

Decision Support System for Advising Students

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ABSTRACT

The purpose of this paper is to explain design and implementation of the decision support system for student advisement. The advisement process plays an essential role in student's academic life. The goal of the decision support system is to help advisors as well as students to plan their degree programs. The system facilitates the process of advisement by providing quick and easy access to valuable information, and giving important feedback on several issues involved in student advisement, which otherwise could have taken considerable time. The student advisement system certainly simplifies the task of advisement, improves the quality of student advisement and gives a viable option to students. The system is invaluable tool for advisors and students.

INTRODUCTION

The academic advisement is an important major function of any academic institution. The proper advisement for students enhances chances of succeeding in an institution. Academic advising is a decision making process through which a student advised by an advisor, maximizes the educational experience through interaction specifically pertinent to both curricular and career planning. The quality of advisement can play a critical role in students academic planning and decision making. The advisement is a rather complex process and involves activities from bookkeeping to discussing different issues with students. An advisor needs to have all the pertinent information to give a good advice to a student. Many times access to information becomes a major handicap to give constructive advice and in this respect, decision support system can be invaluable tool. The goal of the decision support system is to help advisors as well as students to plan their degree programs. In addition to that, the system also gives information on various topics such as different programs available in departments, their requirements, facilities available, courses available, and as well as how to use the system itself. The system also assists in making changes to the existing plan, to help in registration process and to check graduation status. Several tests are performed to evaluate the system response to user requests. It is observed that the system response is consistent with the human response in the same situation. The student advisement system certainly simplifies the task of advisement and improves the quality of student advisement. The system is going to offer students an important viable option in advisement which was not available before [4][5][9][11][18][25][26][27][28][29][31][35].

DECISION SUPPORT SYTSEMS

There is no agreement on the definition of Decision Support Systems. We are going to use the practical definition of DSS. A DSS is an interactive, flexible and adaptable computer based system that uses data, knowledge, and reasoning to aid management of a specific problem [36].

COMPONENTS OF DSS

The Decision Support System is composed of the following components:

1. Data Base Module – Software system to manage internal and external databases used for computations to make decisions.
2. Model Module – Software system that uses conceptual model to make analytical computations.
3. User Interface Module – Software system responsible for user communications.
4. Knowledge Base Module – Software system that manages problem specific knowledge [2][3][20][25][36].

METHODOLOGY

The development of the decision support system is divided into two parts. In the first part, the system is designed and in the second part, it is implemented on a computer. The first part consists of construction of an abstract model for advisement, development of necessary data structures to hold information and development of algorithms to process information. The second part consists of programming to realize the system on a computer system. The system is implemented on the main frame. The knowledge is represented in form of sets of rules. The set of rules is implemented using If-Then-Else statements [13][14][15].

ABSTRACT MODEL

The core concept in the system is the curriculum model. There are four major components in any degree program: general education, major, minor, and electives. Each course in the curriculum has specified require grade for graduation. The successful completion of a degree program essentially depends on completing the necessary number of hours and courses with appropriate grades described in the curriculum for the degree program. The courses required for a given degree program are arranged in proper order from first semester to the last semester as illustrated in figure 1. This becomes our curriculum model for the system [11][14][29][31][35].

The curriculum model is abstracted in the form of data structure called curriculum-page for a department as well as for a student in the department. The departmental curriculum-page contains all the courses required for the degree program and the required grades. The student's curriculum-page contains all the courses required for the degree program and slots open for grades and elective courses. The curriculum-page is a kind of loose adoption of frames. The loose in a sense that procedures and functions acting on it are loose i.e. not attached to the structure. As most of the information about curriculum for a given class is known and is well defined, the static structure is used to implement the curriculum-page.

Another important concept in the system is the degree plan. The degree plan is essentially a list of courses a student needs to take from the first semester to the last semester in a given period of time. The printed form of the degree plan is illustrated in figure 1. The degree plan is the basic concept, as any changes student wish to make to his degree program for any reason, the system will generate appropriate a new degree program for him. When a student enters the school, the system makes a degree plan for him according to his specifications. Subsequently, he can make changes to his original plan and system will generate new degree plan for him. In addition to making degree plan, the system can make projection on

his existing plan, make changes to have additional major, make changes to have alternate major, and help him for registration and to evaluate his graduation status.

