Designing Android-Based Led Television for Detecting Damage Using Forward-Chaining Method

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Abstract: LED television (Light Emitting Diode) was the digital display-based technology that generated images on a flat surface with a lighting system through LED backlight technology. In terms of quality and technology, LED television is also much more developed, but it does not rule out that LED television is free from damage. The problem statement of this study was that detecting damage on LED television was not easy for newly-experienced technicians e.g., vocational students and apprentices who had just finished the training on television reparation at Al-Mubarok Electronic Service. It was because of a lack of their knowledge and experience in detecting damage to LED televisions so that they needed a system for consulting the experienced technicians and the training spots. The system was built through Expert System Application by using the Forward Chaining method that was able to interfere with the engine uses – the user-defined information to move to AND and OR logic – until an object was determined. All rules must be met so that an object was achieved. The system also provides features such as damage detection, damage info, and detection history info that has been done. The system also provides features such as damage detection, damage info, and detection history info that has been done.This system was made through Android so that it was able to be used anytime and anywhere. The result of this study was the implementation of the LED television damage detection system using the Forward Chaining method. It was expected that the system or application that had been created provided convenience in the initial detection process for technicians or users.

Keywords: *LED Television, Expert System, Forward Chaining, Android*

1. INTRODUCTION

Liquid Crystal Display (LCD) televisions were the digital screen-based technology that generated images on a flat surface with a lighting system using CCFL (Cold Cathode Fluorescent Lamps) lamps. On the other hands, Light Emitting Diode (LED) televisions were the lighting system using the LED backlight-based technology. In terms of quality and technology, LED televisions were also highly developed. The Indonesian people preferred the LED televisions to CRT televisions. This was because the LED televisions did not require too much electricity (Yasin et al., 2016).

The LED televisions also had weaknesses. This was because the LED televisions had smaller and more sensitive components than the CRT televisions. The damaged LED televisions were able to be repaired on condition that the causes were clearly identified. The causes of the damages were identified through the symptoms. These symptoms were able to be observed with several examinations. However, the examination processes used to observe or find out the problems were not always the same. The process of examining the problems varied for each component. The examination process was frequently carried out in several stages. Examining the initial symptoms were able to guide the next detection processes.

The improvement processes were able to be carried out on condition that the sufficient symptoms were found to draw the conclusions. The problems for each component had its own symptoms. This assisted the examination processes to be more specific. On the other hands, detecting damages in the LED television was not easy for newly-experienced technicians e.g., vocational school students and apprentices who had just finished the training on television reparation at Al- Mubarok Electronic Service. This was because of their lack of knowledge and experience in detecting the LED television damages so that they still needed a system for improving their knowledge.

Based on this problem, the expert system using the forward chaining method was regarded as the effective way for the newly-experienced technicians in order to learn and consult their problems. The expert system was a part of artificial intelligence designed to answer questions and solve problems in the fields of health, business, economics, and so forth. The expert system was the computer program that was able to store the knowledge and rules of special experts. The expert system was a very helpful method for decision making because this expert system was able to collect and store knowledge from one or several experts and to use the reasoning system that resembled an expert in solving problems. This expert system was able to solve a particular problem because the overall knowledge had already been stored inside it (Naser and Zaiter, 2008). On the other hand, the recent development of mobile devices in Indonesia had grown rapidly, especially the development of the Android-based Smartphone devices. Android was the OS that was highly used among many operating systems. The open-source system inside Android facilitated the developers to create the Android applications. The Android offered flexibility for users. Its shape was not quite big and light so that it made the Android easy to carry everywhere.

2. METHOD

The stages of this study included problem statements, collecting the data, designing the system, developing the system, and testing the system. The stages of this study were seen on Figure 1.

