COURSE ADVISORY SYSTEM (CAS): A SOLUTION FOR ASSISTING STUDENTS IN CHOOSING SUITABLE COURSES OFFERED BY LOCAL UNIVERSITIES

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Abstract: This paper reports how ICT is used to stimulate advancements in providing advice to students for choosing suitable courses offered by local Universities. Course advisory system or CAS is a Web-based system aims to help students in making decision regarding the courses they should apply by giving advice base on previous experiences. It represents the decision-making process by using an artificial intelligence technique called case-based reasoning. CAS consists of two main modules which are general module and advisory module. The general module enables users to search for the synopsis of the courses and provides link to relevant websites, while the advisory module is to generate an advice for the users. Besides that, there are three external agents involved in CAS; user, case base and course information database. The user is responsible for entering the problem descriptions and also getting advice from the system; case base contains previous solved cases; and course information database contains the synopsis of the courses.

Keywords: course advisory system, case-based reasoning, advisory, decision making.

INTRODUCTION

As both the students and education providers are facing huge demand of upgrading their knowledge and the respective delivering mechanisms, the need of looking into the issue of choosing suitable courses becomes pressing. Decisions will be required on the selection of suitable courses. Students who are uncertain about the courses often feel a sense of urgency about choosing the course and want to make the decision as soon as possible. Before making the decision, they should consider their interests, abilities, values, motivations and realities.

When students decided to pursue their studies, they would have committed themselves to an activity with a specific goal occupying a specific period of time. Without proper guidance, students may have problems in managing their futures to the right path. With the recent advent of the Internet and World Wide Web, a tool is developed which can provide guidance to students, specifically for those who have passed their Sijil Tinggi Pepepariksaan Malaysia (STPM) for choosing suitable courses offered by local Universities. The aim of the project is to assist students in choosing and applying suitable courses by depending on their interests and STPM's reslt. Besides, the project also gives benefits to the universities where it can be one of the alternatives to provide a better overview of the courses as well as to promote the courses offered by the universities.

Previous Work

Over the years, a lot of research have been done on exploring the potential of case-based reasoning (CBR) has spark the interest in developing system that has implement case based reasoning as the problem solving method. CBR has been successfully implemented in many fields such as law, medicine, designing, planning, classification and also diagnostic. Besides that, there are few advisory systems developed by using CBR. Another Academic Advisor (AAA) is an example of the advisory system which developed by Binh Viet Nguyen from Ohio University [1]. The objective of the system is to help human academic advisor in selecting suitable courses for students on probation. AAA works on the basis of that similar student will have similar academic performance. It makes course recommendation based on the academic performance of the student in the past and courses that other similar students has succeeded in. AAA used the *nearest-neighbour algorithms* when matching for the most similar case in the case base. Cases in the case base are ranked according to their similarity and case that has the highest ranking is selected as solution. The lists of courses are divided into two lists. The first list contains those courses that are suitable for the students and have a high percentage in

helping students to get a good result. The second list is in contrast with the first list where it contains those courses that the students should avoid to take.

Another example of advisory system is called Mymajors.com. It is a web-based application constructed by Current Software that is use to advice students regarding the majoring that they should take in the university or college [2]. The system is intended to be used by high school senior and also college freshman and use by the United States of America students. The users will be asked to complete a 15 minute interview to gain some data of the students. Some of the questions being asked are the students' result including their specific result on the courses, the students' preferences where the student input those majoring that they are interested in, majoring that the students wish to avoid and their interest in the subject they took in the high school. After analyzing those inputs, the system will recommend 6 majoring to the students. These majoring are chosen based on the students' interests, results and also their high school experience.

