



Development of Android-Based Expert System to Diagnose Faults on Computer Devices

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ABSTRACT

Repairing damage to computer equipment can be difficult if the exact cause of the problem is not known. Therefore, it is necessary to diagnose the cause of the damage first before carrying out repairs. Diagnosis of the cause of the damage can be done using the help of an expert system application. By using an expert system application, one can easily analyze the cause of the damage like when consulting with an expert. In addition, with the application of an expert system, one can also learn to find out the patterns or paths of diagnosing a problem on the computer. Therefore, this study aims to develop an expert system application to perform diagnostics to repair damage to a computer or PC. The type of research conducted is Research and Development (R&D). The R&D process uses a linear or waterfall sequential method which includes the stages of needs analysis, design, implementation, and testing. The expert system application is built to work on an android smartphone device. In order to produce a good application, this study uses the ISO 9126 standard as a standard for the level of application feasibility. The ISO 9126 standard used covers aspects of functionality, reliability, maintainability, portability, and usability. In order to produce a good application, this study uses the ISO 9126 standard as a standard for the level of application feasibility. The ISO 9126 standard used covers aspects of functionality, reliability, maintainability, portability, and usability. In order to produce a good application, this study uses the ISO 9126 standard as a standard for the level of application feasibility. The ISO 9126 standard used covers aspects of functionality, reliability, maintainability, portability, and usability.

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1. Introduction

Computers are devices that are no longer a luxury item, but have become a necessity. Almost every activity we do today is made easier by the presence of a computer or also known as a personal computer (PC). Starting from office activities, health, banking, education, and others. The development of computers continues to this day with better quality and innovation. Damage to the computer is an

annoying problem. Especially for someone whose work depends a lot on computers. Many activities will be delayed due to the damage. Computer damage can be repaired if the cause is clearly identified. The cause of the damage can be known based on the symptoms that appear or are found. These symptoms are generally observable. The observation process is carried out through several checking processes. However, the checking process used to observe or find out the source of the problem is not always the same. Between students and technicians who are experts or experts there is a wide range of experience. A way is needed to narrow this limit. Learning from the experiences of others is one way. "...Although experience may be a good teacher, someone else's experience is a far better teacher..."(Golden, 2012). By using the experience of others as a stepping stone, it is hoped that it can accelerate the learning process. Because it can avoid mistakes that have been made by others. However, the checking process used to observe or find out the source of the problem is not always the same. Between students and technicians who are experts or experts there is a wide range of experience. A way is needed to narrow this limit. Learning from the experiences of others is one way. "...Although experience may be a good teacher, someone else's experience is a far better teacher..."(Golden, 2012). By using the experience of others as a stepping stone, it is hoped that it can accelerate the learning process. Because it can avoid mistakes that have been made by others. However, the checking process used to observe or find out the source of the problem is not always the same. Between students and technicians who are experts or experts there is a wide range of experience. A way is needed to narrow this limit. Learning from the experiences of others is one way. "...Although experience may be a good teacher, someone else's experience is a far better teacher..."(Golden, 2012). By using the experience of others as a stepping stone, it is hoped that it can accelerate the learning process. Because it can avoid mistakes that have been made by others. Learning from the experiences of others is one way. "...Although experience may be a good teacher, someone else's experience is a far better teacher..."(Golden, 2012). By using the experience of others as a stepping stone, it is hoped that it can accelerate the learning process. Because it can avoid mistakes that have been made by others. Learning from the experiences of others is one way. "...Although experience may be a good teacher, someone else's experience is a far better teacher..."(Golden, 2012). By using the experience of others as a stepping stone, it is hoped that it can accelerate the learning process. Because it can avoid mistakes that have been made by others.

Based on these problems, a solution is needed, programs such as expert systems can be an effective way to learn from the experiences of others. Because "expert systems are systems that use human knowledge recorded in computers to solve problems that usually require human expertise" (Turban et al, 2005:708). This means that the expert system is made so that non-experts can access the knowledge of an expert in solving the problem. So that it can be learned how the method is carried out by an expert. The expert system has several special features that have the possibility to support the process. For example, the expert system has the ability to explain (Explanation Capability). Explanation Capability serves to explain to the user, how a conclusion can be drawn (Sutojo et al, 2011:169). Thus, it is hoped that expert system users can gain broader insights.

