

Analysis of Expert System Implementation in Computer Damage Diagnosis with Forward Chaining Method

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ABSTRACT

The necessity for computerization is currently growing quickly because computers are now necessary for all needs connected to business and daily life. Therefore, users' ability to quickly and easily access information seems to be hindered by maintenance and repairs. An expert system is a computer-based method that uses facts, knowledge, and reasoning to solve issues that are often best handled by a subject-matter expert. Expert systems are created for expertise that is close to human capabilities in a given sector. A computer expert currently needs a lot of time to diagnose computer damage, and even technicians frequently put off their work in order to come up with fixes. Forward chaining was used in the construction of this system. In order to derive conclusions, forward chaining is employed to test the given factors against the recorded rules in the system. As a result, this expert system was developed to assist users in dealing with the damage and early maintenance that frequently affect computer systems. using computers in everyday tasks. If we are familiar with the Forward Chaining method used by the expert system to trace computer damage, the known crash features to address frequent crashes on that PC, and the application in object-oriented programming languages such as Visual Basic 6.0, we can determine where the damage is located.

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1. INTRODUCTION

The advantages that people receive from quick access to information are being outpaced by the growth of information systems[1]. Fast-evolving technology requires a powerful gadget to support it, and occasionally a computer will not perform as intended. This is common because computers can become outmoded if used consistently and neglected[2]. System-based information and technology computerization has been widely

utilized in a variety of disciplines, including education, social, business, government, or the health sector or treatment, where it is necessary to manage data with accuracy and speed in order to be trusted as a source of information[3]. Seen from the majority of those that use technology daily. In order for the system to solve a variety of problems in accordance with human demands, more parties feel compelled to produce technology and information as the information required becomes more sophisticated[4]. Users of PCs (Personal Computers) frequently become perplexed when their computer is off or not functioning properly[5]. If you understand the root cause of the issue and know how to remedy it, you can actually solve the issue yourself and improve Windows' operating system performance[6]. However, in order to accomplish this, you must understand how computers and computer-related peripherals work in general[7].

2. LITERATURE REVIEW

Two crucial components make up a computer, sometimes known as a PC (Personal Computer): hardware (hardware) and software (software)[8]. The first is computer hardware, which consists of objects you can see and hold such as a monitor, keyboard, mouse, printer, CPU, and other associated devices[9]. Therefore, we require a program that can assist in resolving the computer damage issue. This application makes use of a technology-based expert system that takes the place of a subject-matter specialist[10]. Prerequisite understanding needs in the implementation of computer damage diagnostic programs covers many aspects.

2.1. Expert System

A computer algorithm or information system that incorporates knowledge from one or more human experts in a topic with a propensity for specialization is known as an expert system[11]. The expert in question is someone with specialized knowledge in their profession, such as a doctor, psychologist, mechanic, etc[12]. In order to execute a correct and accurate corrective system, expert systems might suggest a sequence of user behaviors or activities[13]. Whereas, in order to be able to draw conclusions based on already-known facts and data, this system also makes use of the capabilities of the reasoning process[14].

2.2. Inference Engine

Inference engine is a part of an expert system that uses the knowledge base and logical rules to infer new information[15]. The early inference engines were parts of expert systems[16]. An inference engine and knowledge base made up the conventional expert system[17]. The inference engine is a module that performs the inference process the following are some of the duties performed by the inference engine: a. Ask detailed questions to users. b. Add answers to a working memory (blackboard). c. Adding new facts from a rule (inference results)[18].

2.3. Forward Chaining

Forward chaining is a goal-driven reasoning approach[19]. This reasoning starts from the input information, then visualizes the conclusions. Forward chaining applies facts to derive conclusions from these facts[20]. This reasoning is based on data-driven facts and is the opposite of the Backward Chaining method where this reasoning is carried out by collecting existing facts to draw conclusions. Forward chaining functions to find the appropriate facts from the IF-THEN rules[21].

