduce the impact of this contagious disease. Even computerised artificial intelligence systems that assist in the government's decision-making process simulate infectious disease responses massively and accurately (Chen et al., 2019). Of course, outbreaks of contagious diseases that have created this havoc cannot be avoided, and the use of appropriate medicines, especially therapeutic drugs that have a history of use in patients, is to deal with conditions where infectious diseases spread. The car application was also developed to make it easier for the public to monitor the movement of contagious diseases that haunt the community. It is equipped with protocols that the community must follow to reduce the spread of this infectious disease (Strahm et al, 2018). Differing from all of those three studies, our study is not about diagnosing a disease. Our study is more about how to store data, manage data, and display data well.

Furthermore, the development of applications to reduce the impact of the spread of infectious diseases is inspired by the following research, which provides significant significance in creating applications that can help the community and, most importantly, are accessible for the public to understand. Rahmi et al. (2017) developed an Android-based application as a geographic information system based on Firebase and Google Maps to monitor illnesses suffered by patients who are observed using mobile technology. Apart from that, Birenboim et al., (2019) developed a mobile application operated by patients that is supported by a wearable device and is used for patient tracking at a specific location. This patient tracking is beneficial for patients' whereabouts when they travel from one place to another comfortably and always under control (Birenboim et al., 2019). Furthermore, Iqbal et al. (2018) developed a car application equipped with a device worn in real time using Bluetooth technology and applied deep learning in its implementation. The neural network algorithm is applied as an application of deep learning to streamline and predict the movements of recorded patients to monitor the location where they are and continuously monitor their physical condition to comply with the protocols implemented (Iqbal et al., 2018). Weizman et al. (2020) also developed the same thing and created a car application equipped with

wearable technology to always respond to infectious diseases and monitor infected people. Furthermore, this application is supported by AI technology, which helps this application think more intelligently to help monitor the movements of patients infected with infectious diseases. The AI algorithm is applied so that the number of people infected with contagious diseases can constantly be monitored in real-time, monitored and monitored to determine their condition and whereabouts in a location (Weizman et al., 2020). All of those studies are focused on location tracking. However, our study is not only focused on location tracking. Our study also pays attention and how to enter data by the crowd and visualize the data.

Furthermore, Priya et al. (2019) developed a resource scheduling algorithm to carry out load balancing in managing resources to handle the spread of infectious diseases. It is essential to create scheduling algorithms so that existing resources can be used as optimally as possible with an AI approach to prevent and reduce the development of infectious diseases. Besides that, resource scheduling also provides efficiency for easing inappropriate resource allocation and is, of course, more effective in reducing the massive spread of infectious diseases (Priya et al., 2019). Moreover, Hioual et al. (2020) developed a mobile application that is supported by AI algorithms, such as the fuzzy method for monitoring and managing data on patients infected with infectious diseases and the possibility of fuzzy options as a selection of uncertainties that can be chosen personally in determining how they can recover from contagious diseases. The fuzzy algorithm developed is an appropriate solution for an optimal decision-making perspective in limiting and reducing the spread of infectious diseases (Hioual et al., 2020). The use of AI and fuzzy algorithms is not yet the focus of our study, since we are more focused on the fundamental system so that data can be entered and visualized easily.

Furthermore, Bhatt et al. (2017) implemented an Android and Google Map-based application to monitor the movements of patients suffering from infectious diseases and their families, who were continuously monitored 24 h a day and seven days a week. AI algorithms are also applied to improve reporting to clinical leaders to determine decisions in real-time or at scheduled times. The report for leadership is generated from several measurement parameters that can be used to monitor the condition and movement of infectious disease patients, along with monitoring reports (Bhatt et al., 2017). Finally, Putra et al. (2017) also use a car application based on Google Maps, which is used for a land information system which can be an example of the location of a place which can constantly be monitored and can be supported by current technology. The use of a Google map-based car application is an inspiration to be implemented for regular monitoring and observation of people affected by symptoms of infectious diseases and to regulate and implement protocols that must be followed according to the rules and provisions of laws regulated by the government (Putra et al., 2017). Our study is beyond only in the form of car application. We develop a system so that data can be entered anywhere using mobile technologies.