On the other hand, the development of mobile devices in Indonesia in recent years has grown rapidly, especially Android-based smartphone devices. In terms of the number of users, Android-based smartphones are the most popular mobile devices. In September 2014 (figure 1), Android controlled at least 60% of the smartphone market share in Indonesia.

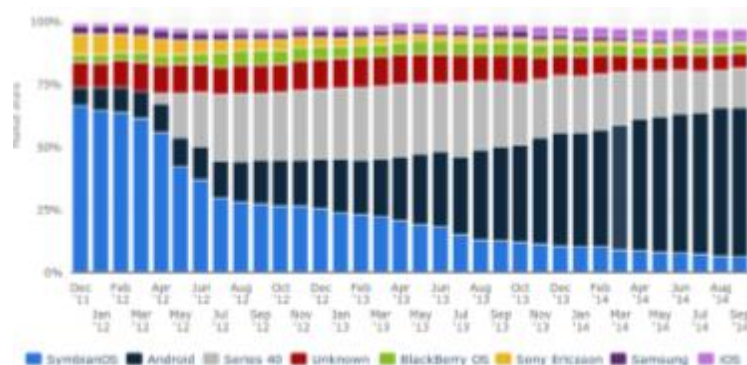


Figure 1. Mobile Device Market Share from December 2011 to September 2014 in Indonesia (Statista, 2014)

Android is not only used as a communication and entertainment tool, but also for educational purposes. AppBrain (2014) states that in October 2014 there were at least 105,677 educational applications, both free and paid on Google Play, as can be seen in Figure 2. This can show that the enthusiasm of software developers to develop educational applications is quite high.

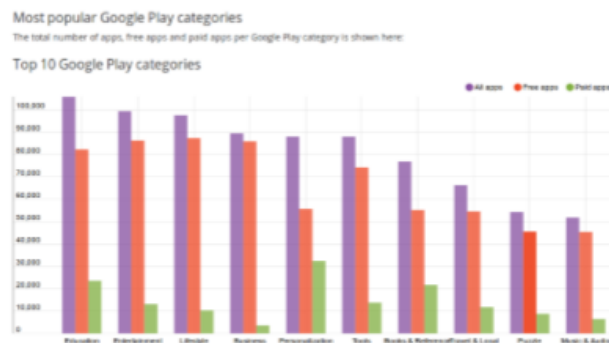


Figure 2. Top Categories of Android Apps (AppBrain, 2014)

Seeing people's enthusiasm for Android devices, it means that there are more opportunities for expert systems to be used by many people if they are developed on Android. Especially for students and prospective technicians, as the main target users of the expert system that will be developed later. In addition, android as a mobile device, offers flexibility for its users. The shape is not too big and light, making it easy for Android to be carried everywhere. The development of expert systems on Android today is still a bit. However, at least there are several expert systems that have been developed on this device, one example is ICare (Singh, Suraj, et al, 2014). ICare is an expert system that focuses on the health sector. However, there is no expert system application for diagnosing computer damage on Android devices.

"Semantic network is a knowledge representation technique that is used for proportional information, while what is meant by proportional information is a question that has a true or false value" (Hartati and Iswanti, 2008: 22-23). The basic components for representing knowledge in the form of a semantic network are nodes and links. Nodes represent objects and relationships between objects are represented by links that are labeled to represent the relationships represented. This network is used for proportional information. Proportional information is a declarative language because it states facts. An example of a semantic network can be seen in Figure 5.



