

# An Expert System for Advising Postgraduate Students

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**Abstract—** Providing accurate advices to postgraduate students during their postgraduate program and directing them toward a proper courses selection with their interests are an essential process in postgraduate stage. In this paper, we propose and develop an expert system for advising postgraduate students instead of the traditional way in advising by the department's advisors. This system aims to assist postgraduate students of Computer Science (CS) major in King Abdulaziz University (KAU) to select the suitable courses during their postgraduate program. The proposed system enables the students to select and get a plan to each semester without needing to consult advisors. Moreover, it takes into account courses prerequisites and department's requirements. Wxpython language and access database are used to implement the system. The result was as expected, where most of the postgraduate students who tested the system, were very amused and satisfied. into which you can type your own text.

**Keywords—** Expert system, advising system, postgraduate student.

## I. INTRODUCTION

An expert system is a computer system that emulates the decision-making ability of a human expert [7]. Expert systems are designed to solve complex problems by reasoning knowledge. It is used in different fields; one of these fields is student advising.

Student advising is one of the core responsibilities for the academic faculty in universities. For both new students and enrolled ones, they have to meet their advisors in order to plan for their schedules. The advising system is very important to postgraduate students in order to prevent wrong choices based on trends or peers. On the other hand, the current advising system puts a huge burden on the academic advisors, because it is time consuming and they could face a monotonous process by answering the same questions over and over. Changes may apply on prerequisites, processes or curricula courses by the university and the advisors may not know about them, also new faculty members could face problems in the advising process because of the lack of knowledge.

The number of postgraduate students in CS department grows steadily versus the number of advisors recently. Furthermore; the system in CS department at KAU is a mixed system, where it requires studying courses besides the thesis to get the master degree, that mixed system requires

precision in the selection of appropriate courses to meet the thesis.

For all of the above points, the authors develop PAS (Postgraduate Advisor Expert System) that aims to assist the postgraduate students in CS department at KAU to select the appropriate subjects for their schedules. The system can provide an accurate and non conflict proposal courses for the postgraduate student. PAS works as an advisor, it gives the postgraduate student a plan with the appropriate subjects according to the courses that have been taken, prerequisites, and thesis scope if it is already determined by him/her.

The rest of this paper is organized as following: Section II presents the related work for this research area, section III describes the KAU Postgraduate Program and PAS Objectives, followed by The PAS architecture in section IV. The result and discussion are presented in section V. Finally, conclusion is in section VI.

conference website.

## II. RELATED WORK

There are many studies which focused on proposing students advising systems, all of them concentrate on undergraduate student. Contrary to this work which has the ability to provide advice for undergraduate students; it has the ability to provide advice for postgraduate students commensurate with their thesis scope.

**IS A-DVISOR** is a prototype that had been developed as advising expert system in Information System-IS department in Ajman University[1]. This system assess students and their advisors to make academic plan that suits the student. This system is based on knowledge base component and reasoning strategies in its inference engine components, it also based on Object-Oriented (OO) architecture of its database.

**ONLINE ADVISOR** is a web-based decision support tool [2], this tool is proposed to help the advisor and student to interact with each other and make the decision for choosing a suite courses. This system can help the advisors to offer the appropriate advices to their students through showing student information, courses that had been taken or not by the student and changes in courses requirement.

**JESS**-Java Expert System Shell- is a prototype that had been used to develop a Student Advising Expert System as a

Graduate Program Advisor for Industrial Technology Department in California State University-Frenso.[3]. The need of the system was to minimize the student forestallment and eases the burden on faculty advisors by answering almost the same questions. The prototype has a graphical user interface (GUI)-based expert system and had been developed using JESS and java.

**SAES**-Student Advisor Expert System- this prototype had been tested on 1000 candidates students in India, which they attend to enroll in under graduate majors for Engineering Department in Thaphar University [4]. The main goal of this system is to help students in choosing the highest successful major for them, by providing major suggestions are yet classified into strongly, mildly and weakly recommended. SAES is a combination of rule based and case based expert system.

**INVESTA** - Interactive Virtual Expert System for Advising - this prototype can work with either small or middle sized universities [5], it had been lunched in a middle sized university at the department of Computer and Information Science of Delaware State University. This system is helpful to advisors and students as well. The proposed system is java based with an object-relational data base and enables users to access system functionality by a web-based interface.

**BUADVIS** is a decision support system that had been developed to advice student through registration stage [6]. This system had been improved to help students and advisors in Bogazici University to make a decision about what courses must be taken by student through a semester. The important considerations that had been taken in this system related such as rules regulations, and courses prerequisites.

**APE SYSTEM** is a knowledge based system that proposed to advice and assistance academic student for planning their studies to get academic degree [8] .It has the capability of planning a courses program which meets the student degree requirement .It also took student preferences and student strength into account. The system is capable of given a correct advice on prerequisites and exemptions.

