

Diagnose Expert System Computer Malfunction Certainty Factor Method

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Abstract-An expert system is a knowledge base system that solves problems using an expert's knowledge that is entered into a computer, thereby increasing productivity. Because an expert can work faster than a human lay works like an expert. Expert systems Also solve problems by imitating the ways in the which an expert expert offer section with problems in his field, one of the which is in the field of computer repair, the problem of computer damage Becomes a fairly complicated problem, this problem is Generally experienced by individuals and institutions. One of them is in school institutions that have computer laboratories. to diagnose computer use can damage the certainty factor method that helps identify damage to the computer and find the cause of damage to the computer based on the symptoms that occur and the solution to repair it. Certainty Factor is one of the techniques used to deal with uncertainty in decision making. In dealing with a problem, answers are Often found that do not have full certainty. This uncertainty is influenced by two factors items, namely the uncertain rules and user uncertain answers. Uncertain rules are rules of symptoms that are determined for a damage.

Keyword : Expert System, Computer, Certainty Factor

1. Introduction

Current technological advances in the computer field is very fast, a lot of advantages in the can by the man of the ease of information that can be accessed easily and quickly evolving technologies must be supported by an appropriate device, there are times when a computer that is used may not work in accordance with function, this is normal because the computer can also be worn when continuously used, and without proper maintenance. in this problem can be solved by experts who can be simplified into expert systems (expert systems). computer malfunction problem becomes particularly complex issue, these issues are commonly experienced by individuals and institutions. One of them in school establishments that have computer labs.

2. Theory

2.1 Expert system

Artificial Intelligence is one area of computer science which utilizes intelligent computer so that it can behave like the computer manusia. Ilmu develop software and hardware to mimic human actions. Simulated human activities such as reasoning, vision, learning, problem solving, natural language understanding and so on. In accordance with the definition, then the artificial intelligence technology learned in areas such as: Robotics (Robotics), Computer Vision (Computer Vision), Language Processing Natural (Natural Language Processing), Pattern Recognition (Pattern Recognition), Nerve System Artificial (Artificial Neural System), Voice Recognition (Speech Recognition), and Expert System (Expert System). Artificial Intelligence to solve the problems by utilizing a computer to a complex problem by following a process of human reasoning. One of the techniques of artificial intelligence that mimics human reasoning process is Expert System.

2.2 Expert System Elements

Expert systems can not be separated from the human element related thereto. Personnel associated with the existing expert system 4, namely:

- a. Expert (Expert)
- b. Builders knowledge (Knowledge Engineer)
- c. Builder system (System Engineer)
- d. User (User)

2.3 Certainty Factor

Factors certainty (Certainty Factor) is one method used to deal with uncertainty in expert systems. Shortliffe certainty factor introduced by Buchanan in the manufacture MYCIN.MYCIN, expert systems to

diagnose bacterial infections in the blood, using a certainty factor method for overcoming the lack pastian.CF
 $(H, E) = MB (H, E) - MD (H, E)$

CF (H, E): certainty factor hypothesis H is affected by the evidence (symptoms) E.

MB (H, E): measure of confidence (measure of Increased belief) against hypothesis H which is influenced by evidence E.

MD (H, E): the size of unbelief (measure of Increased disbelief) against hypothesis H which is influenced by evidence E. The basic form formula certainty factor of a rule in the form of IF E THEN H is as follows:

$$CF (H, e) = CF (E, E) * CF (H, E)$$

Where :

e : Evidence or observation time.

E : Evidence or new observation.

CF (E, E) : Certainty Factor evidence E is influenced by evidence e.

