

Expert System for Mobile Consulting Services with Position Detection

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Abstract—This paper aims to provide an overview of the development of an online consulting service model using an expert system with position detection. A service center is provided as a central provider of knowledge bases for service applications. Knowledge base is represented in the form of a database. Service applications include development applications, web and Android-based consulting applications, and position monitoring applications. Cases used are infectious diseases with examples of dengue fever. Position detection is done when the results of the consultation indicate that the user has the potential to experience an infectious disease. Position data will be read by the consultation application via GPS. The test results show that the system is able to differentiate the results of the consultation decision to detect the position when the user is potentially infected with the disease. The results of the detection of this position can be used for monitoring.

Keywords—Expert System; Android; Positioning; GPS;

I. INTRODUCTION

There are many problems related to the needs of the public or the community who need support for solutions. These solutions may be immediately needed because they can cause a risk to someone or their environment. As in the health sector, victims often fall due to delays in actions and handling due to the ignorance of the community of dangerous diseases. Even in infectious diseases need to be a concern and alert for the community and those who have an interest in handling health in an environment.

One approach that can be done is to provide online consulting services that can utilize web media or mobile devices (smartphones). This approach can be done using an expert system so that the community can conduct interactive consultations on knowledge-based systems. The existence of a variety of services that provide benefits is to provide opportunities for more affordable services to those in need through communication media. On the other hand, the ability of a mobile device (smartphone) equipped with a GPS system that can be detected. This will provide benefits when there are indications of an infectious disease that can be detected immediately so that the community or parties interested in the environment can take the necessary actions or anticipations. Under these conditions, a mobile consultation service on the smartphone and its position detection system is needed to

identify the location of potential infectious diseases such as dengue hemorrhagic fever.

This paper aims to provide an overview of the development of an online consultation system using an expert system. The consultation system is implemented using a smartphone that allows its position to be detected to be further developed for the monitor system.

II. RELATED WORK

Efforts to develop services in the field of health utilizing mobile devices have become a worldwide concern [1]. In developing countries, these services are very helpful in efforts to improve health [2] [3]. Various services have been developed using this device for various purposes, such as measurement, diagnostics, treatment/prevention (Surveillance system), and global services [4].

In Surveillance system services, mHealth can provide reports that are fast compared traditionally [5], so it will be very helpful in taking action. In [6], Surveillance systems used email to collect data on the incidence of diseases. While in [7], proposed a Surveillance system that utilizes information from mobile devices. But the last two studies have not combined with a consultation system. This research is a continuation of previous research [8] [9], which will combine a consultation system with potential detection positions for use in surveillance systems.

III. PROPOSED SYSTEM

The system developed is a service based on an expert system for online consulting using web and smartphone interfaces. A server as a service center contains a database and several services applications (Figure 1). The parts of the system are described as follows:

- The database functions as a knowledge base repository and a container for the user (patient) profile.
- Application Development is a service application for Knowledge engineers to build and manage knowledge base.
- Web-based Consultation Application is an application for consulting services for users using web interface.
- The Android-based Consultation application is an application consulting services for users who use Android application interface.

