



UNIVERSITAS KRISTEN PETRA  
F T INDUSTRI JURUSAN TEKNIK INFORMATIKA  
UJIAN TENGAH SEMESTER : GENAP 2016  
APLIKASI SISTEM PAKAR

Sifat : Open book  
Waktu : 2.5 Jam

1. Jelaskan klasifikasi pengetahuan dibawah ini, dan berikan masing-masing sebuah contoh.
  - a. **procedural** knowledge
  - b. **declarative** knowledge
  - c. **tacit** knowledge
  
2. Jelaskan representasi pengetahuan (Knowledge Representation) di bawah ini beserta sebuah contoh:
  - a. OAV Triplets
  - b. Semantic Networks
  - c. Frames
  - d. Neural networks
  - e. Rule based system
  
3. Implementasikan Pengetahuan tentang "College Major Advisor" pada lampiran di bawah ini, kedalam Shell VP\_Expert.

Selamat Ujian

### OVERVIEW

Students at one metropolitan area community college are required to choose a major area of study when they initially register at the school. Their choices are often based on incomplete or erroneous information. Once students begin classes, they often discover that they do not like their major or that they are not doing well in their major courses. A typical student changes majors four times during a college career.

To guide and advise students in the selection of a major, an expert system has been designed. The prototype of this system, the College Major Advisor, concentrates on students with pre-selected majors in the computer field. However, this system can be expanded to deal with all students and all majors.

### STUDYING THE SITUATION

This prototype is designed for a two-year urban community college. The school year is divided into four 10-week quarters. The college is structured into four components, as shown in Figure 8B-1: Administration, Academic Affairs, Student Services, and Cooperative Education. The administration unit provides all support functions at the college, such as student admissions and financial aid. Faculty members are part of the Academic Affairs component. They are responsible for teaching courses and serving as faculty advisors to students. Student Services staff conduct an orientation course for incoming freshmen. They also provide individual counselling and academic advice. The final component, Cooperative Education, offers internship programs to full-time students in their major fields of study.

The college offers a wide selection of majors, ranging from liberal arts to animal health technology to computer science. Some of the programs, such as computer technology, are designed for students who plan to get a job after graduation. These are called career-oriented programs. Others, such as computer science, are transfer-oriented programs. They are designed for students who plan to continue their education at a four-year college after graduation.

Incoming freshmen declare a major before starting classes at the college. Their choice is based on personal preference as well as on discussions with counsellors and faculty. Counsellors and faculty agree on a best choice of major to recommend based on a student's interests, abilities, and financial need.

Often students choose, however, without adequate information. Many discover that they never really understood the course of study or the skills required for the major selected. As a result, students change majors as many as four times during their two years at the college.

Unfortunately, opportunities to obtain advice are limited even after the student is enrolled. All students take a freshman seminar course in their first quarter. Taught by a counsellor, the course orients new students to the school. Counsellors may discuss choices of major, but they cannot address individual problems because of the large classes. Although students can make appointments to meet with a counsellor during office hours, there is not enough time to deal effectively with all problems. Alternatively, students can discuss concerns about a major with a faculty member. But the problem remains one of too many students and too little time.

If students can be better advised initially, they will not be groping for the correct major, they will not need to change majors, and they will save a great deal of time, energy, and money. An expert system designed to advise students on the selection of a major would make the knowledge of expert counsellors and faculty available to students at their convenience. Students could consult the system at any campus computer facility.

This particular problem lends itself to an expert system solution. The knowledge of experts is available and they agree on recommendations. For example, counsellors and faculty have many years of experience dealing with students. Faculty advisors are familiar with the skills required for particular majors, as well as with the profiles of students who do well in different majors. Counsellors are especially aware of skill requirements. Their psychological training helps them talk to students about interests, hobbies, and attitudes that may influence the choice of a major. Counsellors also are aware of results from various psychological tests, personality profiles, and interest inventories that help in student placement.

### Narrowing the Focus

The prototype expert system developed here focuses on one particular major, computers. It advises students about whether a major in computers is appropriate for them. If it is, the system advises them to concentrate in one of three specialty areas: computer science, computer programming, or computer technology.