Figure 3. Examples of Semantic networks (Hartati and Iswanti, 2008: 24)

"Frame is a data structure that includes all knowledge about a particular object" (Turban.dkk, 2005:792). The frame is a collection of slots that contain attributes to describe knowledge. The knowledge contained in the slot can be in the form of events, locations, situations, or other elements. Frames are used for declarative knowledge representation. The frame contains a description of an object using a tabulation of information related to the object. In other words, frames group the attributes of an object and help imitate the way someone organizes information about an object into data sets. Representation of knowledge with this frame is appropriate for the type of knowledge that has a narrow subject matter, is more definite and rarely changes in content unless there are special conditions.

2. Method

The research method used is the research and development method. This means that this means that research and development is a process in developing a product and testing the validity of the product being developed. In developing this expert system the author uses a linear sequential software development model. The development steps can be seen in Figure 16.

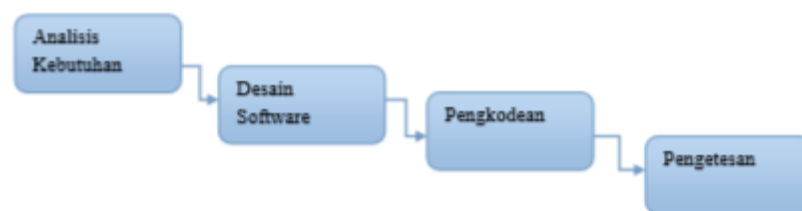


Figure 4. Linear Sequential Software Development Model

3. Results and Discussion

In determining the functions that exist in the expert system that is made, the author first makes observations and studies literature related to the expert system. The functions or features contained in the developed expert system can be described as follows: The expert system has 3 main functions, namely consultation, regulation, and assistance functions. The consultation function can display a list of PC malfunction diagnoses that have been provided. The consultation process in the consultation function has a question concept. The consultation function has a column to display questions and the final diagnostic result. There are Yes and No buttons in response to the displayed question. The consultation function has an explanation feature to explain the intent of the questions raised. The consultation function also has a feature to repeat to the previous question if it is felt that the questions that have been given are not appropriate. These features are represented in the form of a back button.

The regulatory function is useful for managing data and compiling data into a flow or diagnostic rule that will be used in the consultation process.

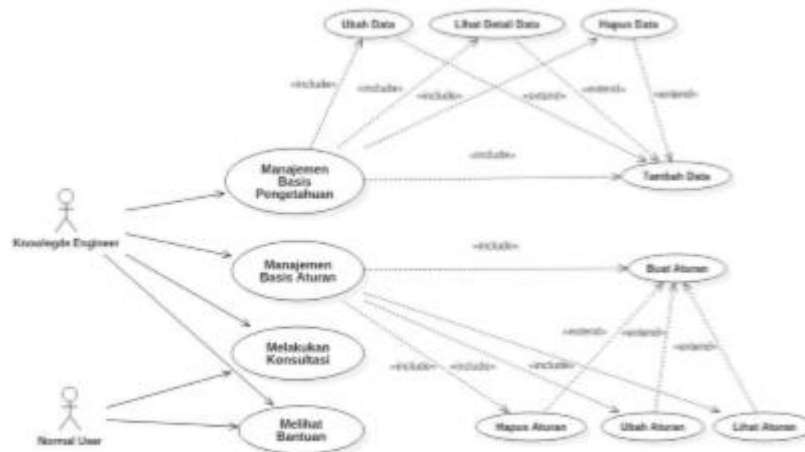


Figure 5. Use case diagram of an android-based computer repair expert system

4. Conclusion

Based on the research that has been done in the development of expert system applications for diagnosing damage to computers, the researchers can draw several conclusions, namely: The expert system application was developed using a linear sequential software development model or also known as the waterfall model. The stages of development in this model include the process of knowledge analysis, design, coding or implementation, and testing.

Feasibility of the application is tested in the testing stage to determine that the application made is suitable for use. Application feasibility is measured using the ISO 9126 software eligibility criteria. Application feasibility testing by developers includes aspects of functionality, reliability, maintainability, and portability. Aspects of functionality based on the tests that have been done, get very good test results. All existing functions can run properly. Aspects of reliability based on the results of the tests carried out obtained very good results.

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