### **3. Methodology**

The method used in developing this Infectious Disease Application system is an agile method created by following standard software engineering principles in

developing an application, which is carried out at least through stages such as analysis, design, implementation and testing. Using feasibility studies, analysis and design activities. The agile development method is a software development methodology based on the same principles or short-term system development that requires the developer's quick adaptation to any changes and allows changes to occur at any time. Agile is applied when developers are experts, design less, and prioritise implementation relatively quickly. To manage the number of people involved and the funds needed for its development, it is adjusted to people, funds and time, which must be changed starting from the amount of funds provided, which will affect the number of people involved, along with the technology obtained and the time adjusted as the time allocation for project completion.

A feasibility study is a research or study regarding the feasibility of a project that must be carried out for its successful implementation. The feasibility study that we describe in this research paper is an initial stage divided into two parts, namely the feasibility study, analysis and design, and evaluation of the feasibility study on the layout that has been carried out. The second stage is determining how the database can run on this Infectious Disease Application. In this stage, the application is analysed and designed based on the concepts born from the analysis. Evaluation is carried out when design testing based on analysis has been done. This is an ongoing study, so this application will continue to be developed so that infectious disease data can be accurate.

- (1) The analysis stage is carried out by implementing the development of software that is by the user's wishes and by the implementation of software as part of the implementation of software engineering, namely how to satisfy the user in creating software. It must be ensured that the software built meets the desires and, of course, helps the user as a user of the software. User requirements tools are used to understand users at the analysis stage as an initial part of building software. The selected user requirements tool activities include questionnaires, interviews, forum group discussions or joint application development, business use cases, observations, data collection, expert assessments and literature reviews. Several user requirement tools can be selected, and the most important thing is to carry out a literature review, which, of course, must be carried out comprehensively and in detail to discover the development of similar research. In this case, we took data randomly at a location in a district in Jakarta. We chose Jakarta as our case study as Jakarta is known as the miniature of Indonesia. It consists of every ethnicity that exists in Indonesia and also almost all of diseases have occurred in Jakarta. We randomly chose to conduct interviews with users and several experts to get clarification on the importance of an application that can monitor infectious diseases and its role in reducing the spread of contagious diseases.
- (2) In the design stage, a design is created and used as a minimum communication blueprint for developing the system model. At this design stage, we will produce using use case and class diagrams, both design tools developed as part of the Unified Modeling Language (UML). Use case diagrams describe the business process as a plan and design development stages of the system that will be implemented and developed. Class diagrams are a tool used to describe database

relationships that will be used to describe the data stores that will be applied. Class diagrams connect several classes, where each class will become a database table, each with a primary key as a unique identification for each record. The relationship between classes, which will later become a table, is described as a one-to-one and one-to-many relationship where one of the primary keys will move to another class as a foreign key, a link to another class.

- (3) In the implementation stage, the prototype is a dynamic system model for assessing a construction project's sustainability. One approach is to use theoretical models to evaluate construction projects regarding the value of sustainable development and the ability of sustainable growth to be implemented in the project life cycle. The prototype method is a form of contemporary application development that uses a more practical application description method to explore public understanding. This method was chosen because it is more concise, easy to understand, and displays test results to users. This car application is implemented on a web-based basis, with server programming such as personal Home Pages (PHP) and client programming as standard, namely HTML, CSS and JavaScript.
- (4) In the testing phase, the application developed is evaluated at the final stage using a focus group discussion (FGD) approach. A testing stage can be carried out using a white box and black box, where the white box is carried out internally from the results of running the program code, while the black box is external testing carried out by capturing data from users who use it either by using interviews or questionnaires from ordinary users or experts. User acceptance tests using ISO 25010 can be an option, and apart from that, the Technology Acceptance Model (TAM) can also be an option.