CF (H, E): Certainty Factor hypothesis H assuming the evidence known with certainty when the CF (E, e) = 1

CF (H, e) : Certainty Factor hypotheses influenced by evidence e

In the method required certainty factor hypothesis certainty factor value given by an expert and also the value of evidence obtained from event / events. In a study to determine the value hypothesis CF (H) hypotheses obtained from consultations to experts. As for the value of CF (E) evidence in getting from the most prominent symptoms are visible from some of the symptoms experienced in the computer lab, so it can produce value CF (H) and the value of CF (E) symptoms of damage to the computer as in the following table:

Table 1.
Table Value Certainty

uncertainTerm	CF
Not sure	0.4
Certainly	0.8
very definitely	1.0

Table 2.
Table Percentage Confidence

No.	Percentage Rate	Values Beliefs
1	40% - 60%	Not sure
2	61% - 80%	Certainly
3	81% - 100%	very definitely

3. Analysis

Table 3.
tabel Damage / hypotheses and Solutions

Code	Damage	Solutions
H01	Monitor / LCD Damaged	<ul style="list-style-type: none"> - The first solution able to turn off the computer with the hard off to die and press a few seconds to remove the charge capacity and then turn on. If they still show symptoms of damage, then there could be a hardware malfunction, check the connectors. - LCD opaque solutions to overcome them can be done simply by replacing the cathode ray tube monitors. - As for the incomplete color can replace the mainboard or replace the VGA cable.
H02	RAM Broken	<ul style="list-style-type: none"> - Try clearing the RAM using the eraser by brushing brass in RAM. - Check the RAM you are using if it is a kind of computer you use.
H03	HDD Damaged	<ul style="list-style-type: none"> - Check the hard drive relationship with the socket - Check whether the hard disk sound if so it is possible that there are bad sectors, immediately back up your data before the total dead hard drive, and prepare a new hard drive.
H04	VGA Damaged	<ul style="list-style-type: none"> - Turn off the computer and unplug the VGA card, and then reinsert it carefully and make sure it is properly installed. - If you use a VGA card VGA On Board clashed with the motherboard, you should disable the function of On Board VGA BIOS. - If it is not able to be repaired manually, you should immediately bring it to the nearest service center or by replacing the motherboard.
H05	Sound Card Damaged	<ul style="list-style-type: none"> - Reinstall the sound card driver and make sure the sound card is installed correctly in the slot. - Make sure the cable connector is plugged in correctly - If there is a broken cable then immediately replace connecting cable is



Code	Damage	Solutions
		broken up with a new one. - Another way is to replace the sound card or speakers with a new one.
H06	OS Troubled	- Check the hard drive cable is already installed - Whether the computer is clean of viruses, if not please clean viruses or reinstall - Check the bios settings at the boot menu, if it is appropriate to boot from the hard drive
H07	Damaged applications	- Forced close the application. If the program becomes unresponsive, you can press (and hold) Ctrl and Alt and Delete keys (Control, Alt, and Delete) on your keyboard to open the Task Manager. You can then choose the unresponsive application and click End Task to forcibly shut down. - Reinstall the faulty application - Turn off the anti-virus protected if the application is useful as debug
H08	Power Supply Damaged	- Check whether the cable is properly connected and installed the plug into the socket. - Also check the on / off button behind exactly behind the Power Supply is in the On position. - If you are sure installed correctly but still no respond. the possibility of cable / power supply itself is damaged. replace with a new cable or a new power supply.
H09	processor	- Open the processor from its slot, clean the processor with tissue and let the pasta to keep them cool. - Check the pin slot on the motherboard if there is no reply defects, if defective please trim - Processor and motherboard must match, if not match it must be replaced.
H10	memory less (Need to Upgrade RAM)	- Unplug long RAM - Replace with new RAM, make sure its capacity is greater than the old
H11	memory VGA less (Need to Upgrade Memory)	- Unplug VGA long - Replace with new VGA, ensure greater capacity than the old
H12	Clock less high processor (Need to upgrade Processor)	- Processor Clock Unplug long - Replace with a new processor clock, make sure the capacity is greater than the old
H13	Front Panel Error	- Check the preparation and cabling - See the installation instructions on the motherboard
H14	Less Power On Power Supply	- It is recommended that a new switch, as if on hold will result in the other components
H15	Damaged USB devices	- Check the drivers in device manager is already installed, if not there will be an exclamation point. If it has not been installed in order to install it first - When it is installed but not detected, check cabling usb.
H16	broken keyboard	- Turn off the computer and check whether the keyboard cable is plugged in correctly to the CPU. - If you need a keyboard can be cleaned using a vacuum cleaner sucked or clean it with a brush. - Cleaning is done when the computer is off and separated from the keyboard port.
H17	Mouse broken	- The first solution to the mouse pointer does not move try to restore order task manager, the way of the keyboard press ctrl + alt + delete together, then if it appears the windows task manager, you can turn off programs that do not resonating. - The second solution to the mouse does not work at all you first need to check the physical connection of the mouse. In the worst case, your mouse may have been damaged and you need to buy a third baru.Solusi try to issue double click lalukan Contorl Panel> Hardware and Sound> Devices and printers> mouse. From here you double-click a data set keceatan as your order
H18	Motherboard	- Check around the motherboard whether there is a capacitor that is swollen, if





