An Android-based COVID Case Monitoring Application Using a Geographic Information System to Educate the Public to be More Aware of COVID-19 Spreads

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Abstract. The purpose of this study is to monitor the spread of Covid-19 cases. The monitoring process takes advantage of geolocation to detect the level of the spread of Covid in an area. Geographical information system utilization is used for mapping areas that have Covid cases. To notify users of the use of geolocation sensors, it is used to notify system users within a certain radius that the area entered is in an active zone for the spread of Covid-19. To carry out the tracing and tracking process, each Covid-19 patient will be reported to the system by recording their telephone number. Therefore, the patient's movement will be detected whether he complies with the protocol by isolating independently or violating the protocol by exiting the quarantine area. Geolocation sensors and telephone number recording will involve a smartphone device so that the system built will be mobile-based. The software development method used the waterfall method, which consists of requirements, design, implementation, verification, and maintenance. This study is a product design prototype application for monitoring mobile phone-based covid cases using a geographic information system approach.

1. Introduction
WHO has declared Covid-19 as a global pandemic that is harmful to the people. Covid-19 is an infectious disease caused by the newly discovered coronavirus. Coronavirus is part of a large family of viruses called the Coronaviridae family in the Nidovirales order [1]. In mild cases, the virus can cause the infected patient to coughs, experience headache, and flu, while people with previously have known illnesses such as diabetes, cancer, or respiratory disorders can have a higher chance of getting a fatal outcome from this virus infection. The virus was spread through small droplets from the nose or mouth, which is expelled when people sneeze, coughs, or even speak. By seeing how easy it is for the virus to spread [1], the government suggested that people must remain quarantined in their house and maintain a safe distance of 1 meter from each other to interact. Despite the effort of implementing a health protocol, the cases each day still increase significantly. One of the reasons to cause this is there are still many people that disobey the health protocol and have low awareness regarding this virus. The research was conducted to build and develop an android based application called Covitor (Covid Monitoring Case), which has the main focus to educated and raise awareness toward this virus transmission. Covitor will also display the number of confirmed cases and heat map transmission of the virus using Geographic Information System (GIS).

GIS is a framework for gathering, managing, and analyzing data. Rooted in the science of geography, GIS integrates many types of data. It analyzes spatial location and organizes layers of
information into visualizations using maps and 3D scenes [2]. This system is usually used in many other areas of expertise, such as making a Malaria vulnerability map or even a symptom tracking [3-4]. Modern GIS technologies use digital information, for which various digitized data creation methods are used. The most common data creation method is digitization, where a hard copy map or survey plan is transferred into a digital medium through the use of a CAD program and geo-referencing capabilities.

For the last three months, the application for covid is not many. One of them is web-based and has little publicity [5]. Seeing how many people can have access to Android phones make GIS a great addition to the Covitor app. Covitor is an application that will give information related to Covid-19. By assuming that most people have an android smartphone, we decide to build our application based on android. Using geographic information systems, the application will have a map that shows the approximation of Covid-19 spread across the area. Covitor will also include a function for the user to enter a custom GPS to point where they are living; once the location is added, Covitor will give a reminder and a warning if the user is going out of their house by tracking the user using the GPS function. The app also has a system that will give warning to the user if the user is going or even enter an area that is heavily populated or has high cases of Covid-19 and finally the app will also educate and commemorate the user surrounding news, symptoms, handling, health policy and raise awareness about Covid-19.

After a few months of practicing the new normal protocol, covid-19 cases seems not lowered much. The spread is still at an alarming and frightening rate. Many people cause this still aren't unaware of the risk of Covid-19 [6]. With that idea, we think of a way to slow down the spread even slightly and maybe eventually stop the growth of Covid-19 cases. With the fast and broad information exchange, use the channel to spread the information on the act on pandemics. A digital platform like social media or Covid-19 related app has proven to be a relevant and effective way to spread awareness and knowledge regarding Covid-19 [7].

Covitor was developed to see how effective it can to educate and raise awareness for people to follow the health protocol given by WHO and the Government. The method that is used in this research is descriptive research, and the model that is used is the waterfall model. The waterfall model was chosen because it creates a linear workflow that fits the development style for the Covitor app. The app is developed using the java programming language in Android Studio. It contains a local database using Room DB to store the user's location and use APIs to collect and display the coronavirus confirm cases, map transmission, and news.

2. Method
This research is focused on developing the Covitor app using the waterfall model, which is one of the software developing methods in the Software Development Life Cycle (SDLC). The waterfall is one of the oldest and most recognized models for building and developing software [8-11]. This software development life cycle progress sequentially. The development cycle can't progress unless the previous step is finished. This guarantees that each process must be done correctly. Generally, the Waterfall model consists of 5 steps can be seen in Figure 1.
1. Requirement and Analysis
   In this step, developers must define a description for the system that is going to be developed. These descriptions can come from a client or a certain amount of respondent that are the target users. These descriptions became the requirements that are needed to build the software.

2. Design
   The information gathered from analysis and requirement is used to be a guideline and implemented to the general design for the software. It can be a starting point on choosing the functionality, data, data flow, data relation, content, information, and complexity of the software. This phase also a pinpoint where researchers choose the appropriate operating system for the software.

3. Implementation
   After getting the general design for the software function, data, procedures, logic, and others, it will be implemented to the desired programing language chosen. In other words, it is building the actual software application itself.

4. Verification and Testing
   This phase ensures that software can bring a solution and fulfilled the client or target user needs. It mainly focuses on three big point software and design functionality, as well as navigation. This is why the requirement and analysis process needs to be done correctly.

5. Maintenance and Bug Fixing
   Once the product is done, it may still need to fix and adjust. In this phase, the users can express their inconvenience and provide input for improvement. This step also allows the developers to fix some of the bugs and errors in the software.
3. Results and Discussion

3.1. Functionality COVID Monitoring Case System

The specifications for functional software requirements are software requirements resulting from the analysis process carried out in software development. Analysis of software requirements specifications is needed to make use of case descriptions. Analysis of functional software requirements can be seen in Table 1.

| Code     | Specification Requirement                                      |
|----------|---------------------------------------------------------------|
| SKPL-F01 | User can view case number                                     |
| SKPL-F02 | User can view mapping of Covid-19 transmission                |
| SKPL-F03 | User can get news                                             |
| SKPL-F04 | User can get health Protocol                                 |
| SKPL-F05 | User can scan Covid-19 patient in one area                    |
| SKPL-NF01| OS Minimum Requirement is 4.4 Kitkat                          |

3.2. Use Case Diagram

Use case diagram of the COVID Monitoring Case System is shown in Figure 2.

![Use Case Diagram](image-url)
3.3. Implementation
The program code is made in android studio, using Java language. The database that has been using in the program is using SQL. And for the API is using JSON and SQL queries.

3.4. Verification and testing
In this phase, the testing is checking three main aspects:
- a) Software functionality
  Test whether the functionality in the program is executed well.
- b) Program command
  Test if the program can run normally.
- c) Function logic
  Test if the validity of the program is logically true.

3.5. Maintenance and Bug Fixing
After releasing the application, maintenance is still needed to keep the program run normally if some bugs or errors are not shown in the testing.

4. Conclusion
Android phone is one of the most accessible and owned pieces of technology in this day and age. Using it as a platform to spread information and educate people can be very beneficial and effective. In this case, the Covitor app has proven that having an accessible source of news and information regarding Covid-19 can increase the level of awareness and education related to health protocol, Covid-19, and its transmission. Showing and reminding its user about confirm cases, map transmission, and health protocol can minimize the user’s desire to go out of their house without protection for unnecessary reasons.

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