Curriculum Leading to the Degree of Bachelor of Science in Computer Science

Freshman							
First Semester				Second Semester			
	Course	Hours	Grade		Course	Hours	Grade
Educ	101	2	P	Educ	101	3	C
Engl	101	3	C	Engl	102	3	C
BSc	101	3	D	M	106	3	C
Econ	101	3	D	BSc	102	3	D
MS	101	2	D	Econ	102	3	D
M	105	3	C	MS	102	2	C
Sophomore							
M	203	3	C	M	204	3	C
M	209	3	C	M	208	3	C
CS	201	3	C	CS	202	3	C
Huma	201	4	D	Huma	202	4	D
M	212	1	C	MS	202	2	D
MS	201	2	D	SP	103	3	C
Junior							
P	201	4	C	Psy	201	3	D
Huma	301	3	D	P	202	4	C
CS	301	3	C	CS	304	3	C
CS	307	3	C	CS	308	3	C
M	307	3	C	M	213	3	C
Senior							
CS	401	3	C	CS	409	3	C
CS	402	3	C	CS	403	3	C
Approv		3	C	Approv		3	C
Approv		3	C	Free		3	C
Free		3	C	Free		3	C

Figure 1. Abstract Model

The ultimate goal of a student is to graduate from the school with a diploma. From student point of view, the graduation is the final goal to be achieved. The system can assist a student to evaluate his current degree plan and inform him status of graduation. If he is unable to graduate with the existing conditions, the system will offer him suggestions to remedy the situation and a possible way to graduation [11][14][15][29][31][35][37].

THE SYSTEM DESCRIPTION

The aim of this project was to construct a decision support system for student advisement. The goal of the system is to help advisors as well as students to plan his or her degree program. In addition to that, the system also gives information on various topics such as different programs available in departments, their requirements, facilities available, courses available, and as simple as how to use the system itself. The system also assists in making changes to the existing plan, to help in registration and to check graduation status. The system consists of three major components: user interface, knowledge representation, and database [13][15][16][20][36].

User Interface

Most of the systems constructed and will be constructed in future are going to interact extensively with end-users. So, user interfaces are utmost important for productive use of any system. To make working environment comfortable, convenient, and pleasant is the primary task of any designer. The user acceptance is greatly depends on user-interface of the system.

User interfaces are constructed using menus and Q&A system. Each module invokes its own user interface to communicate with users. The information collected from user is interpreted by the module and the necessary actions are taken. Thus each module interprets and controls part of the system and so act as shell or subshell for the system [36].

Knowledge Representation

The knowledge-base is essentially information (knowledge) from the college-handbook, faculty-handbook, and advisor's personal experiences over several years in academics. The knowledge-base is implemented as rules. Rules are organized as sets of rules. The related rules are put into a set. The sets of rules are implemented as procedures [32].

Data Bases

A lot of information is required to make decisions involved in student advisement. The system derives information from its databases. The major data-bases used in the system are as follows:

Course_Base : All the courses available in the college.

Student_Base : All the students enrolled in the college.

Help_Base : All the information about college and the system itself to be used by help module [19].

SYSTEM ARCHITECTURE

The system model is essentially composed of three modules: User Interface Module, Processing Module, and Output Module.

User Interface Module

The user interface module consists of user input module and output module. The user input module contains keyboard event handlers to collect information from the users regarding his/her degree plan. The output module is responsible for tasks such as displaying responses to user requests, error messages, as well as saving the results created by the processing module in an output file.

Model Processing Module

The processing module consists of several subprocessors, each one responsible for processing specific tasks, such as checking validity of grades specific to a program, and the inference processor to make necessary symbolic computations to apply advisement rules to draws conclusions regarding advisement.

Data Base Module

The function of this module is to manage the various databases used in the system. The relational data base model is used to do so.