### III. KAU POSTGRADUATE PROGRAM AND PAS OBJECTIVES

The postgraduate program in CS department requires 31 units to complete it. Fifteen of them are core units while twelve of them are elective units, besides a thesis. Some of the core courses require prerequisites before studying them. If the postgraduate student has more than or equal to two prerequisites, he/she cannot register in postgraduate program till they are completed. Otherwise, he/she can register in the postgraduate program with a restrict condition on the number of units allowed in each

semester; it should not be less than 6 units and not more than 12 units.

Most postgraduate students suffer from the ambiguity and conflicts when they are choosing the semester courses or the courses that related to their thesis field. For that, CS department assigns an advisor for each student. However, many students do not get the potential benefit from the offered advice for them because of various reasons such as developing the course occasionally by CS department which may lead to misunderstanding between the students and advisors and etc.

The first objective of PAS model is to help postgraduate in choosing the appropriate subjects for them and to solve the problems of ambiguity and conflicts. The second objective is to reduce the burden on CS department to offer adequate number of advisor for all students. In addition, the last and very important objective is to reduce the wasting time for taking appointment with advisors which might sometimes takes more than one day.

### IV. PAS ARCHITECTURE

The architecture of the PAS model consists of four components: Knowledge Base (KB), Processing Unit, User Interface, and scheduler. Figure 1 shows the architecture components and the interactions between them.

#### A. Knowledge Base (KB)

The KB component consists of Database (DB) and Rule Base (RB). The system use the DB to store and retrieve the information about courses, students, prerequisites, core and elective subjects, sub-fields( thesis area) and the advising related information.

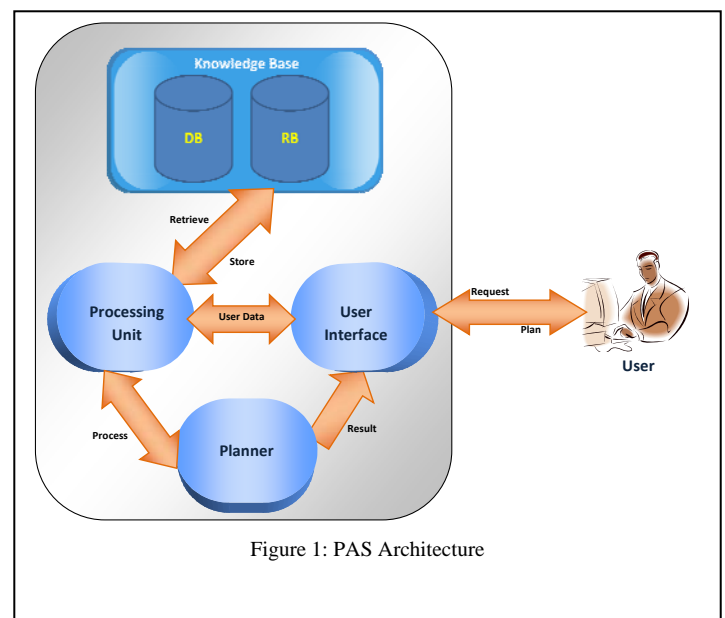


Figure 1: PAS Architecture

The RB contains the rules and conditions that builds the PAS system. For instance, consider the following rules written in English Language:

Rule#1:

IF: the student has more two prerequisites  
 THEN: he/she cannot register in postgraduate program.

Rule#2:

IF: the student identifies his/her thesis field  
 THEN: select the appropriate subjects for his/her field and organize them by priority taking core courses in account.

Rule#3:

IF: the student dose not identify his/her thesis field  
 THEN: select best general subjects that have high priority by taking the core courses in account.

Rule#4:

IF: the student accepts the suggested plan  
 THEN: store these subjects for his/her record in DB.

Rule#5:

IF: the student does not accept the suggested plan  
 THEN: return to the user enabling him to select another sub-field (thesis).

**B. Processing Unit:**

The processing unit is responsible for receiving the postgraduate student request and analyzes it. It makes appropriate DB queries and checks if they meet the conditions. Then it gets an appropriate solution and passes it to the planner.

**C. Planner:**

The Planner receives the solution from processing unit and arranges it by the priority. Then it displays the suggested plan to student.

**D. User Interface (GUI):**

The user interface was designed by WxPython language. There are five windows interfaces: login window, register student window, student status with prerequisites window, sub-field (thesis area) window, and plan window. Figure 2 shows the login window, where the student can enter the system using his/her ID with the password. If the student uses the system for the first time, he/she should click on sign up button to insert his/her data then register to the PAS system. Figure 3 shows the sign up window. After registering the student's data, the system will return the student to the login window to enter the system.



