

Laptop Damage Detection Expert System with the Forward Chaining Method

Teguh Muhammad Ilham^{1✉},

Putra Indonesia University YPTK Padang

Teguhmuhammadilham@gmail.com

Abstract

Ultra Computer is a shop that is engaged in the service and sale of laptops and has difficulty overcoming laptop damage to clients and writing reports that have not been computerized. The method used by the author in this study is Forward Chaining by taking data directly to the Ultra Computer Store. The analysis is based on research conducted that the obstacles experienced are that technicians have difficulty in overcoming damage to laptops, both hardware and software damage. The results of the research are expected to design an expert system for diagnosing damage to laptops so that it can facilitate the shop so that it can diagnose damage quickly, precisely and accurately. efficient. The implementation of a diagnostic expert system design on this laptop certainly has a great influence on the shop without the need for more difficulty in diagnosing damage to the client laptop and recording data more accurately so that it can be a benchmark for other damages and the data storage is even better. safer than before. The tools used in the design of this system use UML and the programming uses the PHP programming language and is supported by a MySQL database..

Keywords: Expert System, Forward Chaining, UML, PHP, MySQL

Abstract

Ultra Computer is a shop engaged in the service and sale of laptops. It has difficulty dealing with laptop damage to clients and writing reports that have not been computerized. The method used by the author in this study is Forward Chaining by taking data directly to the Ultra Computer Store. Analysis based on the research conducted shows that the obstacles experienced are technicians having difficulty dealing with damage to laptops, both hardware and software damage. The results of the research so that expert systems are able to diagnose damage to laptops can make it easier for the shop so that it can diagnose damage quickly, precisely and efficiently. The implementation of the design of a diagnostic expert system on this laptop certainly has a big impact on the shop without the need for more difficulties in diagnosing damage to the client laptop and recording data more accurately so that it can become a benchmark for other damages and the data storage is even more safer than before. The tools used in the design of this system use UML and the programming uses the PHP programming language and is supported by a MySQL database.

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1. Introduction

The development of computer technology has been accompanied by an increase in the number of computer users in the world. Along with the increasing number of computer users, the problem of computer damage is a fairly complicated problem. This is understandable given the large number of computer users who lack knowledge about computers, especially in dealing with computer damage. This problem is generally experienced by both individuals and institutions. Lots of funds are spent to repair computer damage, even though the computer damage that occurs is not necessarily complicated and can be repaired independently [1].

In general, a laptop has the same function as a computer, which is a versatile tool that can be used to perform various functions. Where the main function is to perform data processing, so that it can help humans

in presenting information quickly, precisely and accurately. However, data processing cannot be done if there is damage to the laptop used [2].

Expert Systems is a field within artificial intelligence that functions as a consultant for decision making. It uses a collection of facts, rules of thumb, and other knowledge about a limited domain to help make inferences within the domain. It is called an expert system because it addresses problems that are usually thought to require human specialists for the solution. An expert system can be viewed as having two environments: a development environment and a consulting environment. The development environment is used by Expert System builders to build components and enter knowledge into the knowledge base. The consulting environment is used by non-experts to gain knowledge and expert advice [3].

Expert systems arise because there are problems in a specific specific field where the user wants a solution to the problem to be solved by approaching expert ways to solve the problem. The design of this expert system application uses the forward chaining method which is used to test the factors entered with the rules stored in the system until a decision can be taken [4].

Forward Chaining is a bottom-up computing model. Forward Chaining works with a set of known facts and applies rules to generate new facts whose premises match the known facts, and continues until it reaches a predetermined goal, or until no further facts can be derived whose premises match the known facts. 5]

The Forward Chaining method is a search method or a forward tracking technique that starts with existing information and combines rules to produce a conclusion or goal. This forward tracking is especially good if you are working with a problem that started with recording the initial information and you want to achieve a final solution, because the whole process will be done sequentially forward. Forward Chaining means using a set of conditional - action rules. In this method, data is used to determine which rule to execute, then the rule is executed. Maybe the process adds data to working memory. The process is repeated until a result is found [6].

The use of the Forward Chaining method has been very widely used, including research using data from pregnant women which produces an Expert System that can help pregnant women in knowing the level of risk of pregnancy, anticipation during pregnancy and what methods can be used in treatment during pregnancy [7]. While research using Forward Chaining is also able to help patients with nervous disorders to find out about neurological diseases and how to treat neurological diseases [8].

Other studies using Forward Chaining also provide conclusions reaching 100% for diagnosing diseases in the field of hematology and oncology. However, according to experts, a diagnosis based on symptoms only has a confidence level between 50-60%, so other factors are needed in assessing the level of accuracy [9]. The Forward Chaining method can also assist farmers in determining the level of soil acidity and determining the most suitable planting for that type of soil [10]

The results of the research using the Forward Chaining method in evaluating the system were carried out using a questionnaire on 50 respondents showing that the system in terms of appearance has a percentage of 82.3% and in terms of benefits it is 82.2% so it can be concluded that the system can be accepted by the public with a very strong interpretation. 11]. The application of Forward Chaining is also able to identify weeds that attack oil palm plantations and how the solution is to handle these weeds so that it can make it easier for users of this system [12]

The system can be defined as a collection of things or activities or elements or subsystems that work together or are connected in certain ways so as to form a single unit to carry out a function to achieve a goal [13].