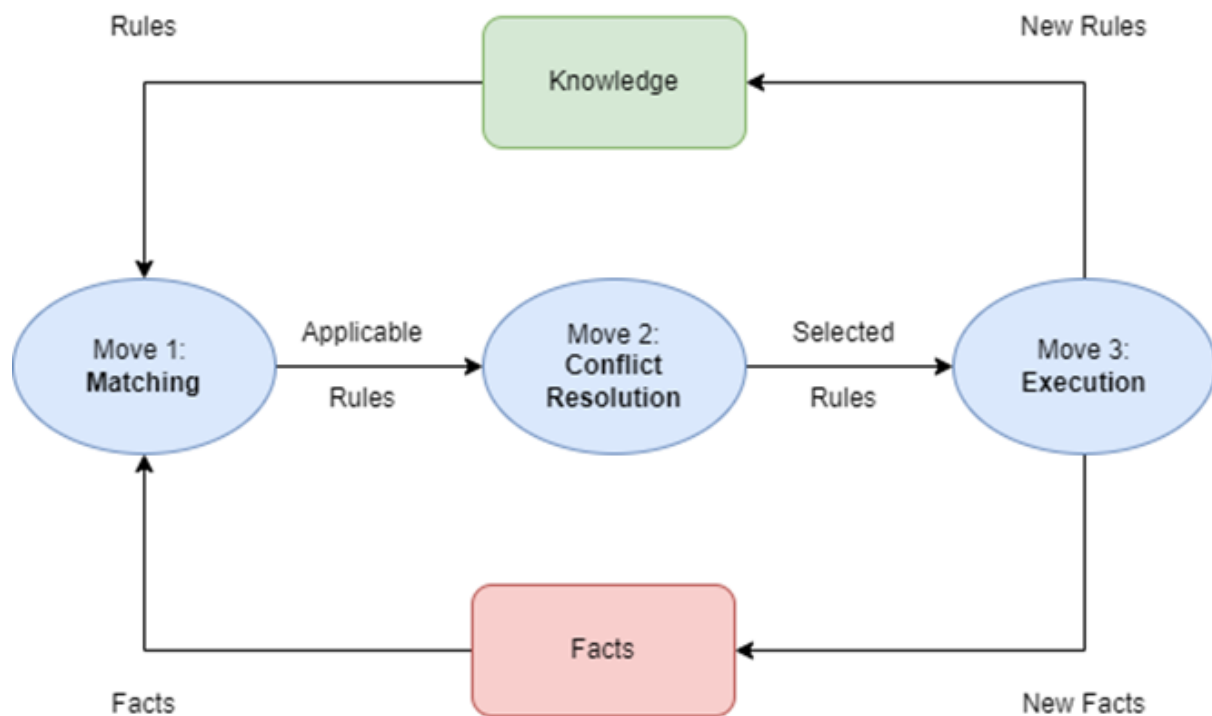


Figure 1. Shows the flowchart of the expert system implementation in computer damage diagnosis with forward chaining method

2.4. Unified Modeling Language

Object-oriented systems are designed using the visual modeling technique known as UML (Unified Modeling Language)[22]. The Object Management Group initially developed UML, releasing version 1.0 in January 1997. UML is sometimes referred to as a language system for creating software blueprints and can be used as a language for design, visualization, and system documentation[23]. UML is anticipated to be capable of accelerating software engineering and effectively, totally, and precisely meet all user needs[24]. This encompasses aspects like security, robustness, and scalability.

3. METHOD

An expert system's inference engine uses logical rules and the knowledge base to infer new information[25]. Early expert systems had inference engines. The typical expert system was made of an inference engine and knowledge base[26]. The Forward Chaining Inference Method is used in this analysis, and it begins with the input data before visualizing the findings[27]. Forward chaining uses facts to draw inferences from them. In contrast to the Backward Chaining technique, where conclusions are reached by compiling preexisting facts, this reasoning is supported by data-driven facts[28]. To extract the relevant information from the IF-THEN rules, forward chaining operations are used. The method will assert the conclusion if the clause premise matches the situation (value TRUE). Fig 3 illustrates how the forward chaining approach works in its most basic form.