MATERIALS AND METHODS

System Architecture

In general, CAS has two main modules which are general module and advisory module. The general module enables users to search for the synopsis of the courses and to provide link to the relevant websites, while the function of the advisory module is to generate advice for the users. Besides that, there are three external agents involved in this system, as shown in Figure 1. The user is responsible for entering the problem descriptions and getting advice from the system, case base which contains previous solved cases and the course information database which contains the synopsis for the courses.
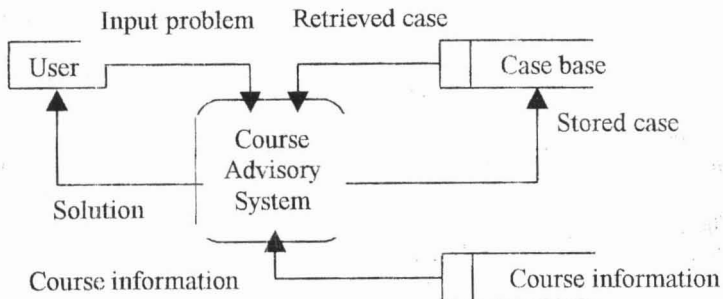

Figure 1: Data flow diagram for CAS

System Design and Implementation

The main part of the advisory system is the advisory module which implements case-based reasoning cycle in order to provide advice for the user. The module consists of 6 sub-modules which are; identify module, matching module, adaptation module, evaluation module, retain module and display module.

Identify module: The function of this module is mainly to get the input from the user. The features that are needed for finding similar case will be extracted from the input. As some of those features are not directly available from the input, there are needs to process the input to get those features. Some of the main inputs are the students' results, co-curriculum post and the courses that they want to apply.

Matching module: The function of this module is to retrieved previous cases from the case base based on the weight and indexes given by identify module. The nearest-neighbour method is use to find the similarities between past cases and the current case.

The similarity function that is being used to calculate the similarity between features is given below:

$$Sim(I,R) = \frac{Min(I,R)}{Max(I,R)}$$

where I is the input case value and R is the retrieved case value. This equation shows that the minimum value from the both value is divided by the maximum value to find the similarity value between the two features. A threshold will also been conducted in this module so that cases that have very low overall similarity value will be excluded from consideration. A total of 10 cases will be allowed to pass the threshold value.

Adaptation module: The function of this module is to adapt the retrieved cases with the current case in order to find the optimum solution for the current case. The adaptation is done base on the courses that the user would like to apply for. Those cases that match with this feature will be added some similarity value to their overall similarity value, thus adapting the solution closer to the user interest.

Evaluation module: After all the cases have been adapted, it will be ranked by using this module. The ranking is based on the overall similarity value between the retrieved case and the current case. All the cases will be ranked in descending order. After the cases have been ranked, only the top five cases with the highest overall similarity value will be selected to be displayed as the solution to the user.

Display module: The display module functionality is to display the result after the CBR cycle. This module will match the solutions from the cases and display the solutions together with the synopsis of those courses to the user.

Retain module: The function of this module is to index the new case that the user want to store and stored the case in to the case base so that it can be used later as solution for others problem.

Case Design

A case is a description of knowledge which can be a story, an event or some record that typically consists of features and their specific values while case design is a method of how to present all these cases [3]. Table 1 shows example of a case design of the system. The first four features are the STPM result of the student, followed by the year of the case, the highest post the student held during his pre-university education for co-curriculum and finally the course to apply. These features are all indexed information where it is used for retrieval purposes.

Table 1: The features and its values in a case

Features	Features Value
Physic	20
Chemistry	18
Pengajian Am	16
Mathematic	20
Year	2002
Co-Curriculum	President
Course advice	Computer Science

The categories of the student type for the STPM level are shown in Table 2. After the student category have been chosen, user can enter their results on subjects, the year STPM is taken and also the course of user's interest. After all data have been entered, the system will display the advice courses together with their similarity value as shown in figure 2.

Table 2: The categories of student type

Student Type	Subjects
Science Physic	Pengajian Am Kimia Fizik Matematik
Science Biology	Pengajian Am Kimia Biologi Matematik
Art Accountancy	Pengajian Am Pengakaunan Ekonomi Matematik
Art Economy	Pengajian Am Perniagaan Ekonomi Matematik
Art History	Pengajian Am Bahasa Melayu Sejarah Ekonomi
Art Business	Pengajian Am Bahasa Melayu Sejarah Perniagaan

Figure 2: The result displayed by the system