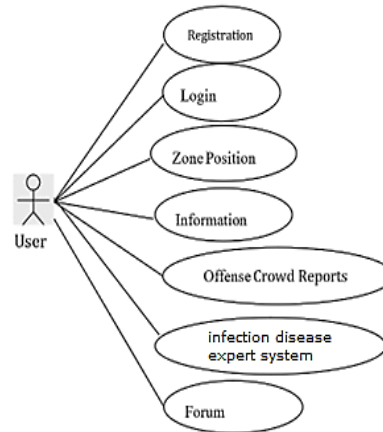
#### **4. Results and discussion**

The use case diagram in **Figure 1** explains the functionality built into an Infectious Disease Application. First, the user opens the application and registers on the registration menu. In the registration menu, prospective users are asked to enter their data, such as the user interface shown in **Figure 2** in the middle, and the data entered, such as identity card number, name, age, address, cellphone number, email and password. The system will check if data, such as cellphone numbers and emails, have ever been used. If they have been used, registration will be rejected, and prospective users will be required to enter cellphone numbers or emails that have never been used.

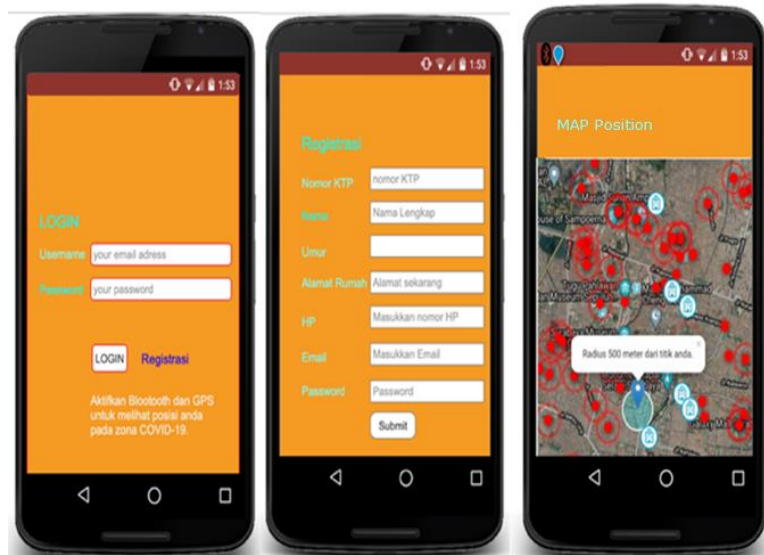
If the user has previously registered as a user, the user will immediately log in like the user interface shown in **Figure 2** on the left. The system will check whether the username and password they entered are the correct username and password. If the user forgets or enters the wrong data, the user interface will display the information they entered incorrectly. They are asked to enter their data completely and correctly. If they forget their username and password, the user interface will display a screen for the user to enter the email they used during initial registration. The system will send the username and password to the email address used at the beginning of the user registration process. Users will open their email to get the username and password for



their created account.



**Figure 1.** Use a case diagram of the infection disease application.



**Figure 2.** User interfaces for login menu, registration menu and your position menu.

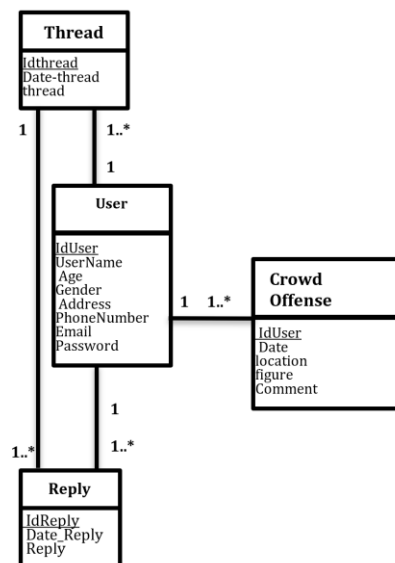
After registering or logging in, the user will automatically be directed to the position page for the coordinates of a particular zone on Google Maps, and this can be seen in the user interface shown on the right in **Figure 2**. Users can see all zone conditions in various regions with their status, namely red, yellow and green. The red zone condition describes the worrying condition of a zone regarding the spread of infectious diseases; the yellow zone condition describes the condition of being alert and on guard for the spread of contagious diseases. Meanwhile, if the conditions are in the green zone, you can be sure that the zone is free from infectious diseases. For the red, yellow and green zone categories, data on the distribution of infectious diseases is obtained and withdrawn from the Ministry of Health, which can report in real-time on the development of infectious diseases in a location and region.