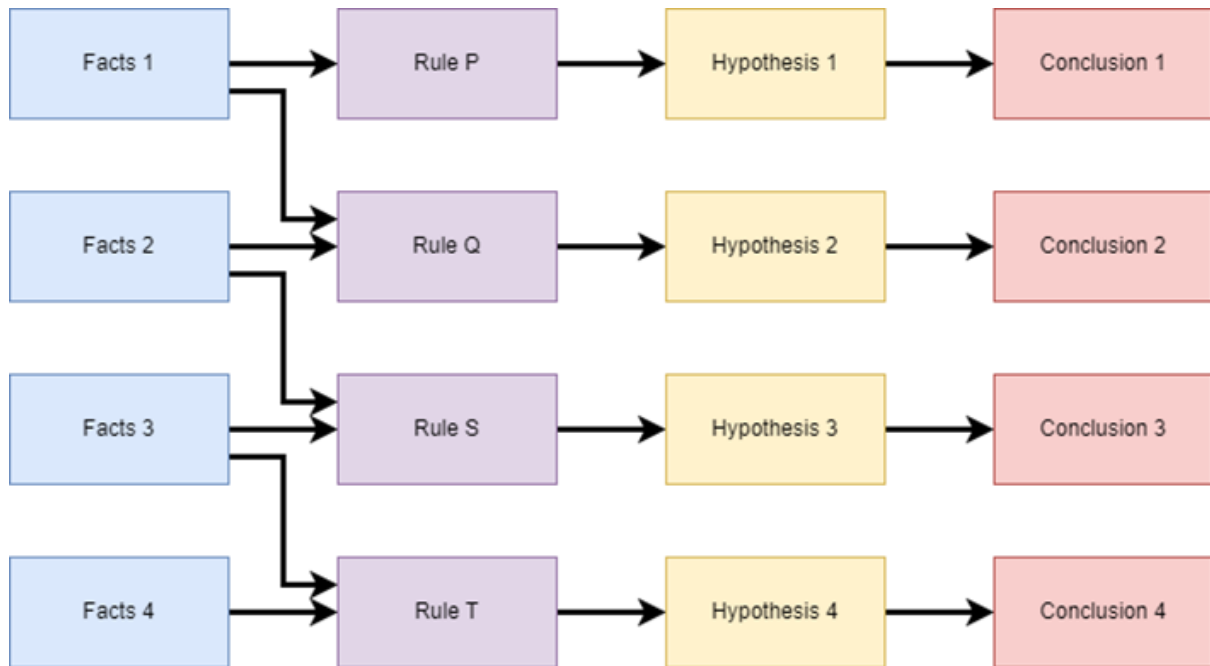


Figure 2. Forward Chaining Method Rule

4. RESULTS AND DISCUSSION

The following is an analysis of the computer damage detection design expert system. The following things are necessary for the system to operate to its full potential:

1. Hardware Specification:
 - a. Intel Up to 3 GHz or greater processor
 - b. 2048 MB ram or greater ram
 - c. Intel HD 512 MB or greater graphics card
 - d. 250 GB Hard Drive or greater
2. Software Specifications:
 - a. Windows 10 or latest operating system
 - b. Directx 9 or latest directx version

The expert system program that was generated and will be developed at this design stage linked the system on the UML. Determine this computer issue in expert system design by performing some of the methods These include knowledge bases, database designs, interfaces, and planning algorithms and experts.

4.1. Expert Table

The manufacturing regulation is the information that the author gathered from professionals, their knowledge, and their experiences in spotting computer issues. From table 1, there are 16 different categories of current damage, including signs of damage to the power supply monitor and others. In addition, depending on the type of potential future damage, an error may also be included.