Information is data that has been processed into a form that is important to the recipient and has real value that can be felt in current or future decisions 14].

2. Research methodology

Research methodology is a science that talks about ways to carry out a correct research, which discusses how to find, record, formulate, and analyze to compile reports based on facts or symptoms scientifically Figure.1.



Figure 1. Research Framework

The research stage is a sequence of processes or steps that will be carried out in completing this research. The stages of this research are as follows:

2.1. Preliminary Research

Preliminary research is the first step in conducting research. The research was conducted at the Padang Ultra Computer Shop. This preliminary research was carried out by reading books, journals, and other literature related to the research to be carried out and going directly to the research object and asking for the data needed in the research.

2.2. Data collection

In this study, data were collected from various sources by searching for references such as books, scientific works and journals, both in the library and on the internet related to research. Data was also obtained from field studies by direct observation and interviews.

2.3. Analysis

Based on the preliminary research above, data analysis is carried out with the aim that problem solvers can find the right solution and avoid the emergence of new problems. The existence of this decision support

system can later help the process of detecting damage to laptops on Ultra Computer Padang. The data can be stored properly in a pre-designed database. So that later the data of the participants can be stored in detail and well structured.

2.4. Design

In designing the system, object-oriented modeling is carried out by designing the Unified Modeling Language (UML). At this stage, the facts are collected to support the system design. The Unified Modeling Language (UML) will be used as a tool in explaining the flow of program analysis.

2.5. Implementation

System implementation is a stage that is carried out when the designed system is ready to operate. Implementation is carried out with the aim of confirming the results of the system design, so that users can provide input (feedback) on system development.

2.6. Testing

System testing is a stage that is carried out when the repetition process has been completed and the system is ready to be used to find out whether the designed system is running correctly and is free from errors.

3. Results and Discussion

In this study of damage detection on laptops, several damages and symptoms of damage were found through observation. The following is the data obtained which will be used for trials to be implemented using the forward chaining method.

Table 1. Laptop Damage Data Table

Code	Damage
P1	Power Supply
P2	Memory
P3	Monitors
P4	VGA
P5	Hard drive
P6	Optical Drives
Q7	Motherboards

Table 1 contains the codes and damages obtained from the research results which found 7 defects.

Table 2. Table of Laptop Damage Symptoms Data

Code	Symptom
G1	Smell Burnt
G2	Total Dead Laptop System, Power Button not working
G3	Old Shutdown Accompanied by Beep Tone
G4	When Power On No Display
G5	Blue Screen When Loading
G6	System Operator Not Working

G7	Exits Repeated Beep Tone
G8	Monitor Off, Blank and No Picture
G9	Monitor Flickering
G10	Display Does Not Match the Original
G11	Long Loading and Often Hank
G12	Program Not Supported and Restarts Frequently
G13	The screen does not appear even though it has been turned on, and does not want to access the BIOS
G14	No System Detect
G15	Unable to Fast Boot
G16	Slow Program Access
G17	Slow Laptop
G18	Cannot read, write, delete and edit
G19	Fast Hot Laptops
G20	Slow Laptop Working
G21	Cannot Shutdown
G22	Always Ask for CMOS Setup

Table 2 contains the symptoms that exist in laptop damage as many as 22 symptoms with codes ranging from G1 to G22

Table 3. Table of Symptoms and Damage to Laptop Damage

Code	Symptom	Damage						
		P1	P2	P3	P4	P5	P6	Q7
G1	Smell Burnt	X						
G2	Total Dead Laptop System, Power Button not working	X						
G3	Old Shutdown Accompanied by Beep Tone	X						
G4	When Power On No Display		X					
G5	Blue Screen When Loading		X					
G6	System Operator Not Working		X					
G7	Exits Repeated Beep Tone		X					
G8	Monitor Off, Blank and No Picture			X				
G9	Monitor Flickering			X				
G10	Display Does Not Match the Original			X				
G11	Long Loading and Often Hank				X			
G12	Program Not Supported and Restarts Frequently					X		

G13	The screen does not appear even though it has been turned on, and does not want to access the BIOS	X	
G14	No System Detect		X
G15	Unable to Fast Boot		X
G16	Slow Program Access		X
G17	Slow Laptop		X
G18	Cannot read, write, delete and edit		X
G19	Fast Hot Laptops		X
G20	Slow Laptop Working		X
G21	Cannot Shutdown		X
G22	Always Ask for CMOS Setup		X

Table 3 contains a synchronization of symptoms with damage to existing laptops, where there are 22 symptoms and 7 damage.