Knowledge Base Module

This module is responsible for managing the knowledge base of handbooks. The knowledge base is dynamically created and used in inference module at the time of execution [2][3][20][26][33][36].

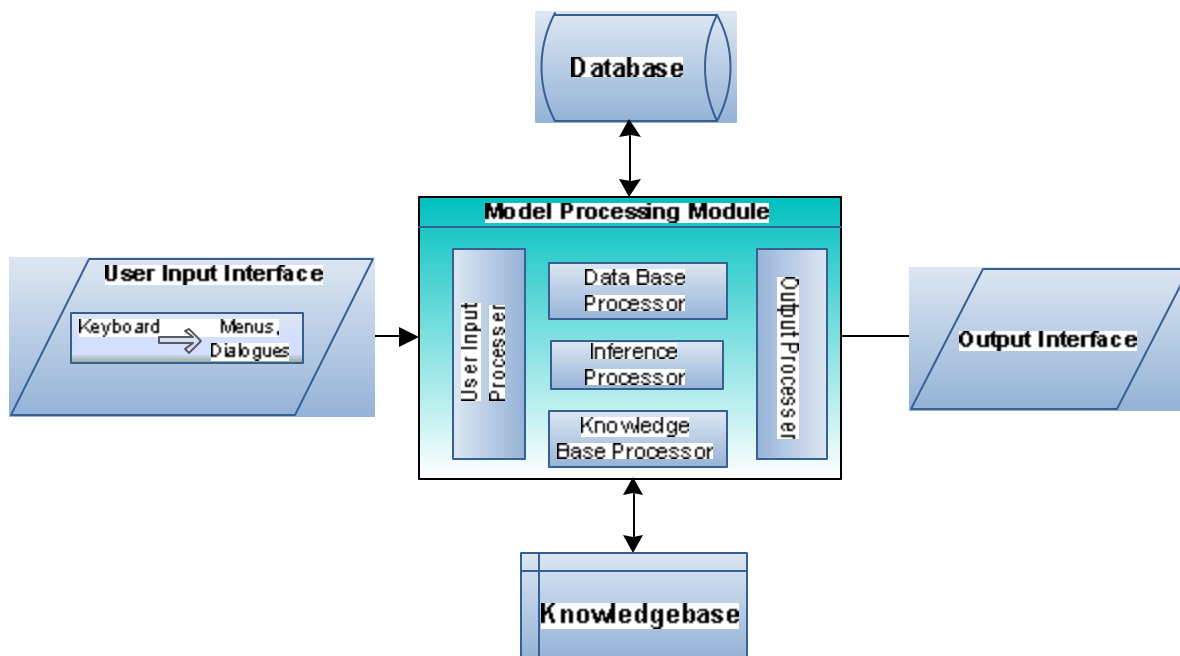


Figure 2. System Architecture

IMPLEMENTATION

A prototype of the system is implemented on main frame. The heart of the system is the processing module that is implemented by the main processor. The processor consists of several subprocessors that are responsible for specific tasks such as processing user inputs, processing data. The inference subprocessor performs the necessary computations by applying data validation rules. The inference subprocessor is implemented using forward if-else chaining.

Output module is implemented by the display procedures. It displays the output of the system and the appropriate error messages [24][25][32][36][37][38].

TESTING

The test results are in the form of outputs from the system which is implemented. Several tests were performed to evaluate the system response to the users' requests. One of the test results are illustrated in the figure 3 and the figure 4. This test consists of processing the request for graduation. The current status of the student's present curriculum is shown in the figure 3. The student logs in and selects the option for graduation. The user session is shown in the figure 4. The student is Computer Science major and mathematics minor. He has completed most of the curriculum. He has to take CS401, CS411, CS403 and he got D in CS307 which he needs to repeat as grade of C is required. The system requests and collects the specifications from the user for graduation. The system response is shown in the figure 4. The system suggested repeating CS307 and complete CS401, CS411, CS403. Thus the response is consistent with the human response.