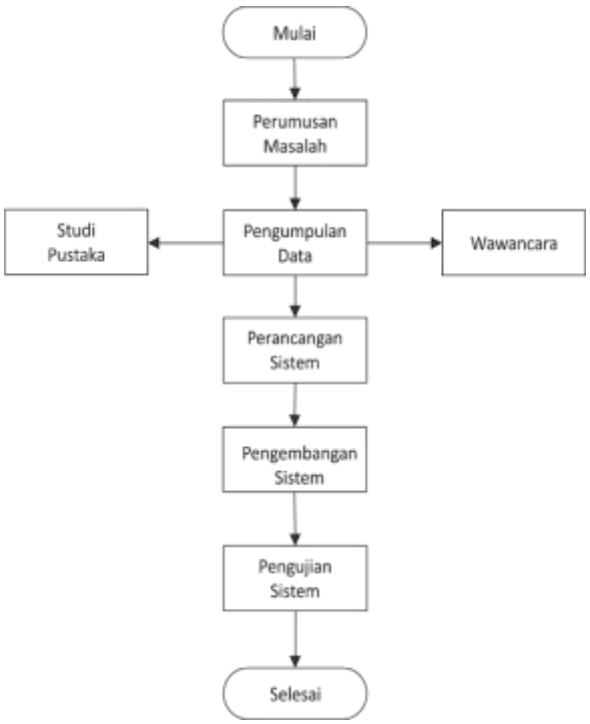

Figure 1. Research Stages

2.1 Designing System

The method used in this system was the waterfall method. This method was the method often used by the system analysers. The core of the waterfall method was that the system was carried out sequentially or linearly (Jogiyanto, 2005).

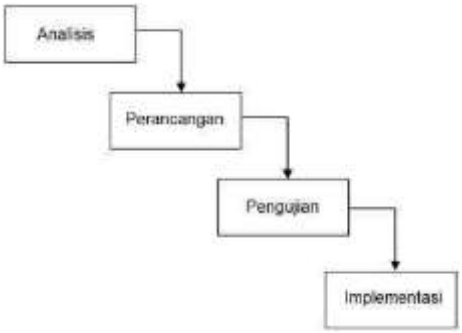

Figure 2. Flow of Waterfall Method
(source: Jogiyanto,2005)

In this process, the system was designed and made in order to be able to implement the requirements that had been obtained previously. There were five designs to design the system e.g., the decision tree, the use case diagram, the class diagram, the activity diagram, and the interface design.

2.2 Decision Tree

In this process, all knowledge obtained from observations and interviews with the experts were collected to make a decision tree. This decision tree was applied in coding. The decision tree was seen on Figure 3.

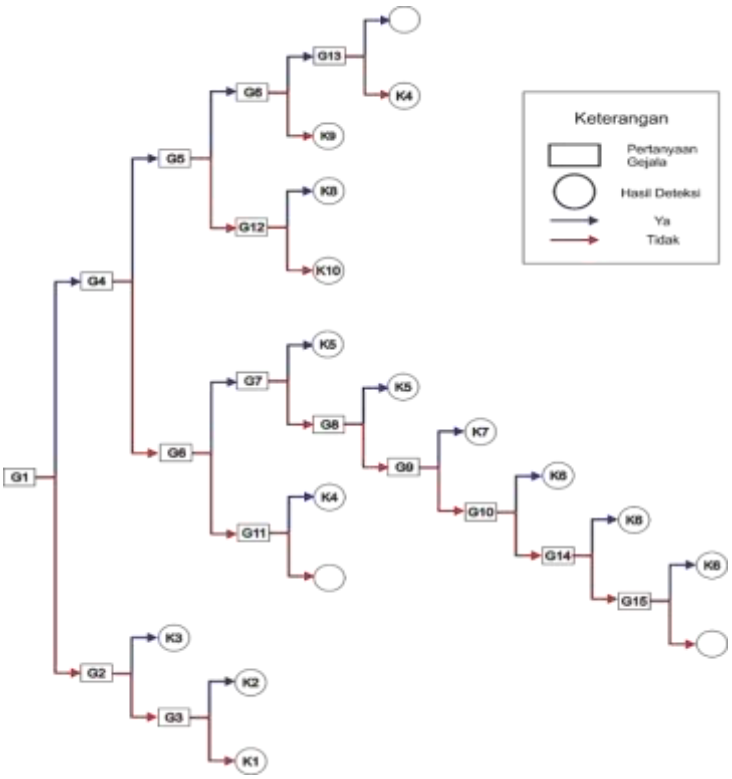

Figure 3. Decision Tree. of Expert System

From this decision tree diagram above, the flow of questions and the results of the analysis were completely displayed. The provided questions only had two answer choices "Yes" and "No" to get analysis. The “Yes” answer option was a blue arrow line and the “No” answer option was a red arrow line. All questions were square and in the form of "G" code. Information for each of the question codes was seen on Table 1.