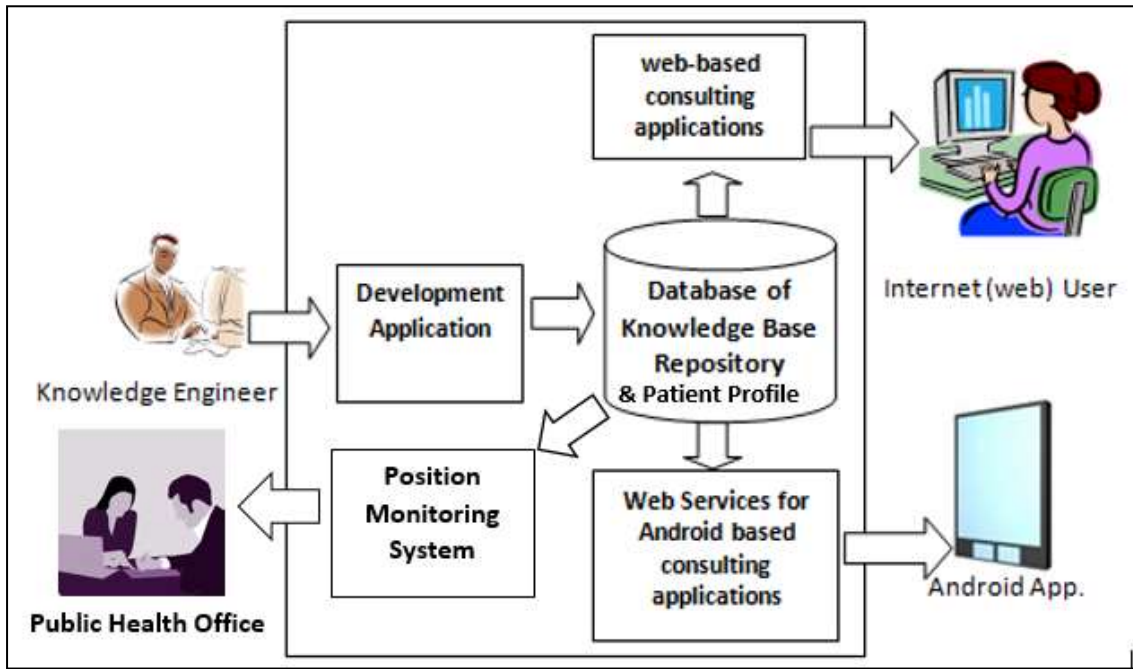


Figure 1. Architecture of Online Consulting Services with Monitoring Position System

e. Position Monitoring System is an application to monitor indicated users who have the potential to experience infectious diseases.

In this study, the decision tree approach is used to represent the expert system knowledge base. The concept of a decision tree is in the form of a search process from the initial

identification point (root) to the branches (decision nodes) and ends when reaching a conclusion (leaf node) [10].

Furthermore, at the level of implementation, a form of knowledge base repository model is needed to be accessed by the application. In this case, it is stated in the form of a database whose design is shown in Figure 2. The design of the knowledge base repository database consists of several tables.