1. There is a burning smell = true and No system detection = true and turn off the laptop, the power button does not work = true then Power supply.
2. Long shutdown with beep = true and When turned on no display = true and Blue screen when loading = true Blue screen when loading and operator system not working = true and exit from beeping tone repeatedly = true then Memory.
3. Monitor is off, blank and no image = true and Monitor blinks = true and Display does not match the original = true and Displays images that are disproportionate = true then Monitor.
4. Loading for a long time and often hank = true and the program does not support and often restarts = true and the screen does not appear even though it appears, but does not want to access bios = true then VGA.
5. No system detection = true and unable to boot = true and quickly lost = true and slow program access = true then hard drive.
6. Slow laptop = true and can't read, write, delete and edit = true then optical drive

7. Laptop heats fast = true and notebook performance Slow = true and Can't turn off = true and always asks CMOS setup = true then motherboard.

Table 4. Table of Rules

Code	Symptom Code	Crash Code
R1	G1, G2, G3	P1
R2	G4, G5, G6, G7	P2
R3	G8, G9, 10	P3
R4	G11, G12, G13	P4
R5	G14, G15, G16	P5
R6	G17, G18	P6
R7	G19, G20, G21, G22	Q7

System Interface Testing

The admin home page layout displays the appearance of the admin home after the admin has logged in and successfully validated the system. This view contains any menus and sub menus that can be accessed and seen by the admin. Figure 2 shows how the home admin looks like in the expert system.

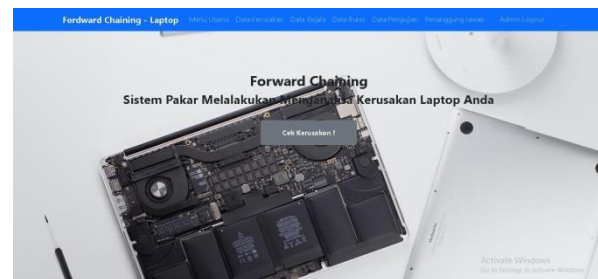


Figure 2. Dashboard Page Display Page

This view shows the display of input data for the laptop owner to be processed later to become the final report.

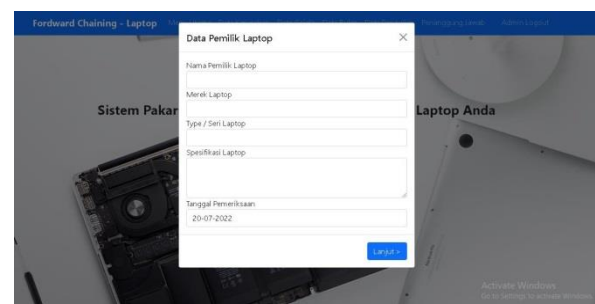
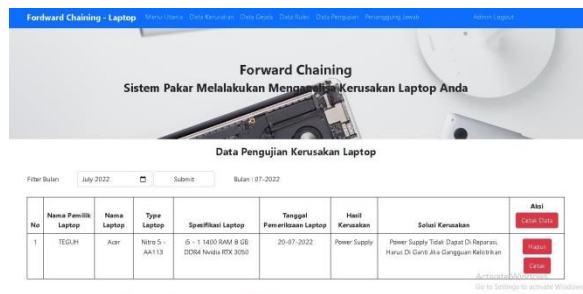


Figure 3. Display of the Laptop Owner's Data Page

Test Data Page

This view shows the laptop data that has been entered in the previous forms:



The screenshot shows a web application titled "Forward Chaining Laptop" with the subtitle "Sistem Pakar Melakukan Menganalisa Kerusakan Laptop Anda". Below the title is a section "Data Pengujian Kerusakan Laptop". It includes a filter for the month of July 2022 and a table with the following data:

No	Nama Pemilik Laptop	Nama Laptop	Tipe Laptop	Spesifikasi Laptop	Tanggal Penemuan Laptop	Hasil Kerusakan	Solusi Kerusakan	Aksi
1	TIGUH	Acer	Nitro 5- AA113	6 - 1 1400 RAM 8 GB DDR4 Nvidia RTX 3050	20-07-2022	Power Supply	Power Supply Total Harus Di Rongrong, Harus Di Ganti Jika Gangguan Keluaran	Cetak Data

Figure 4. Display of the Test Data Page

4. Conclusion

Based on the explanation from the description of the problems that have been discussed in the previous chapter, the following conclusions can be drawn:

1. It is hoped that by designing an expert system it can help Ultra Computer Padang services in detecting laptop damage so that it can be done easily and accurately.
2. It is hoped that the forward chaining method will detect damage to the Padang Ultra Computer laptop so that it can analyze data accurately.
3. It is hoped that by using the PHP programming language in detecting laptop damage on the Padang Ultra Computer it can be used easily and can process data quickly and accurately.
4. It is hoped that by using the MySQL database data in detecting damage to laptops on Ultra Computer Padang can be stored properly and safely.

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