Table 1. Description of Question Code

Question Code	Information
G1	Could the TV be turned on?
G2	Was the standby indicator light on?
G3	Was the fuse for the blow checked?
G4	Was the image normal?
G5	Was the broadcast normal?
G6	Was its normal sound?
G7	Was the screen completely dark?
G8	Was the screen partially dim?
G9	Was the screen striped?
G10	Was the screen white blank?
G11	Did the video and audio have any distortion?
G12	Was the antenna cable properly connected?
G13	Did the OSD (On Screen Display) / menu appear?
G14	Did the colour of the image change?
G15	Did the screen partly appear dark / the image appear full?

All of these analysis results were circular and in the form of "K" code. The description of each analysis result code was seen on Table 2.

Table 2. Description of Damage Code

Fault Code	Information
K1	Damage to the power supply (not working)
K2	Damage to the power supply (short)
K3	Damage to the Power Supply (Standby)
K4	Damage to the Mainboard
K5	Damage to the LED Backlight
K6	Damage to the T-con Board
K7	Damage to the Panel
K8	Damage to the tuner
K9	Damage to the Audio Amplifier Circuit
K10	Antenna Damage

2.3 Use case Diagram

In this process, the system or software requirements were planned. This Android-based system required a use case diagram model used to interpret interface functions. The Use case diagram was presented on Figure 4.

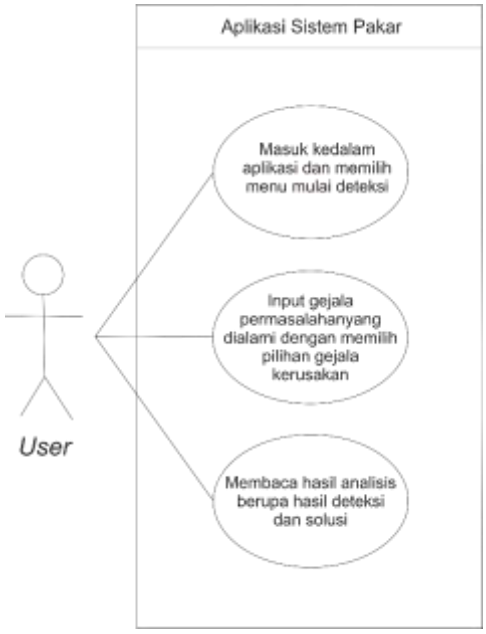

Figure 4. Use Case Diagram

2.4 Class diagram

The class diagram not only described (attributes / properties) of a system but also offered services to manipulate this state (method / function). The class diagrams described the structure and description of classes, packages, objects, and their relationships. The class diagram was presented on Figure 5.

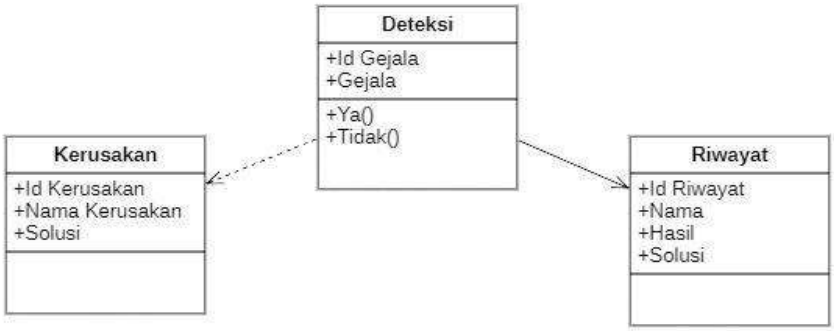

Figure 5. Class Diagram of of Expert System

2.5 Activity Diagram

Activity diagram was the diagram that described the workflow or activities of a system. The activity diagram was presented on Figure 6.