Table 1. Symptoms Type

Code	Symptoms Type
------	---------------

S001	Symptoms of Power Supply Damage
S002	Symptoms of Damage to Motherboards
S003	Symptoms of Damage to the Monitor
S004	Symptoms of Damage to Processor
S005	Symptoms of Damage to Hard disk
S006	Symptoms of Damage to VGA
S007	Symptoms of Damage to RAM
S008	Symptoms of Damage to Sound Card
S009	Symptoms of Damage to the CD-ROM/DVD-ROM
S010	Symptoms of Damage to Keyboard
S011	Symptoms of Damage to the Mouse
S012	Symptoms of Damage to the Printer
S013	Operating System Activation

S014	Symptoms of Problems with Application Program
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Table 2. Location of Power Supply Damage

S001 : Location of Power supply Damage		
Code	Symptoms Name	Diagnosis
SD001	CPU and Monitor dead	Diagnosis Damage There is Power supply
SD002	Power Supply Fan Not Spinning	
SD003	CPU on, Monitor Dead, Nothing beeps	
SD004	Power Supply Fan Noisy	
SD005	PC sometimes turns on sometimes not	
SD006	Power Supply works but motherboard not working	

SD007	Computer off when operated a moment ago	
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4.2. Database Design

a. Login Table

Table 3. Database Login Table

No	File Name	Data Type	Size	Explanation
1	Username	varchar	25	Username for admin/user
2	Password	varchar	15	Password for admin/user

b. Symptoms Table

Table 4. Database Symptoms Table

No	File Name	Data Type	Size	Explanation
1	dbsymptomscode	text	5	Symptoms code
2	dbsymptoms	text	250	Symptoms diagnosis
3	dbcategory	text	12	Category

c. Damage Table

Table 5. Database Damage Table

No	File Name	Data Type	Size	Explanation
1	dbdamagecode	text	5	Damage code
2	dbdamage	text	250	Damage
3	dbsolution	memo		Explanation of the solution

d. Rule table

Table 6. Database Rule Table

No	File Name	Data Type	Size	Explanation
1	dbrulecode	text	5	Rule Code
2	dbsymptomscode	text	250	Symptoms Code
3	dbdamagecode	memo		Damage Code

4.3. Location of Power Supply Damage

The findings of the damage conclusion are obtained when this inference engine gathers the information about the occurrences that occur in succession (see Figure 4). The inference engine draws inferences using fact data derived from damage symptoms and a knowledge base derived from experts.

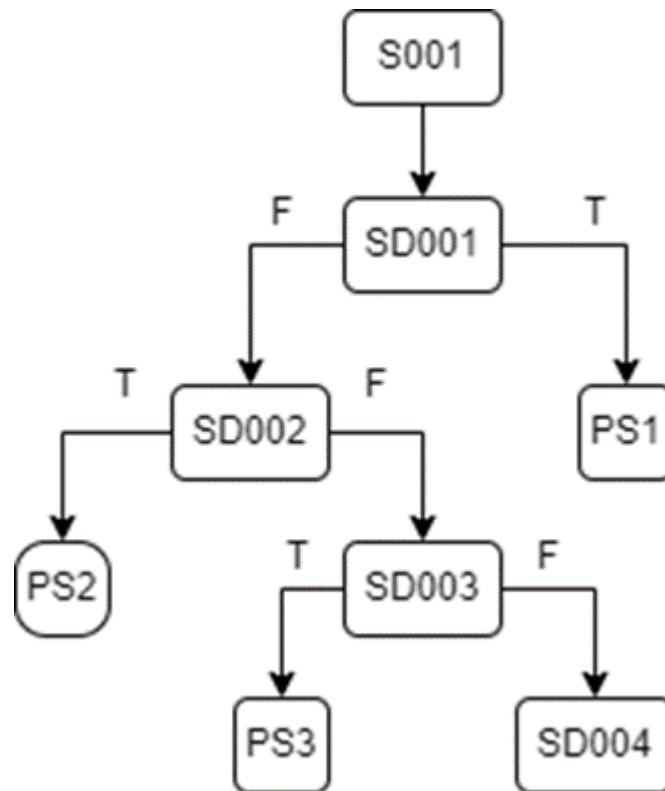


Figure 3. Forward Chaining Algorithm

Caption Definitions:

S = Symptoms

SD = Symptoms Diagnosis

PS = Problem Solution

T = True

F = False

4.4. Data Management Diagram

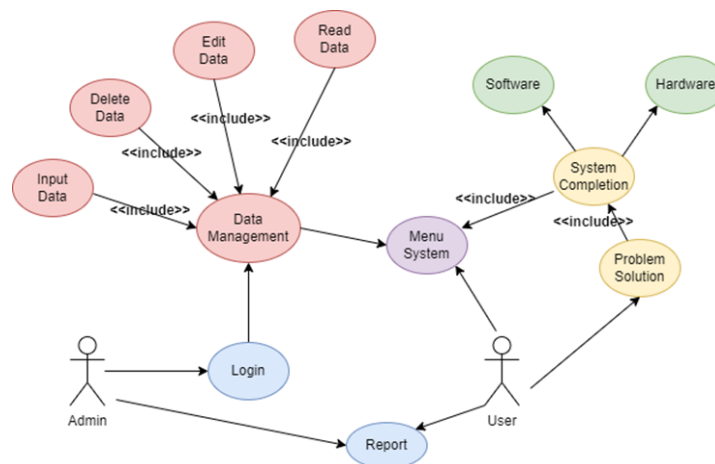


Figure 4. Use Case Diagram

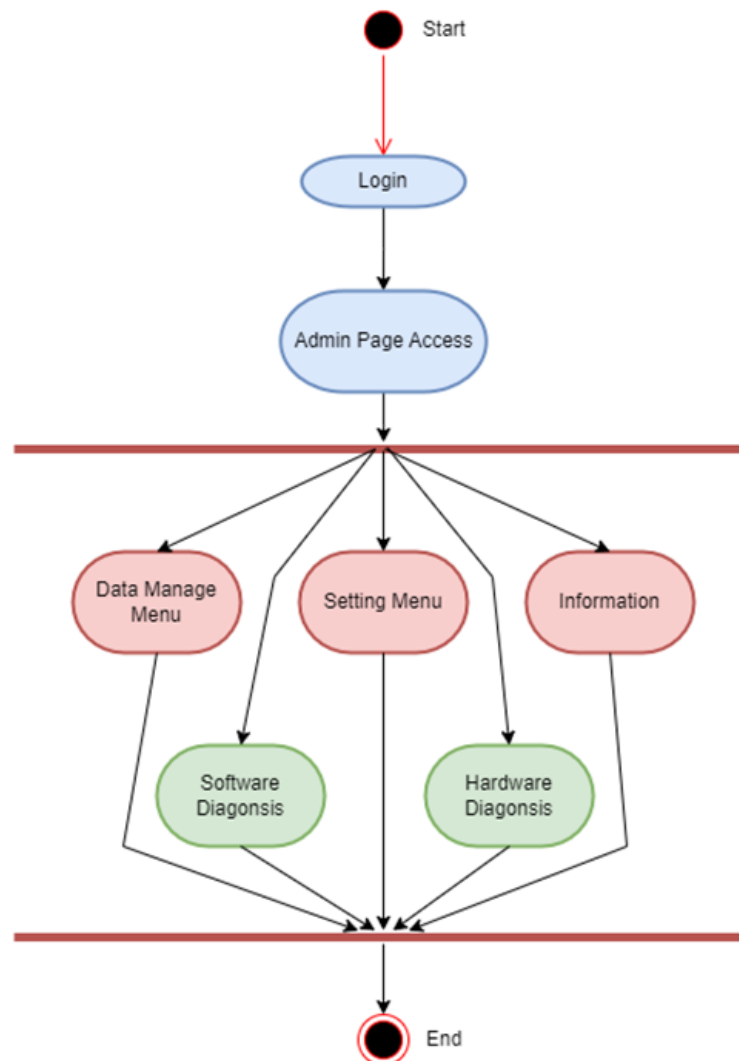


Figure 5. System Application Activity Diagram

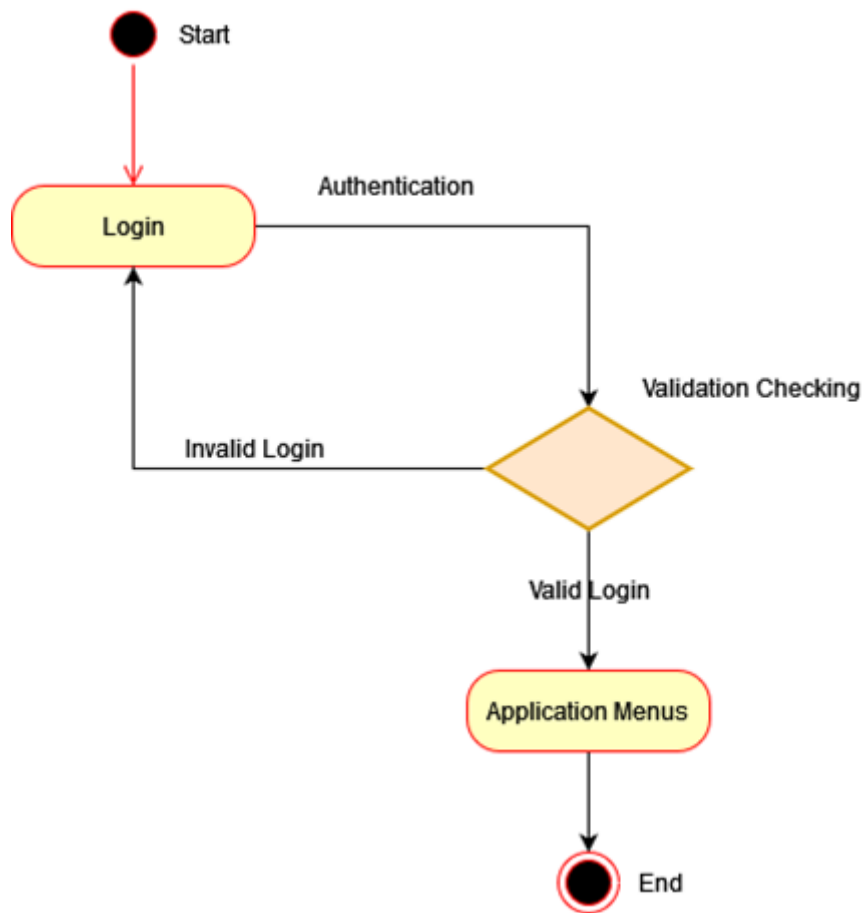


Figure 6. Activity Diagram for Admin Login

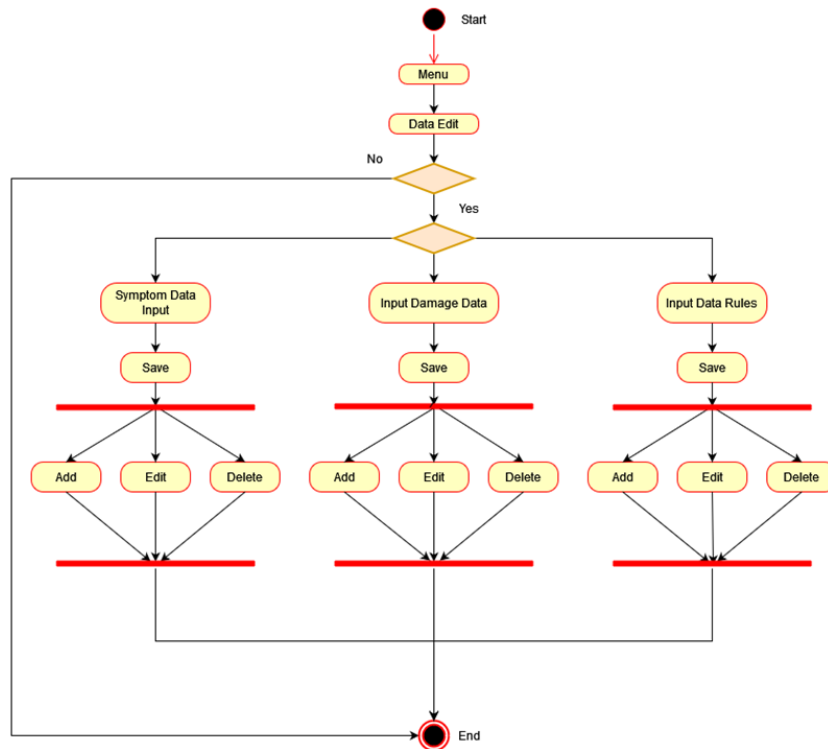


Figure 7. Activity Diagram Data Manage

4.5. Interface

In the main view the user can choose what type of damage he is experiencing. Here there are 2 features, namely for hardware diagnostics and software diagnostics. Users can choose one of them depending on the type of damage.

