International Journal of Engineering & Technology, 7 (3.5) (2018) 127-130

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paperr

Design of expert system to determine a major in higher Education using forward chaining method

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Abstract

The problem of this study was how to design aidsto assist students to introduce their potential and ability that they have. So that, they could choose an exact major in higher education based on their potential and ability. This study aimed to design expert system software to determine a major in higher education based on Multiple Intelligence. Design of expert system software used UML (Unified Modelling Language) process and Microsoft Access as a data base.

Keywords: *Expert System, AI (Artifcial Intelligence), Multiple Intelligence.*

1. Introduction

Education is an effort undertaken by students to create a learning process so that students can develop their potential to be useful for him, nation, state and society[1]. Education as embodied in GBHN (1973) is a conscious effort to develop lifelong inner and outer personalities and abilities within school.

Education is not just learning and seeking formal sciences in educational institutions, but education is every effort to change students to adapt to their environment[2][3]. It should be good education should be followed by guidance, such as guidance of student intelligence to determine the majors in the college so that students can know which department suits him through the identification of the intelligence.[4]

One of the educational paths in Indonesia is the Secondary School. Middle School is an integral part of the national education system, where secondary schools also have an important role to form competent students. Secondary School is one of the groups of education that also participate in forming students so that students have a high level of expertise in the field. But in general, not all students can determine the choice of majors appropriately.[5]

Based on the experience when sitting in high school, there are students who choose the department based on the wishes of parents or sometimes based on the desire to be with friends. Without knowing the potential and ability possessed by him, so that the ability possessed by the student is not in accordance with the chosen majors[6][7].

Therefore, intelligence consultation to determine the majors in this college is one of the important things for students, so through this intelligence consultation students can know which department is suitable for him.

But sometimes the students feel lazy to come to the psychologist and feel no need to consult about the intelligence and the ability he has, so that students only choose the majors based on the fad and the students were trapped with a department that sometimes does not match the ability of intelligence he has[8]

For that researcher feel the need to contribute to find a way out in this problem. By utilizing the advances in information technology that is happening now, the author wants to design an application that can help students in conducting advisory services in college majors. In order for the student to know the course that suits him through the identification of the intelligence. So that, researcher want to develop expert system software to determine a major in higher education for students[9]

Expert system consists of two words namely the system and experts. The system is a set of elements or elements that are interrelated and affect each other in conducting activities to achieve a goal[9][10]. While experts are people who have special experience of a problem.

Expert system is an application or computer software that serves to solve problems just like an expert or an expert[11]. Expert systems are the development of artificial intelligence or Artificial Intelligence (AI)[12]. AI is a special study in which the goal is to make computers think and act like humans.

Expert systems are the development of artificial intelligence that combines knowledge and data retrieval to solve problems that normally require human expertise[13]. The purpose of expert system development is not to replace human role, but to substitute human knowledge into the form of system, so that it can be used by many people[14]

An expert system is a system designed in front of a computer by imitating the thought processes used by an expert to solve certain problems that usually require expertise of an expert[15][16]

Based on the above background, this research needs to be done as a preliminary study in the design of expert systems to determine the majors in college by using forwad chaining method.

2. Method

In designing expert system of determination of this department the author uses System Development Life Cycles (SDLC) research

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framework, which consists of identification, initiation and project planning, analysis, design, implementation, and maintenance
The design of the SDLC research framework is at the fourth stage after the analysis. In this system design step researchers and experts determine the concept to be designed into the expert system. The results of the need analysis will be implemented into the form of data relations will then be applied in the system. This expert system will be designed in a user friendly manner, i.e. the expert system is easy to understand and easy to use.

3. Result and Discussion

A. UML Design
1) Use case diagram

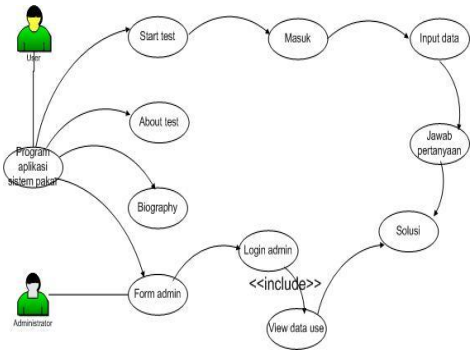


Figure 1. Design of expert system use case diagram

Figure 1 shows how the user's usage of the user starts from the start menu of the test, then the application system will show the login or login form, followed by filling in the visitor data, and then the visitor can fill the test answers on the form on the screen.
After the test answers are completed, the system will check the user's answer by referring to the existing knowledge base, which will then issue test results in the form of explanations and solutions.