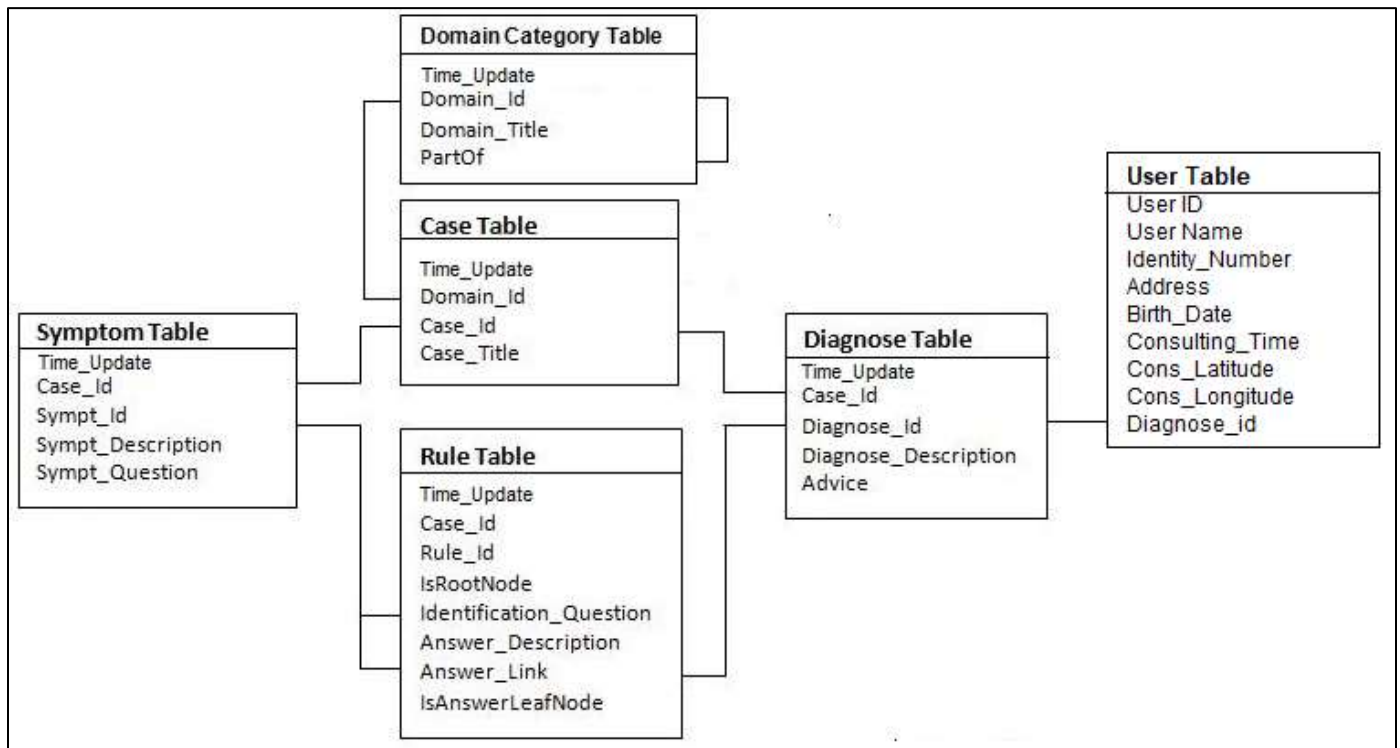


Figure 2. The Knowledge Base Repository Model

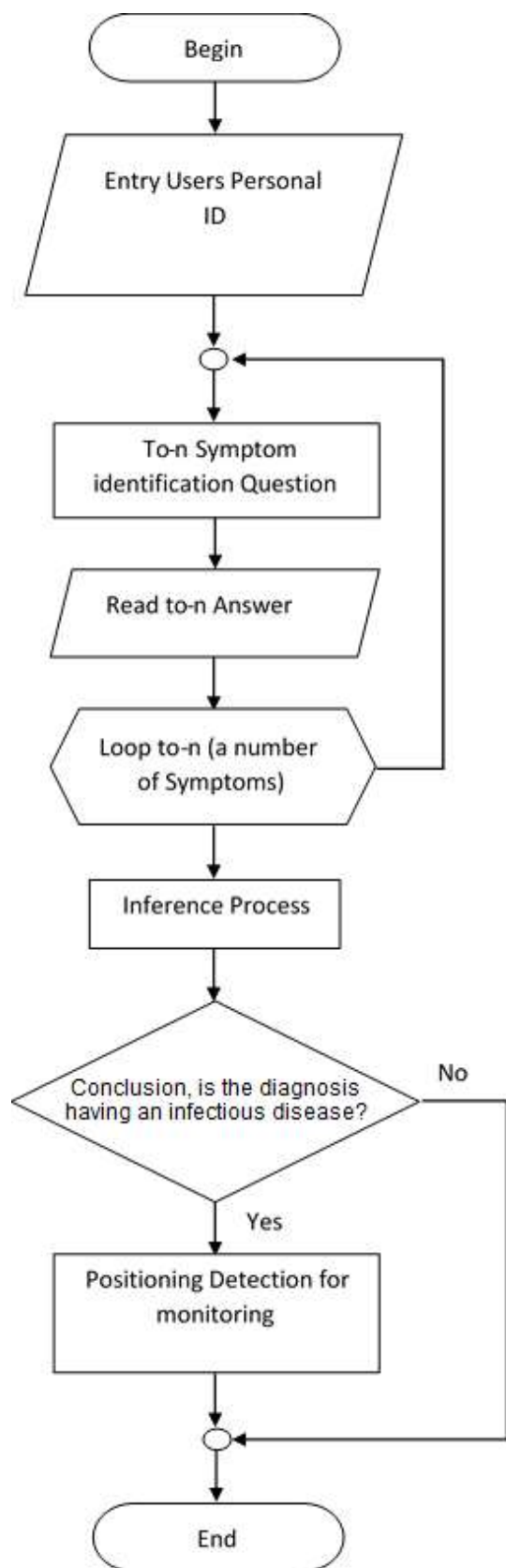


Figure 3. Flow Chart of Consulting Process

The Domain Category table is to represent dynamically multilevel organizations that cover a broad to the specific problem domain. Case Table to describe a scope of problems. Symptom table to describe symptoms and questions for symptom identification. Diagnosis table to describe conclusions and recommendations. The rule table is used to represent decision trees in a scope of cases (problems).

The operating system of the consultation system is presented in Figure 3 which presents the flow of the consultation process. Users who will consult must fill in the identity data first which includes Name, Population Registration Number (NIK), Gender, Age, and Address. Furthermore, the consultation process was carried out using the Question and Answer method. The system will provide questions regarding the identification of disease symptoms that must be answered. This process will take place with a number of questions depending on what is available in Knowledge Base. After the identification process has been carried out, the system will conduct inference to determine the type of disease based on the user's answer data. The results of this inference are conclusions and recommendations to users. The results of this conclusion are also used to make decisions regarding position detection. If the conclusions show the potential for infectious diseases, the system will detect the user's position to be sent to the server that will be used for monitoring.

IV. EXPERIMENT AND DISCUSSION

The experiment is conducted using a prototype system. The knowledge base is implemented using MYSQL Server, the web application developed using PHP programming and Android App developed using Android Studio. The purpose of this experiment is to determine the operation of a position detection system from the results of the consultation decision.

Experiments are carried out with a sample consultation using an Android smartphone that indicates an infectious disease. The chosen case is Dengue Hemorrhagic Fever, which is an infectious disease that is most often found in developing countries. This case representation is referenced from [11], which is represented in the decision tree referring to [10].

