



Expert System in the Application of Learning Models with Forward Chaining Method

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Abstract

Expert System (ES) is one of the course subject contained in the Department of Information Engineering, University of Pasir Pengaraian (UPP). There are several methods in ES, and one of them is Forward Chaining Method. This method is quite difficult to understand such that 30.1% of students did not pass the course. Therefore we need a tool or model of learning in the delivery of this Forward Chaining Method.

Keywords: Expert System; Forward Chaining; Model Study.

1. Introduction

Nowadays technology has brought human life into advancement, computer for instance. The rapid technological developments in computer science have had a positive impact in various people activities such as education sector. Expert System is one of computer science courses which is also contained in the Department of Informatics Engineering, University Pasir Pengaraian (UPP). In this course there are subjects called *forward chaining* method. Many students find difficulty to understand *forward chaining* method as well as in applying it. In recent years, there are 30.1% of the students who did not pass the course of this expert system. Therefore the use of a learning tool is required so that students could be quickly understand the expert system especially in forward chaining method. We conducted this research which is expected to be able to facilitate students in understanding and applying the *forward chaining* method.

2. Expert System

Expert System is a branch of *Artificial Intelligence (AI)*, which was developed and popular in 1960. *AI* expert system is a program with a knowledge base obtained from expert experience, knowledge, and expertise in solving problems in specific area. *AI* Expert System also known as a system with *Inference* powered engine which has the reasoning or the tracking of something facts and rules in the knowledge base.

Benefits of expert system :

1. Increase productivity, because expert system can work faster than human.
2. Make a layman work like an expert.

3. Improved quality, with consistent member advice and reduced error.
4. Capable of capturing knowledge and expertise.
5. Facilitate access to expert knowledge.
6. Can be used as a complementary medium in training. Beginner users who work with expert system will become more experienced because of the explanatory facilities that serve as teachers.
7. Improve the ability to solve problems because expert system take the source of knowledge from many experts.

2.1. Disadvantages of Expert System:

In addition to the benefits, there are also some shortcomings that exist in the Expert System, including:

1. The cost is very expensive to create and maintain.
2. Difficult to develop due to limited expertise and expert availability.
3. Expert system are not 100% true.

The characteristics of the expert system are as follows:

1. Limited to *the domain* of expertise.
2. Can provide reasoning for uncertain data.
3. Can bring up the series of reasons it provides with Understandable ways.
4. Based on certain rules.
5. Knowledge and *inference* mechanism clearly separated.
6. Designed to be developed gradually.
7. The output is recommended.
8. The system can enable the rule in the appropriate direction which is guided by a dialogue with the user.

Classification of Expert System based on its usefulness according Siswanto, 2004 that is:

a. Diagnosis:

1. Used to recommend: Drugs for sick people, engine damage, electronic circuit breakage.
2. Find out what the problem / damage is.
3. Using decision tree as a knowledge representation.

b. Teaching:

1. Used for teaching, from elementary school to university.
2. Make a diagnosis of what caused the shortcomings of the students, then provide a way to fix it.

c. Interpretation:

To analyze incomplete, irregular, and contradictory data. For example is in image interpretation.

d. Prediction:

1. Example: how a meteorologist predicts tomorrow's weather based on previous data.
2. For weather forecasting.
3. Determination of planting period.

e. Planning:

1. Starting from planning machines to business management.
2. To save costs, time and materials, because of modeling.
3. It is not necessary.
4. Example: Computer configuration system.

f. Controls:

1. Used to control activities that require high precision time.
2. For example: Controlling in high-tech industries.

Basic Concepts of Expert System:

Expert system consists of several concepts that must be owned. The basic concept of an expert system is as follows:

2.1.1. Expertise

It is a special knowledge gained from training, learning and knowledge. Knowledge can be a fact, theory, rules, *global* strategy to solve the problem.

2.1.2. Expert (Expert)

Involves identifying and *formulating* problems, solve problems quickly and accurately, explain solutions, learn from experience, the *restructure* of knowledge, breaking the rules and determine *relevancy*.

2.1.3. Transferring skills (Transferring Expertise)

Is the process of *transferring* the expertise of an expert into the computer to be used by another person who is not an expert. Knowledge is placed into a component called the knowledge base.

2.1.4. Summing up a rule (Rule inference)

Represents a pre-programmed computer capability. This inference performed by the *inference* engine that includes procedures for the settlement of the problem.

2.1.5. Rule

Rule is required because the majority of expert systems are *rule-based systems*, which means the knowledge stored in the form of regulations.

2.1.6. The ability to explain (Explanation Capability)

It is characteristic of an expert system that has the ability to explain or advise why certain actions are recommended or not recommended.