2) Activity diagram
Activity diagrams describe the processes that occur when the activity begins until the activity stops. Activity diagram is similar to flowchart diagram. To simplify the process of understanding the activity diagram used, the authors divide the following activity diagrams into four parts:

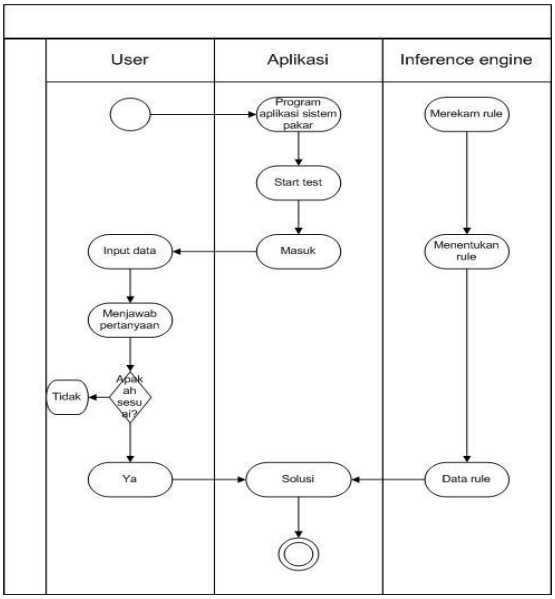


Figure 2. Design of user activity diagram and inference engine

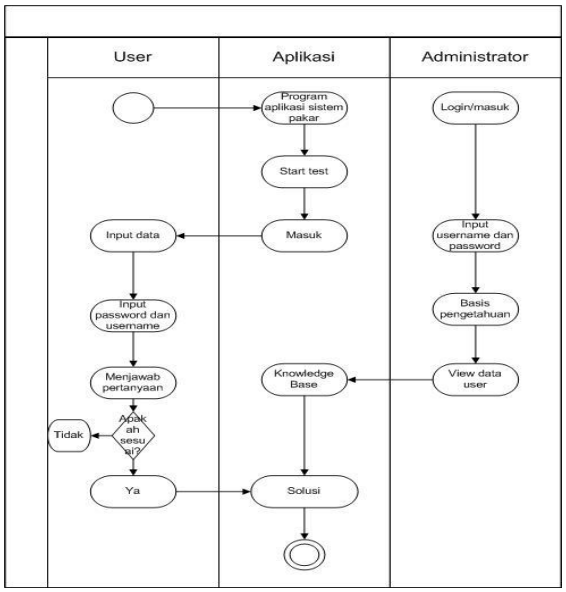


Figure 3. Design of user activity diagram and admin

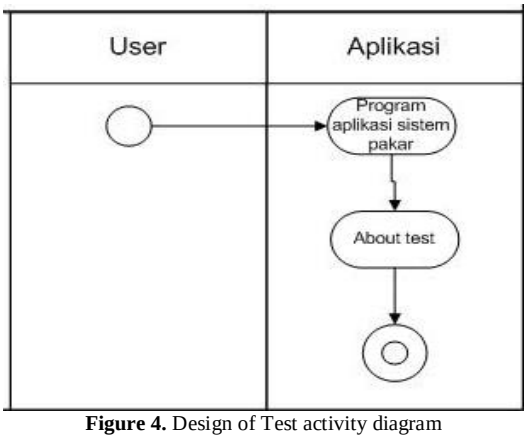


Figure 4. Design of Test activity diagram

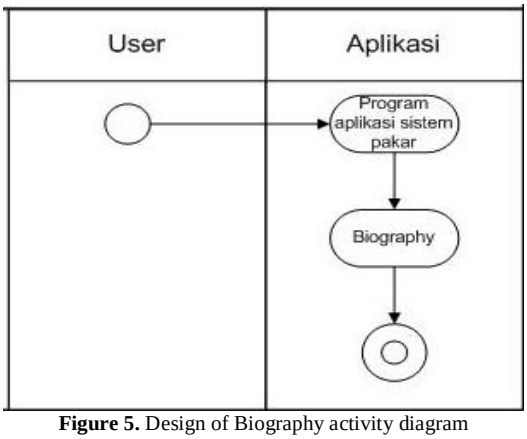


Figure 5. Design of Biography activity diagram

3) Sequence diagram
This sequence diagram serves to model the usage scenario. The author divides the sequence diagram into two parts, namely as follows:

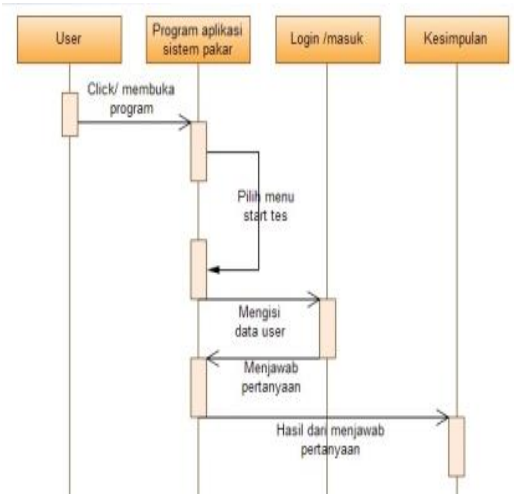


Figure 6. Design of user sequence diagram

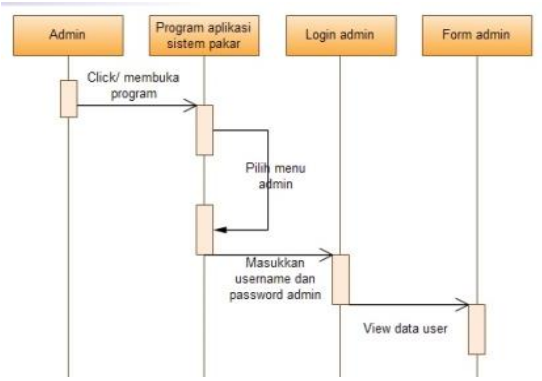


Figure 7. Design of Admin sequence diagram

B. Knowledge Base

Knowledge base components of expert system consisting of elements fua, namely facts and rules. Facts are information about objects in a particular problem area, whereas rules are information about how to obtain new facts from existing facts.

1) The stages of forward chaining method

Forward chaining is an inference method that does the reasoning of a problem to its solution. If the rule data matches the situation (worth TRUE), then the process will state the solution. If the database sends data in accordance with existing rules on the knowledge base then the knowledge base will issue a solution in accordance with the rules.

If the rules in the database meet R1, ie A, I, L, T then R1 will issue a solution that is 1, then R1 has complied with the rule. And so on up to R8.

2) Inference Engine

The inference engine is part of an expert system that does the reasoning using the contents of the rule list based on a certain pattern sequence. In this case how the system can take a conclusion based on existing traits or signs, providing the mechanism of thinking function and system reasoning patterns used by an expert. Based on existing rules and facts, an inference engine is constructed as shown in the following figure:

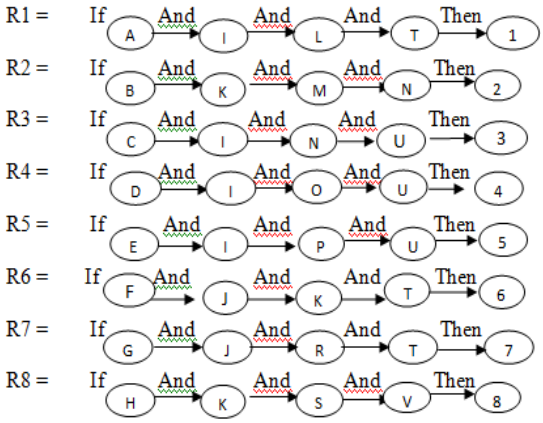


Figure 8. Inference Engine System

Figure 8. shows how the inference engine works for forward chaining. In forward chaining all data or rules will be tested to achieve a goal or solution. As seen in figure 14 above, if the situation satisfies the rules of A, I, L, T then the situation goes into condition R1, and R1 will issue a solution that is 1. All rules will be tested to meet the eight rules above.

C. Database

In this system the database is created by using Microsoft Access 2007 and then accessed or connected with Visual Basic 6.0. In this case, Visual Basic is used to design User Interface. Data Base created in this system is a data base that contains user data, admin data, symptom data, solution data, and knowledge base. The table design on the expert system to determine the majors in this college is as follows:

1) Design of User Table

Table Name : User
Key Field : Username

User data table serves to store the user database. User data table shown in Table 1 below:

Table 1. Design Of User Table

File Name	Type	Size	Description
Username	Text	20	Username forstudents login
Password	Text	6	Password for login
Name	Text	20	Students' name
Date of Birth	Date/ Time	10	Students' date of birth
Address	Text	20	Students address
Gender	Text	10	Students' gender
Handphone Number	Text	15	Students' phone number

2) Design of Admin Table

Table Name : Admin
Key field : Username

This data table admin serves to store the database for the facts of these intelligence indicators in this system. The structure is like the table below:

Table 2. Design of Admin Table

File name	Type	Size	Description
Code	Text	5	Fact Code
Fact	Text	225	Fact

3) Design of Symptoms Table

Table Name : Symptoms
Key Field : Code

This symptom table serves to store symptom data, these symptoms data entered by admin or expert into the system. Shown in the following table:

Table 3. Design of Symptoms Table

File Name	Type	Size	Description
Code	Text	5	Symptoms Code
Symptoms	Text	225	Symptoms Data

4) Design of Solution Table

Table name : Solution
Key Field : Code

The data table of this solution serves to store data database solutions, data solutions entered by admin or experts into the system. Here's the table design:

Table 4. Design of Solution Table

File name	Type	Size	Description
Code	Text	5	Code for solution data
Solution	Text	225	Solution Data

5) Design of Knowledge Base Table

Table name : Knowledge base
Key Field : Code

This knowledge base data table serves to store a database of knowledge base, this knowledge base data is input by experts or admin into the system. Shown in the following table:

Table 5. Design of Knowledge Base Table

File Name	Type	Size	Description
Code	Text	5	Code of question
Statement	Text	225	Knowledge base data
Fact of YES	Text	5	Fact of YES from the question
Fact of NO	Text	5	Fact of NO from the question
If YES	Text	5	If YES from fact of YES
If NO	Text	5	If NO from fact of NO

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