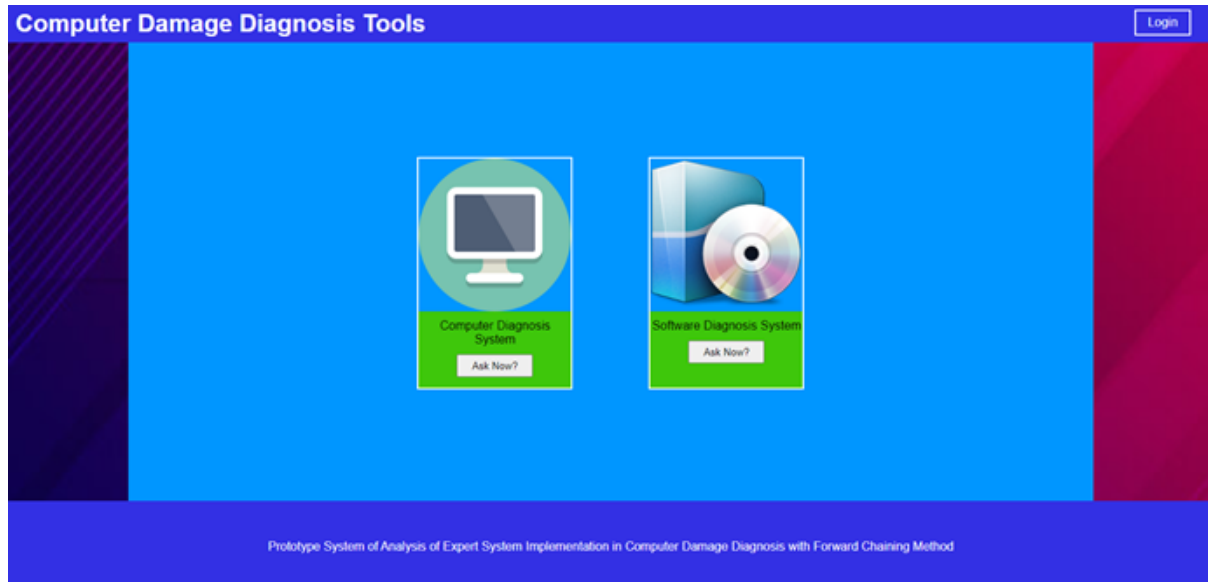


Figure 8. Main Interface

How to run the program :

1. Run the main menu program
2. If you select the computer diagnosis it will show the form of your question
3. If you click the Run Diagnostic menu, the program will search a solution based on your question and search it from the knowledge base on the system, and if it finds it will guide you on how to solve the computer problem you are facing.

5. CONCLUSIONS AND RECOMMENDATIONS


This study's findings indicate that using an expert system to look for damage is beneficial. This computer gear can assist inexperienced users in determining the location of computer or laptop damage, finally enabling them to act swiftly to correct the issue. This expert system program is designed to be fairly simple to use in order to make it easier for users to use. It offers a variety of knowledge information regarding computer damage and how to address it as beneficial knowledge for the user. Due to the fact that it can only make diagnoses in accordance with the rules, this expert system is anticipated to develop in the rule basis part. Bigger databases were anticipated to be employed, which is what happened.

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