2.1.7. Expert System Components:

An expert system program consists of several components that absolutely must exist. The components are as follows:

a. Knowledge Base

The knowledge base is the core program for the knowledge base of expert system is a representation of knowledge from an expert.

b. Database

The database is the part that contains all the facts, both the initial facts at the time the system starts operating and the facts obtained at the time of conclusion are being implemented.

c. Inference Engine

The *inference engine* is the part that contains the mechanism of function of thinking and reasoning pattern system used by an expert. This mechanism will analyze a particular problem and will then seek the best answer or conclusion. The *inference engine* start tracking by matching rules in the knowledge base to the facts in the database. There are two existing *inference* techniques is tracking backwards (*Backward Chaining*) who started reasoning from hypothesis towards fact conclusions containing this hypothesis. And the second that is traced forward (*Forward Chaining*) which is the opposite of backward tracking is started from a set of data towards the conclusion.

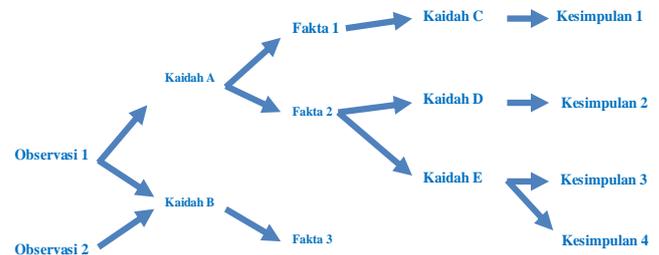


Fig. 1: Picture Forward Chaining Diagram

Understanding Learning:

According to (1), learning is a change of eternal behavior resulting from experience. This change may be unclear resulting in a situation that accentuates this new behavior; Learning is usually not shown immediately through achievement.

According to (2), learning encompasses a rather lasting change of behavior caused by a certain experience or repetition of experience. From the description above, it can be concluded that although understanding of the given learning is different from each other, there is also

The similarities between these descriptions. All of these definitions emphasize changes in one's behavior as a measure of the applicability of learning.

Types of Learning Bloom:

US education psychologist (3) states that human learning applies in three areas:

2.1.1.1 Cognitive Learning

Give priority to mental use. Example: solving mathematical and scientific problems, giving argument for supporting academic conversation.

2.1.1.2. Affective Learning

Prioritize the use of social and emotional aspects. Example: interact with others and explore your own emotions.

2.1.1.3. Psychomotor Learning

Prioritizes the use of physical aspects and involves coordination between the brain, nerves and limbs. Example: learn to write, play soccer, fix the train with tools, sew.

Factors which affect the Learning

1. Connection. Learning is easy to apply to cases that have ties between each other. For example, cases that are shared, fit and applicable within a short period of time.
2. Repetition. Cases that are often repeated can help the learning process.
3. Satisfaction. Actions of learning that produce rewards and satisfaction will encourage learning and learning matter will also last forever in memory.
4. Experience. Learning and understanding will be easier to apply if the learner has experienced something in itself.
5. Pelaziman. The habit of making things over and over again can result in learning in a normal way.
6. Willingness. Lessons can only apply if a person is Have a willingness to learn. Coercion can not produce a memorable lesson.
7. Inclusion. Students who engage themselves actively in the learning process will produce a memorable understanding and what they learn can be remembered for longer.
8. Imitation. Learning may apply to mimic the actions of others.
9. Interest. Learning is easier to apply if someone is interested or able to learn something.
10. Motivation. A person who is driven (motivated) to learn will produce a more memorable lesson. Motivation may be in the form of the form of extrinsic (external rewards) or intrinsic (desire innards).

2.1.1.4. Understanding the multimedia

Multimedia comes from the word multi (Latin) which means many, various and medium (Latin) which means something used to convey or bring something. Word "medium" (4) also defined as a tool to distribute and present information. So, multimedia can be interpreted as the use of several different media to combine and convey information in the form of text, audio, graphics, animation, and video.

Major Multimedia Components

1. There must be a computer that coordinates what is seen and heard.
2. There must be a link connecting the user with the information
3. There must be a navigation tool that helps the user navigate the connected information network.
4. Multimedia provides a place for the users to collect, process, and communicate information with ideas. If one component is missing, not multimedia in the broadest sense of his name.

2.1.1.5. Adobe Flash

Adobe Flash Formerly called Macromedia Flash, is one of the leading computer software products from Adobe Systems. Adobe Flash is used to create vector images and animated images. Files generated from Adobe Flash have the extension .swf and can be played in a web browser that has been installed Adobe Flash Player. Adobe Flash uses a programming language called *Action Script* which first appeared in Flash 5.