Furthermore, this system's fourth function is to provide users with information about infectious diseases using the latest data taken and drawn from the Ministry of Health data. The data displayed is per province, complete with the number of people exposed and the number of recoveries and deaths. This data provides a barometer for

users to visit a place so that when someone visits a location, they can understand whether their area is safe. The presence of red, yellow and green zones will provide comfort when visiting an area.

Apart from that, this application is also equipped with a form to provide reports regarding anything like news, such as red zone violations in terms of holding crowds in certain areas, to the government so that immediate handling and prevention can be carried out in implementing protocols to prevent the spread of infectious diseases. Apart from that, an expert system equipped with a fuzzy algorithm is used to display predictions of the spread of infectious diseases using a regression approach as a supervised algorithm approach. Furthermore, users can also request information through consultation with a team of infectious disease experts regarding the problems they face regarding controlling the spread of contagious diseases. Apart from that, this application is equipped with a forum that allows users to communicate with each other politely and regularly to share information, questions, and answers. This forum will be moderated to show that the conversations that arise are conversations that are mutually respectful and do not result in forum conversations that disturb the public interest, such as those related to ethnicity, race and religion, which need to be guarded from the start so that they do not escalate into problems and racial issues.

Meanwhile, **Figure 3** shows the database flow in an Infectious Disease Application that implements a MySQL database. A database flow describes how a user performs some related action. When a user opens the database application, the input is ID, username, age, gender, address, telephone number, email, and password. The database input created by the user is related to Crowd Offense. In the Crowd Offense class, users enter a database using user ID, date, location, images and comments. The comments referred to here are the contents of news data, for example, about crowds at a location.



**Figure 3.** Class diagram of the infection disease application.

The thread class is connected to the user and reply classes, and the reply class is related to the thread class. The database entered by the user gets feedback from the

administrator. When logging in and committing crowd violations, the user database is recorded in the application database and gets input from the admin. This database is the initial database describing the initial application implementation, and in the future, the data implementation must be applied more deeply to obtain a more complex database model. This class diagram will produce four database tables where each class or table will have a primary key as a unique identification for each record. The one-to-many relationships in this class diagram will cause the primary key in one class to move to another and become a foreign key connecting to each primary key.

As for how this application works to display data on Google Maps, it is undoubtedly connected to a geographic information system based on the Google Maps API, GPS, and Bluetooth. Google Maps API is a highly interactive Android clinic geographic information system (Rahmi et al., 2017). GPS and Bluetooth are wearable and location-tracking technologies for sensing mental conditions in outdoor environments (Birenboim et al., 2019).

The advantage of the API is that it allows applications to interact with others. These features are used as real-time mapping on application devices as follows:

- (1) GPS coordinates are taken based on the last point the user is at. In this case, the biometric bracelet's GPS feature will continue to track individuals' movement within a geographic area and communicate back to the infectious disease database platform, storing input about the whereabouts of the population at any point in time.
- (2) Data transmission at internet GPS coordinate point and data web server from GPS to Cloud Server. Cloud computing uses scheduling and load balancing to share virtual files in cloud infrastructure, one of which is through a web API. Both must be done optimally in a cloud computing environment for optimal file sharing.
- (3) Through the internet, the web API sends data to a cloud server to be stored as a database.
- (4) Web API retrieves data from the Cloud Server based on input on the user's GPS coordinates (Hioual et al., 2020). A cloud server is crucial because it can process data faster.
- (5) Web API retrieves processed data from cloud servers via the internet.
- (6) The web API retrieves processed data from the cloud server via the internet to the Google Maps mobile device.
- (7) Users get accurate data about their position coordinates in the Google Map Device (Android). GPS (Global Position System) technology is a handy feature for detecting the user's location by obtaining coordinates in the form of latitude and longitude values. User location detection also determines user location information (Putra et al., 2017).