Freshman							
First Semester				Second Semester			
Course	Hours	Grade		Course	Hours	Grade	
Educ 101	2	P		CS 105	3	B	
Engl 101	3	B		Engl 102	3	B	
BSc 101	3	B		M 106	3	B	
Econ 101	3	B		BSc 102	3	B	
MS 101	2	B		Econ 102	3	B	
M 105	3	B		MS 102	2	B	
Sophomore							
M 203	3	B		M 204	3	B	
M 209	3	C		M 208	3	B	
CS 201	3	A		CS 202	3	B	
Huma 201	4	C		Huma 202	4	C	
M 212	1	C		MS 202	2	B	
MS 201	2	B		SP 103	3	B	
Junior							
P 201	4	C		Psy 201	3	C	
Huma 301	3	C		P 202	4	C	
CS 301	3	C		CS 304	3	C	
CS 307	3	D*		CS 308	3	C	
M 307	3	B		M 213	3	B	
Senior							
CS 401	3	*		CS 409	3	C	
CS 402	3	C		CS 403	3	*	
CS 411	3	*		Econ 205	3	B	
CS 417	3	B		BA 205	3	B	
ACC 201	3	B		ACC 202	3	C	

Figure 3. Student's Current Curriculum

Sample Test Output

```
*****
*   Welcome to the Student Advisement System   *
*                                               *
*   The following options are available:        *
*   1 : Administration                        *
*   2 : Advisement                          *
*   3 : Help                                *
*   4 : Exit                                *
*****
```

Make your choice

2

Give your student id:

90002156

The following options are available:

- 1 : Help
- 2 : Advisor
- 3 : Exit

Make your choice

2

The following plans are available:

- 1 : Requirements
- 2 : Degree plans
- 3 : Review plan
- 4 : Change of plan
- 5 : Registration
- 6 : Graduation
- 7 : Exit

Make your choice

6

This institution consists of the following divisions:

- 1 : Arts
- 2 : Sciences
- 3 : Engineering
- 4 : Business
- 5 : Exit

Make your choice

2

Division of sciences consists of the following departments:

- 1 : Department of Biology
- 2 : Department of Chemistry
- 3 : Department of Computer Science
- 4 : Department of Mathematics
- 5 : Department of Physics
- 6 : Department of Statistics
- 7 : Exit

Make your choice

3

Degrees offered by this department are:

- 1 : Bachelor of Science
- 2 : Master of Science
- 3 : None of above

Make your choice

1

The Following degree options are available:

- 1 : Professional
- 2 : Teaching
- 3 : None of above

Make your choice

1

The following minors are available:

- 1 : Math
- 2 : BA
- 3 : English
- 6 : Exit

Make your choice

1

From which semester you wish to start a plan?

- 1 : Fall-Freshman
- 2 : Spring-Freshman
- 3 : Fall-Sophomore
- 4 : Spring-Sophomore
- 5 : Fall-Junior
- 6 : Spring-Junior
- 7 ; Fall-Senior
- 8 : Spring-Senior
- 9 : Summer
- 10 : Exit

Make your choice

8

Do you wish to graduate this semester?

1 : Yes

2 : No

Make your choice

1

You need to repeat the following courses

1 : CS307 File Processing 3

You need to complete the following courses

1 : CS401 Operating Systems 3

2 : CS411 Data Base Systems 3

3 : CS403 Numerical Analysis 3

You have not completed all the requirements

The following plans are available:

1 : Requirements

2 : Degree plans

3 : Review plan

4: Change of plan

5 : Registration

6 : Graduation

7 : Exit

Make your choice

7

The following options are available:

1 : Help

2 : Advisor

3 : Exit

Make your choice

3

Figure 4. Test Output

CONCLUSIONS

The DSS for student advisement is a valuable tool for advisors as well as for students for students academic planning and decision making. It certainly simplifies the advisement process. It is undoubtedly very useful for advisors and students to make important decisions in a student's academic life. It can provide quick and easy access to an important information and also can provide important feedback on different issues which otherwise could have taken a considerable time. The system is by no means to replace advisors but it can certainly provide an option to students.

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