After filling the user profile, the consulting process will be work. Android-based consulting services will run the process. of symptom identification step by step until reach a conclusion. The identification process works through the generation of the identification page (Figure 4a) which contains questions related to the symptoms that may arise. Users are asked to answer the question according to the choice of answers available and continue the process by pressing the advanced link. After the identification stage has been directed to a conclusion, the conclusion page will be raised. Conclusion page (Figure 4b) contains the results of diagnosis and suggestions needed by the user. By using a black box test, this experiment was conducted for two types of consultation results, namely potentially infectious or not. If the user has an infectious disease the position detection system should send the position data, whereas if not then there is no position data received. The test results are presented in Table 1.



Figure 4 Example of Consulting Application (a) identification page (b) Conclusion page

TABLE 1. RESULTS OF DETECTION POSITION

Location Test	Consultation Results	Position Data (Latitude, Longitude)
Campus II Widyagama University	potentially infectious	(-7.936921700000001, 112.63340810000001)
	not identified	(-, -)

Based on the test results (Table 1), it can be seen that the system has been able to detect positions based on the results of the consultation decision. The first result shows the value of Latitude and Longitude when the conclusion shows the potential for infection. The second result shows that the system does not detect positions when the results of conclusions do not identify



Figure 5. Example of Position Monitoring Display

the results of infection. This states that the system has been able to distinguish the two conditions.

Furthermore, the position detection results will be sent to the server to be stored. This result can be used for position monitoring by interested institutions such as the Public Health Office. Example Display of the monitor is presented in Figure 5. Thus, this system is a potential for surveillance systems by knowing the potential locations of infectious disease sources.

V. CONCLUSION

This study has developed an online consultation system using a smartphone equipped with a position detection system. Position detection system utilizes the presence of GPS on a smartphone. The system developed has been able to distinguish the results of the conclusions of the consultation that will detect the position when showing the potential for an infectious disease. Thus, this service has the potential to be further developed for surveillance systems.

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