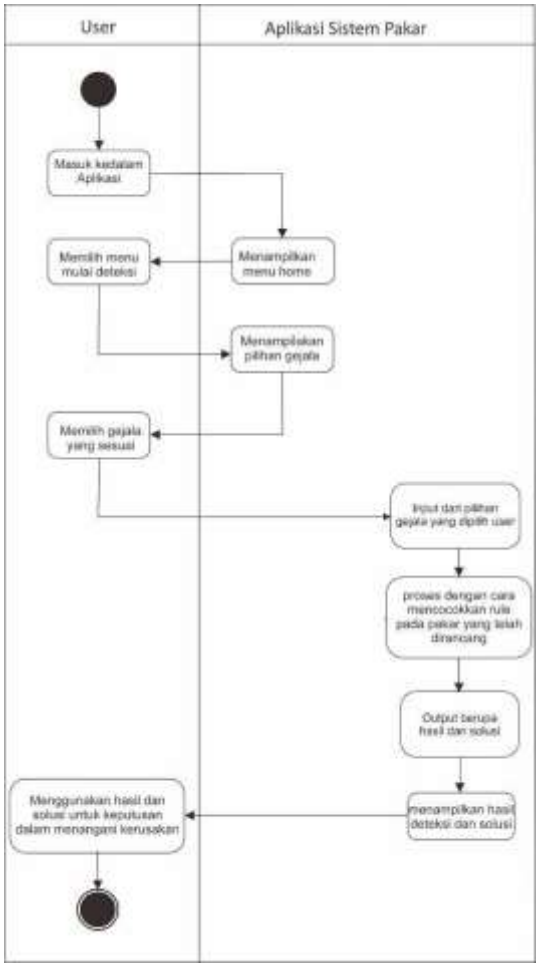

Figure 6. Activity Diagram of Expert System

Process in figure 6 starting from the user who enters the application then the system will display a menu on the start page and then the user selects the start detection menu, the system will display a question about the symptoms experienced and if the user answers the appropriate symptom question, the system will display the results of the damage along with the damage solution.

3. RESULTS AND DISCUSSION

3.1 Splash Screen Interface

The splash screen Interface was run the first time in the application. The following was the result of the implementation:

Figure 7. Splash Screen Interface.

3.2 Main Menu Interface

The Main menu interface was the initial page when the users entered this application. The following was the appearance of the main menu interface. It was seen below:

Figure 8. Main Menu Interface.

3.3 Detection Interface

The Detection Interface was the page for detecting the television damages. The users were able to trace the visible symptoms on this page. After the users had selected, the problems were detected. The following showed the detection interface:

Figure 9. Start Detection Interface

3.4 Detection Result Interface Display

This page was the result of detection that had been done by the users. This page contained a section of faults, selected symptoms, and solutions. The following was the display of the detection result interface:

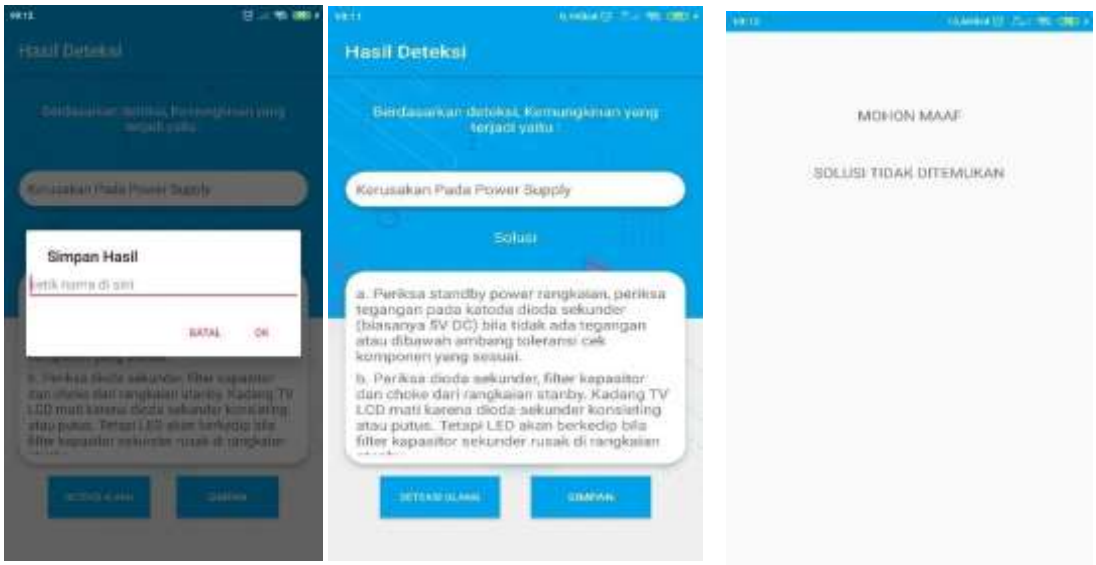

Figure 10. Display Detection Result Interface.

4. CONCLUSION

Several conclusions and benefits of this study are:

1. The system is able to find damage problems due to the gradual search system.

2. The system is able to facilitate the users to save and view a history of detections.
3. The application is easy to carry because it is in the form of an android mobile-based system.

The result of this study is expected to be more helpful and facilitate the technicians, especially newly-experienced technicians to detect and repair the damaged LED televisions.

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