### Critical Factors Affecting the Situation

The critical factors affecting a choice of major are a student's aptitude, interests, and financial need, as diagrammed in Figure 8B-2. Factors related to a student's *aptitude* for the computer field include mathematical skills, programming skills, and manual dexterity. Factors that determine *interests* are a student's enjoyment of computers, inclination toward problem solving and repairing things, and preference for working at a desk or in the field. A student's *financial need* is based on whether he or she needs to get a job after graduation. (The need to get a job eliminates the possibility of going directly to a four-year school after graduation.)

A detailed breakdown of the three critical factors is diagrammed in Figure 8B-3.

### Possible Recommendations

After a student answers a series of questions, such as those shown in the sample consultation in Figure 8B-4, the system makes one of four final recommendations:

1. The student should major in computer science.
2. The student should major in computer programming.
3. The student should major in computer technology.
4. The student should major in some field other than computers.

Each of these recommendations is based on a combination of critical factor values. For example, students should major in computer science if their mathematical skills are good and if they demonstrate a strong aptitude for computer programming. They should like working with computers and enjoy problem-solving tasks. Computer science majors should not mind working at a desk for long periods of time. Finally, this major requires that students be willing and financially able to go on to a four-year school after graduation, since a computer science professional traditionally needs a four-year degree before employment.

A candidate for a computer programming major is someone who is a good logical thinker. A strong math orientation is not mandatory. The student should like working with computers and solving problems. This person must also be comfortable working at a desk. If financial need requires getting a job after graduation, the student could do this and continue his or her education as appropriate in the future.

The third computer major is computer technology. This requires people who are good at working with their hands (have good manual dexterity) and enjoy fixing things. They need not have strong math skills, but they should like computers and be curious about how they work. This major requires someone

who likes to work in the field. It is especially appropriate for students who need to get a job immediately after graduation.

Finally, a student should major in some field other than computers if he or she has no interest in computers or problem solving.

### A Typical Decision Situation

John Marcus is graduating from high school in June and applying to enter college in the fall. He plans to go to the community college near his home. On the admission application, John is asked to choose a major. He thinks he is interested in computers, so he looks on the application for the computer major choices. John sees Computer Science, Computer Technician: Computer Repair, and Computer Technician: Telecommunications. (Unfortunately, Programming and Operations are listed under Data Processing, a term that has no association to computers for John.) Not knowing the distinctions between the different computer majors, John checks the box labeled Computer Science.

His first quarter at the college, John is enrolled in the Freshman Seminar, Introduction to Computer Science, Pre-calculus, and two other courses. During the quarter, he sees that he is doing poorly in the pre-calculus course. He has mixed feelings about the computer science class, where a lot of time is devoted to programming in Pascal. John sets up a meeting with the counsellor who teaches his Freshman Seminar class. The counsellor and John start to discuss John's choice of a computer science major and whether it is the best choice.

The counsellor, Ms. Jones, asks John whether he likes computers. John says that he does like computers and that he especially likes to tinker with them. John also says that he likes to solve problems and to find out how things work. After further discussion, John reveals that he dislikes sitting at a desk for long periods of time.

Based on his responses, Ms. Jones concludes that John has the interest and personality traits for a computer major, but she is not certain which computer major is right for him. She questions him about his aptitude and skills. John explains that he is not doing very well in pre-calculus; he has a C average. He has a B average in the Introduction to Computer Science class, but he really is not very good at programming in Pascal. He is good, though, at learning about the different parts of the computer and how the hardware and software work together.

Ms. Jones now realizes that John is not strong in math or programming, which rules out a computer science or programming major. But his manual dexterity is strong and he is interested in computers. So she feels that he should switch his major to computer technology. To reach a final conclusion, she asks John about his financial situation and what he plans to do after graduation. John says that he wants to get a job instead of going on to a four-year school.

Ms. Jones concludes that John should switch his major to Computer Technology. This would allow him to learn all about computers and how to repair them. John has the interest in computers and repair, the necessary manual dexterity, and the need to get a job after graduation.