The infection disease application is an alternative to the many applications of infection disease that have existed before. It is undeniable that the spread of infectious diseases is a common concern in tackling it. Computerised countermeasures are also a form of assistance to the general public to maintain their distance from zones exposed to the infection disease. The following are the results of the infection disease application in the prototype, which is equipped with how to use its features.

**Figure 2** describes the start page when the user uses this application: the login page, registration and position map. The following is an explanation of each figure in

**Figure 2:**

a. Login menu

When the user opens the infection disease application, the user is asked to fill in the login form. The login form is for users who have opened the application and have registered on the registration menu. On this page, the user can click the login button when the user has entered the correct username and password. New users who do not have an account in the application are asked to click the register link; then, the user will be directed to the registration form, which will be filled out on request. Users are also reminded on the login page to activate Bluetooth and GPS so that when logged in or have successfully registered, the user will see the position shown by Virtual Reality on the map. Use will see its position with the red zone for the spread of the infection disease.

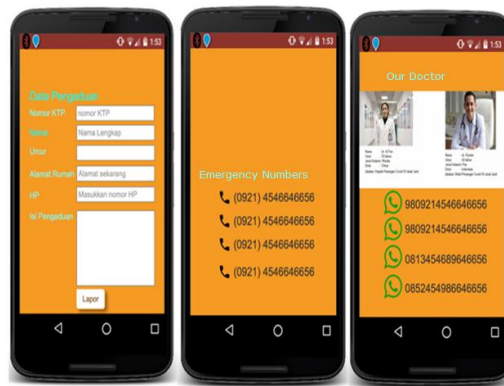
b. Registration menu

The registration menu is a menu where the user is asked to fill out the form provided. When the user has filled in the form correctly and double-clicked submit, the user will be automatically directed to your position page. There, users can access other pages of the infection disease application.

c. Your position menu

In the login menu, users who have registered to the application and already have an account after a successful login process will see their position in a particular zone, as shown on the map. Likewise, a user who has just entered this application after successfully registering will automatically have an account. After successful registration, the user will be shown your map position on the page. Here, GPS and Bluetooth activation functions are visible. The activated GPS functions to detect the location where the user is at that time while Bluetooth is activated so that anonymous data exchanges can occur with other users at the exact location to find out the condition of other surrounding residents. The user will get a notification if the user is detected entering an area that is included in the red zone (a zone where patients are infected with an infectious disease) or if the user is close to someone who has previously had contact with an infectious disease patient or someone who is doing self-quarantine. This notification aims to make the user move away from his current position immediately.

In this application, when the user clicks on “are there any complaints about infection disease? The user will be directed to the complaint data page. Users fill out this form to enter personal data and include the contents of a complaint to the government, for example, two days before the user had just returned from the infection disease red zone.



**Figure 4.** User interfaces for crowd offence report menu, forum contact menu, and infection disease expert system menu.