Figure 2: login window

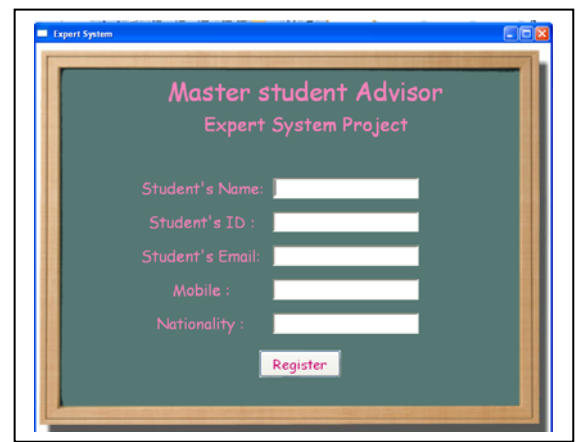


Figure 3: sign up window

Figure 4 shows the student status and prerequisites window. In this window, the student chooses his/her status and selects the prerequisites subjects if (he/she) already had.

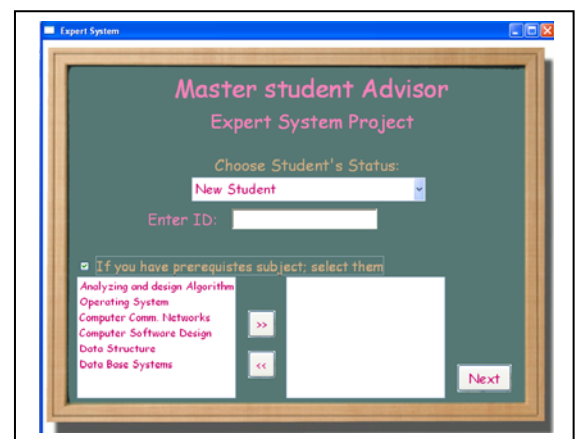


Figure 4: choosing Student's status and prerequisite subjects window

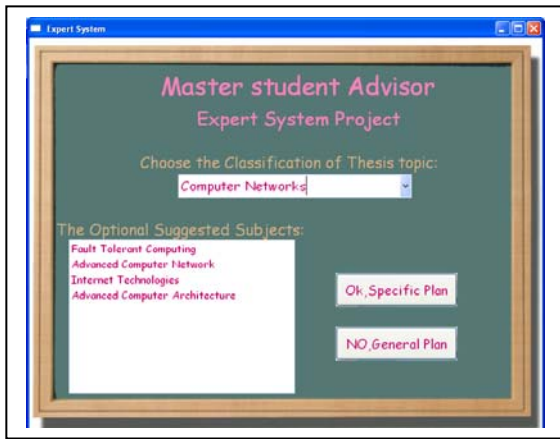


Figure 5: choosing the preferred or appropriate field for thesis

Figure 5 shows the sub- field (thesis field) window. The student selects the sub-field (thesis field) from combo-box and then the subjects that are related to the selected field are presented in the list. Figure 6 shows an example for a plan which is suggested to a student.

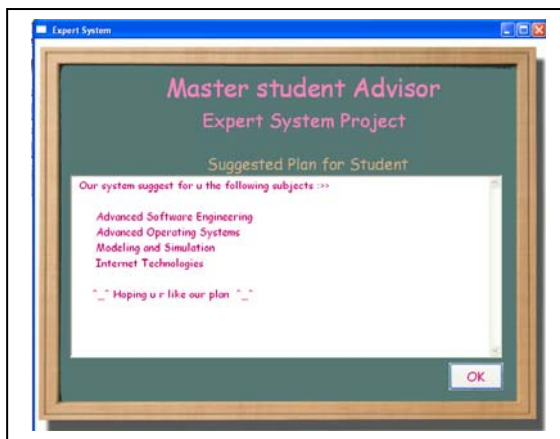


Figure 6: Example for suggested plan

## V. RESULT AND DISCUSSION

PAS system was tested by comparing previous proposed plans for students already took the advice from their advisors. Some of these plans were for new students who registered for the first time, while others were for students who already registered and had selected thesis topic. The result was as expected, where most of the suggested plans by PAS were identical to the faculty advisors plans. The system is proved to be more comfortable because it is easy to

use as it had a friendly GUI. It also gives accurate plans, and it gives the result in just minutes; while the traditional system of advising take long time to get the advice .

## VI. CONCLUSION AND FUTURE WORK

In this paper, the advising system had been developed to assist postgraduate student to appropriate selections of courses in their master's study in CS at KAU. The proposed system is different from all previous systems by targeting the postgraduate student taking into account their thesis field. The result was as expected where most of the postgraduate students, who tested PAS system, were very amused and satisfied. In Future, the authors aim to make a statistically study on PAS to determine the precision of the system in producing good plans. They are looking forward to deploy the program in KAU website to be available for all postgraduate students. They also aim to develop a system which includes all the entire departments at KAU.

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