Code	Damage	Solutions
H19	broken Power cable Broken	<p>there is a change soon if it can not take the place of service.</p> <ul style="list-style-type: none"> - Remove the cable and reinstall it. Make sure the power cord is plugged in correctly - Check if there are scratches on the cable, the cable dressing to cover cable silotif who drop out - We recommend that new change
H20	Cable Sata / Ide Damaged	<ul style="list-style-type: none"> - Make sure the cable is properly installed. - Replace the cable if damaged
H21	CD / DVD / ROM / RW Damaged	<ul style="list-style-type: none"> - Try to replace defective motors tray with a new one on the CD / DVD Rom. - Furthermore, if the CDs / DVDs can not be read then intervenes to clean the optical CD / DVD Rom, and then perform a calibration trimpot (a type of potentiometer) which exist in around the optic. The trimpot slightly rotate clockwise using any device, be it with a pointed pliers and screwdriver mini. Be sure and see if the trimpot on the CD / DVD you've really twisted. - 43 Another way is to fix part of the regulator CD / DVD Rom. The solution is to replace the total board IC and replace the CD / DVD Rom new.
H22	bios Error	<ul style="list-style-type: none"> - Turn off the PC, wait for approximately 5 minutes, then On right back. - When booting, press suggested that (Del, Esc, F1, F2, F10, etc.) to enter the BIOS Setup menu, please read the article. - Select the BIOS settings on Default_settings. And change the time and date settings in the BIOS. - Press F10 or Save & Exit the BIOS. - The computer will restart, and see if the boot able to walk normally mean all finished. - If the error message still appears and turns BIOS can not keep setting the date (step 3), replace the CMOS battery with a new one, On-kan pc, do no.2 - 4. Hopefully here can walk normally.

Table 4.
DataGejala / Evidence

Symptoms code	Symptoms name	CF Expert
E01	Tombol life but there is no image displayed monitored	0.8
E02	Terdapat horizontal / vertical middle of the monitor	0.8
E03	Tidak no initial appearance bios	0.8
E04	Muncul Error messages on the bios (message is always different depending on certain conditions)	0.4
E05	Bios alarm goes off	0.4
E06	Terdengar strange sound on the HDD	0.8
E07	Frequent hangs / crashes while running the application	0.8
E08	Always scan the disk when booting	0.8
E09	Muncul error message when running the application	0.4
E10	Device driver information is not detected in the device manager, even if the driver has been installed	0.4
E11	suddenlyarrived OS automatic restart	0.4
E12	The exit of the blue screen on OS (message is always different depending on certain conditions)	0.8
E13	Sounds remain out although device drivers and settings have been done according to the instructions	0.8
E14	Muncul error message while running audio applications	1.0
E15	Muncul error message the first time the OS loaded from the HDD	0.8
E16	Tidak no signs of sebagain / whole device works (all of the cooling fan is not spinning)	0.4
E17	Often sudden death without cause	0.8
E18	Muncul messages on the windows, that the windows virtual memory shortage	0.8
E19	Applications run with a slow, slow response to input	0.8
E20	Graphics performance is very heavy (usually in the open internet and manipulation of images)	1.0
E21	Device not detected in the bios	0.8
E22	Information detection wrong in the bios	0.4