**Figure 4** explains how users can submit complaints through the form provided and use the contacts listed to open forums with medical professionals. The following is an explanation of each figure in **Figure 4**.

a. Crowd offence report menu

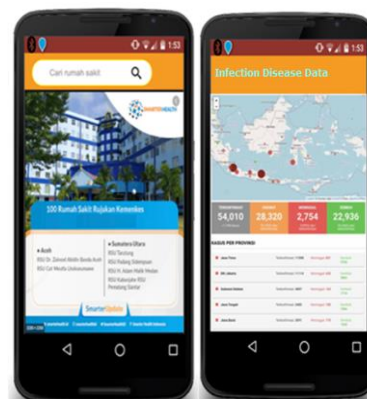
The complaint data form is used by users who want to complain about problems related to infectious diseases. For example, he is submitting a complaint during the 14-day self-quarantine because he had just returned from the red zone area of the spread of the virus. Users will get responses via cellphone numbers or email from the health (government) admin.

b. Forum contact menu

In addition to submitting complaints via the complaint data form, users can contact the emergency contact listed on the application. This emergency contact is open 24 h. The function of this emergency contact is so that users can get the health authorities directly for help or find the nearest infectious disease referral hospital.

c. Infection disease expert system menu

Users can contact doctors whom the government has appointed to deal with the public regarding the infection disease. Users can contact doctors via the WhatsApp contact listed on the application. The goal is to provide direct guidance to users about dealing with the infection disease and to get remote care from doctors. The doctor will send everything needed to the address entered by the user during registration if he still lives at that address or submits a new address on the complaint data form.



**Figure 5.** User interfaces for hospital information menu and today menu.

**Figure 5** provides more information about infectious diseases and recommends hospital information for treating infected patients. The following is an explanation of each figure in **Figure 5**:

a. Hospital information menu

As the person in charge of the application, the government has entered a list of referral hospitals for handling infectious diseases. This page provides a list of hospitals, complete with the information. Users can also search for other hospitals through the available browsing features.

b. Today menu

Users can access the latest infection disease info on the newest infection data menu. This data will display a map of the spread of the infection disease throughout Indonesia. The exact page also shows the number of sufferers, the number of patients being treated, the number who died and the number of patients who have recovered.

## 5. Conclusion

The application of infectious diseases focuses on a person's position at a certain point. Users can use this application to see the green, yellow and red zones in various regions in Indonesia. This application provides information to users and warnings to be careful about entering the red zone. The red zone is where many people are exposed to infectious diseases. The green zone indicates that the community area has not been exposed to contagious diseases. Meanwhile, yellow is still classified as an emergency status zone, meaning that vigilance in the area is increasing because people are exposed to infectious diseases.

Research on mobile applications to tackle infectious diseases in Indonesia is an application design that still needs improvement. Therefore, future researchers can develop applications in other forms, especially regarding the accuracy of data on Indonesian people throughout Indonesia, based on not only Google trend data but also data from hospitals and local government agencies—health. Its implementation is an effort to make data more transparent. The goal is that the entire community can be free from the spread of infectious diseases. It is hoped that its application can be applied to 9 contagious illnesses recorded in the Directorate of Prevention and Control of Infectious Diseases of the Ministry of Health, namely tuberculosis, HIV as a sexually transmitted disease and infection, hepatitis as a digestive tract infection, neglected tropical diseases, arbovirosis, malaria, zoonoses, diseases caused by bites—venomous animals and poisonous plants, as well as respiratory tract infections. Forming an application that can handle these nine infectious diseases can improve the health level of the Indonesian people as part of the government's obligation to serve public health as early as possible through the Ministry of Health.

**Author contributions:** Conceptualization, LAB, ASAF, RKH and HLHSW; methodology, LAB, ASAF, RKH, HLHSW and AR; software, LAB, ASAF and RKH; validation, LAB, ASAF, RKH, HLHSW and AR; formal analysis, LAB, ASAF, RKH, HLHSW and AR; investigation, LAB, ASAF, RKH and HLHSW; resources, LAB, ASAF and RKH; data curation, LAB, ASAF, RKH and HLHSW; writing—original draft preparation, LAB, ASAF, RKH, HLHSW and AR; writing—review and editing,

HLHSW and AR; visualization, LAB, ASAF, RKH, HLHSW and AR; supervision, HLHSW, AR and NN; project administration, HLHSW; funding acquisition, HLHSW and AR. All authors have read and agreed to the published version of the manuscript.

**Conflict of interest:** The authors declare no conflict of interest.

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