3. Design and Methodology

Requirements Analysis Software

Software requirements analysis is used to obtain the necessary data in making this application. With the existence of this analysis, *input*, *output*, and processes required in this application can be determined. For the necessary data, obtained from books on *forward chaining* method as well as through several *websites* in related fields.

Analysis Result:

1. Analysis Data needs
2. Analysis the needs of input
3. Analysis process needs
4. Analysis output needs

Interface-Needed Analysis:

1. Between advance home
2. Between advance forward chaining
3. Between face exit

Design Method

The design method used is HIPO (*Hierarchy Input Process Output*), a summary diagrams and detailed diagrams.

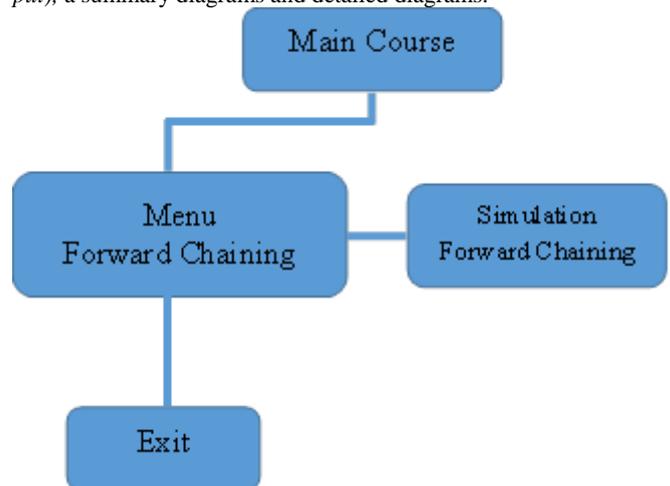


Fig. 2: Picture of HIPO Diagram

4. Results and Invention

The result of expert system on the application of learning model with forward chaining method is to produce some pages that have menu. The page is displayed in the form of the main menu page, which has four main menu and the menu will change according to the menu selected by the *user*. Like the main menu, menu forward chaining, simulation, and exit menu.

The main page is the first page that appears when *the user* opens the application. On this page consists of several parts, namely, *the header* main menu and button support. The main menu section contains buttons that will link to other pages ie menu forward chaining menu, simulation menu, and exit the exercise. while supporters button found on each page consists of the *exit* button to close the application and the overall *sound* button to turn off and turn back the existing *sound*.

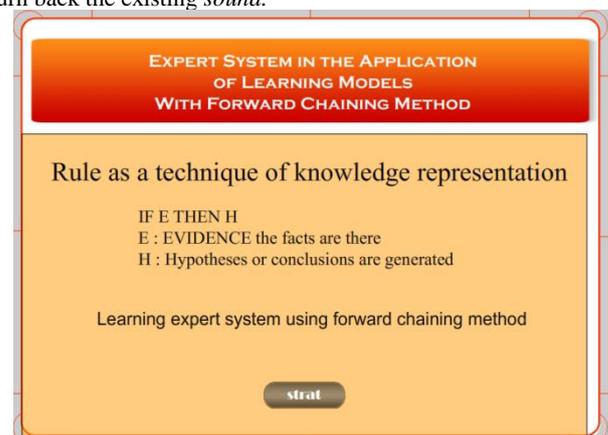


Fig. 3: Main menu image, forward chaining

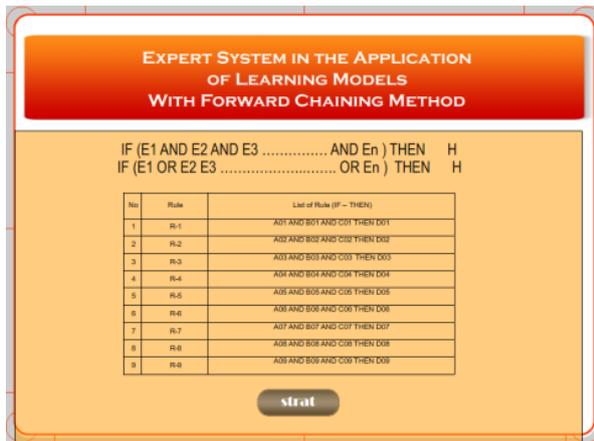


Fig. 4: Image of forward chaining simulation

4.1. Originality and Contribution:

Expert system on the application of learning model with forward chaining method is interesting, easy to use, material easy to accept and application easy to understand. So that young students understand the learning materials, and lecturers to convey the material to students. With this media then help improve model of student learning system in understanding material expert system with forward chaining method.

5. Conclusion

1. This research deliver and understanding of applying the method on a *forward chaining* expert system.
2. By learning model of *Forward Chaining* Implementation Method will help students apply the method.
3. This explanation is attractive, easy to use, easy to accept and an easy-application to understand.

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