Symptoms code	Symptoms name	CF Expert
E23	HaPart of his devices work	1.0
E24	Sebagain / whole character input dead	1.0
E25	The mouse pointer does not respond to mouse movement	1.0
E26	TaMPAK black block, and the image is not symmetric / random	1.0
E27	Exit long beep when the laptop is turned on	0.4
E28	Dihidupkan somewhat difficult	0.4
E29	The power cable suffered scratches	0.4
E30	Tidak no indication of incoming power	0.8
E31	Mati total	0.8
E32	Computer life position and then suddenly die screen	0.8
E33	Exit beeps repeatedly	0.4
E34	Bforgetting until the operating system has been restarted again	0.4
E35	Power supply fan is not spinning	1.0
E36	The power supply fan and processor fan spins	0.4
E37	CD / DVD / ROM / RW undetected in OS	1.0
E38	CD / DVD / ROM / RW drive that can not go out CD	0.4
E39	The message "BIOS ROM checksum error - System halted"	1.0
E40	Operating System Not Appear	1.0
E41	When in the press the power button is not lit.	1.0

In establishing this expert system would apply Certainty Factor Method (Certainty Factor) to resolve the problems encountered. The knowledge base is taken from the relationship of symptoms and damage to the computer that is then compiled in the form of rules (rule). Rule (rule) can be seen in the following table:

Table 5.
Rule (Rule)

Rule (Rule)	Rule Production (AND)
R01	IF E01
	E02
	E26
	THEN H01
R02	IF E03
	E04
	E05
	THEN H02
R03	IF E06
	E07
	E08
	THEN H03
R04	IF E09
	E10
	E11
	THEN H04
R05	IF E12
	E13
	E14
	THEN H05
R06	IF E15
	E40
	E41
	THEN H06
R07	IF E07



	E12	
	THEN	H07
	IF	E16
R08	E17	
	E35	
	THEN	H08
	IF	E01
R09	E03	
	E04	
	E05	
	THEN	H09
	IF	E18
R10	E19	
	THEN	H10
	IF	E09
R11	E20	
	THEN	H11
	IF	E19
R12	THEN	H12
	IF	E41
R13	THEN	H13
	IF	E05
R14	E23	
	THEN	H14
	IF	E10
R15	THEN	H15
	IF	E10
R16	E24	
	E27	
	THEN	H16
	IF	E10
R17	E25	
	THEN	H17
	IF	E28
R18	E31	
	E36	
	THEN	H18
	IF	E29
R19	E30	
	E32	
	THEN	H19
	IF	E10
R20	E21	
	THEN	H20
	IF	E37
R21	E38	
	THEN	H21
	IF	E39
R22	E03	
	THEN	H22

Here is an example of a computer malfunction factordiagnosa certainty calculation below:

Rule 1 MONITOR / LCDRUSAK:

IF Tombol hiduaptitidakada image tertampildimonitor
AND Terdapatgaris horizontal / vertikal ditengah monitor
THEN Tampak blok black, dangambar asymmetric / random
 Specialists determine the value of CF experts for each of the following symptoms:
 CF (expert) Power on but no image displayed on the monitor = 0.8
 CF (experts) are horizontal / vertical amid the monitor = 0.8
 CF (expert) looks black block, and the image is not symmetric / random = 0.1
 Users determine the value of CF user for each of the following symptoms:
 CF (user) Power on but no image displayed on the monitor = 0.4
 CF (user) are horizontal / vertical amid the monitor = 0.4



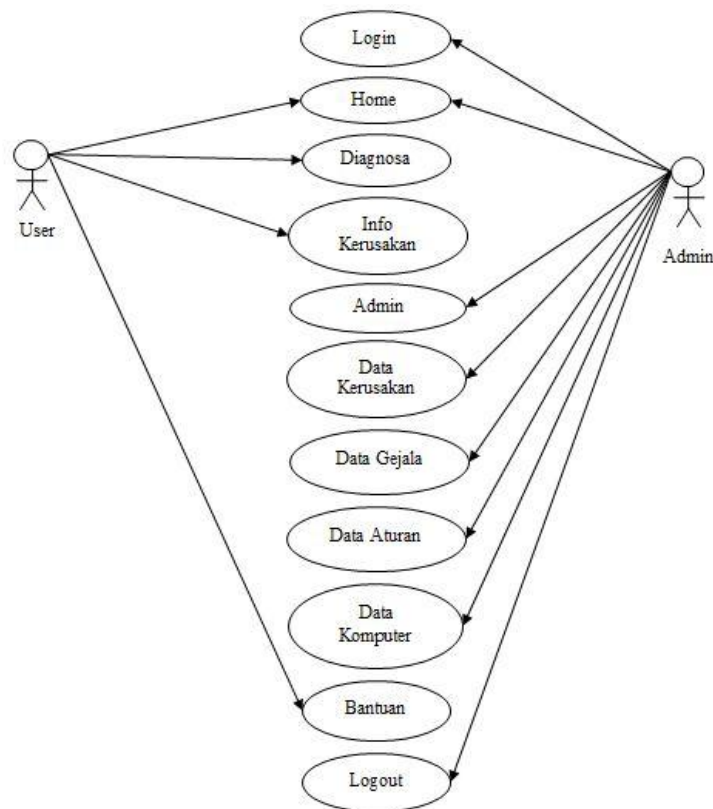


CF (user) looks black block, and the image is not symmetric / random = 0.8
Rules which have been determined are then calculated the value of CF CF expert with the user using the equation:
 $CF(H, E) = CF(E) * CF(\text{rule})$
 $= CF(\text{expert}) * CF(\text{user})$
Rule 1.1 = $0.8 * 0.4 = 0.32$
Rule 1.2 = $0.8 * 0.4 = 0.32$
Rule 1.3 = $1.0 * 0.8 = 0.8$
Because there is more than one symptom, then subsequently used to determine damage to the equation:
 $CF_{\text{combine}}(CF_{\text{gejala1}}, CF_{\text{gejala2}})$
 $= CF_1 + CF_2 * (1 - CF_1)$
 $CF_{\text{combine1}}(CF_{\text{gejala1}}, CF_{\text{gejala2}})$
 $= 0.32 + 0.32 * (1 - 0.32)$
 $= 0.32 + 0.21$
 $CF = 0.53 \text{ old1}$
 $CF_{\text{combine2}}(CF_{\text{old1}}, CF_{\text{gejala3}})$
 $= 0.53 + 0.8 * (1 - 0.53)$
 $= 0.53 + 0.37$
 $CF = 0.9 \text{ old2}$
Hence the conclusion: the last old CF CF damage, based on a calculation of the percentage calculated CF subsequent conviction damage to the equation
Percentage = $CF_{\text{disease}} * 100$
 $= 0.9 * 100$
 $= 90\%$
Based on the calculation, then the damage monitor / LCD has a confidence level of 90% and the system has a percentage value of confidence "SANGATPASTI".

4. Design

Designing a system for diagnosing expert system computer damage is to use Diagram *usecase* diagram, This diagram is used to describe the application and user behavior to application. In this system, the user consist general application and general admin. User as users of the system while the admin as the manager of the system. As do the common user and admin in this system is more visible in this Figure:





Picture 1. Use Case diagram Applications

5. Conclusion

Based on the description and discussion of the analysis of testing has been done, it can be concluded against damage Diagnosing Computer Expert System with Certainty Factor method as below:

- a. An expert system to diagnose damage to the computer with certainty factor method can be implemented properly and efficiently and can provide solutions to overcome them.
- b. Diagnosing damage to the computer with certainty factor method, performed in a way to diagnose based on symptoms and produce a confidence percentage value against damage.
- c. This expert system can accelerate the performance of a technician to repair damage to computers in the computer lab.

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