New Trends for Improving the Academic Advising System

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Abstract: Recently, the academic advising systems have been studied by several researchers in both technical and educational fields. However, most of the existing academic advising systems available in the universities include CAS College provides a manual academic advising system which are face some drawbacks and problems in the educational fields. This paper proposes a system which is used to automate the process of academic advising with the goal of avoiding the problems of the manual version of the academic advising system titled Intelligent aCademic aDvising (ICD) system. ICD is consisting of two main units. Each of these units is responsible to provide services for each of the advisors and students. Nevertheless, to reach a degree of automatic advising by the ICD system, GA mechanism is adopted in the suggested units. The GA helps the ICD system to provide the student with a reasonable recommendation to his/her marks in the current registered semester if he/she is under proration. In addition to the suggested main units, ICD able to displays the number of the completed credits, GPA, the study plan and the courses that they don’t completed. All these features of ICD make the advisor a useful system for those under proportion students. ICD is developed with one database which is built within web applications employing Apache Web Server, MySQL, Java Server Pages and NetBeans. The performance of ICD in the college of applied science has been evaluated during an experiment with experienced advisors and 30 students of this college.

Keywords: Academic Advising System, Genetic Algorithm, Decision Tree Algorithm.

1. Introduction

In Recent years, educational institutions, including colleges and universities, seek to apply new technology to facilitate the collaboration between students and their academic advisors. Such new technology improves academic advising by adopting an intelligent system as a priority for the development of students. Academic advising is a decision-making process which supports students in achieving their educational goals through the university’s education requirements. Advisors assist advisees (students) in the development of their academic plans that are consistent with their life goals.

The idea of adopting an intelligent system for academic advising is a useful one. The benefit of such system is used to automate the process of academic advising with the goal of avoiding the problems of the manual version of the academic advising system. In this vein, the present paper tries to find good solutions to the academic advising system by proposing a new intelligence system titled Intelligent aCademic aDvising (ICD).

ICD is an intelligent web-based advising system for helping and providing some advices and directions to the students in a way that help them to meet a good performance in their study life. Indeed, ICD will overcome the manual academic advising system problems by proposing some intelligent tools that will help both the students and advisors in developing a precise short-term curricular schedule. However, ICD will save the time and the effort of the advisors and helps them to do their work efficiently.

To cope with the above idea, Genetic Algorithm (GA) and Decision Tree are highly recommended as tools for designing such system with the aim of supporting students and advisors to automate the planning and scheduling services. Thus, the proposed system is seeking to achieve the following innovative aspects:

- The deployment of GA and decision tree aspects of the proposed systems’ units.
- Implementing other utilities to help advisors and students for saving their time and the effort and doing their work efficiently.

The reminder of this paper is structured as follows. Section 2 presents the related works to different system that are used for solving the problem of academic advising. The main architecture of the proposed system is presented in section 3. It concentrates on designing and implementing the proposed system by describing the system's architecture which consisting of three main intelligent units. Section 4 provides the experimental results of the proposed system and discusses those experiments. In addition, this section encompasses several examples in order to examine the validity of the proposed system. Finally, section 5 includes the overall conclusions and it covers the directions of future work for extending the proposed.

2. Literature review

There are several systems for academic advising have been proposed and developed to assist in solving the problems of such filed. For completeness sake a brief overview of the related works is discussed below.

In [11], the author proposed a Web-Based Advising Tool for the Department of Computer Science and Engineering at Florida Atlantic University. Their system supports advising for students in which the
students do not rely on their advisors to tell them what courses to take next. The proposed system provides a list of recommended courses based on the student information. However, their system has three different types of users (students, advisors, and secretaries), each of which has different privileges and allowed operations. Student users may use the system to find relevant advising-related information, such as course descriptions and advising FAQs. In [3], the author proposed a spreadsheet-based Decision Support Tool for Academic Advising to aid the advisors in preparing registration plans for students and the department in projecting the demand on each course and making decision on which courses should be offered each semester such that the resources are optimally allocated. The proposed system has been developed by using VBA scripts for Microsoft Excel to provide functions for the system tasks.

A web-based decision support tool in [6] is developed. The proposed system helps advisors and students make better use of an already present university student information system. In their system supports students with needed information for course planning in visually appealing way. However, the proposed system displays the major and overall average indicates which major, university and distribution requirements have been satisfied and which need to be completed. Also, it displays the number of credits completed and the number still needed for graduation. Their mechanism is to recommend schedule for the following semester by displaying all the information on one screen. Their online advisor is not ‘intelligent’.

In [2] proposed an advising system to assist postgraduate student to select their master courses in their study in CS at KAU. The proposed system is targeted the postgraduate student taking into account their thesis field. Their result was amused and satisfied by their postgraduate students. The disadvantage of their system is not a website based system and is not intelligent.

JESS-Java Expert System is proposed in [13]. The proposed system is a prototype that had been used to develop a Student Advising Expert System as a Graduate Program Advisor for Industrial Technology Department at California State University-Fresno. A graphical user interface (GUI)-based expert system has been used in their system. One of the objectives of the proposed system is to reduce the pressure on faculty for answering same questions that might be targeted by their students at the beginning of each semester. An Interactive Virtual Expert System for Advising is proposed in [16]. The proposed system is Java based with an object-relational database. In order to access system functionality by users, a web-based interface is used. The proposed system works with small and middle sized universities. One of the advantages of their proposal is to help the advisors and students as well to select the suitable course at the beginning of each semester.

BUADVIS is developed in [4]. BUADVIS is a decision support system that had been developed to advise student through registration stage. The idea of the proposed system was to help the students and the advisors to select their courses through a semester.

A prototype expert system supported with an object-oriented database is proposed in [1]. A decision support tool was used in their proposal. The developed tool provides the students (and academic advisors) with quick and easy major search and selection. The proposed system has a graphical user interface and simple menus.

KMCD is proposed in [16]. KMCD is based on knowledge of students who want to choose majors and students who have finished their studies. In addition, KMCD is a first-order reasoning system equipped with an uncertain reasoning function. The objective of their proposed system is to help the student to choose the best major. The idea of their system is to calculate the passing marks for each course, and count it to reach the whole major supporting degree.

3. Advising Domain

The experiment that will be represented here adopts College of applied Science [17] data for exploring the feasibility of using ICD to solve the problem of academic advising. Indeed, the Information Technology Department in the College of Applied Science of Oman, offers a BSc degree in Software Development, Computer Networks, IT Security and Data Management. Each course in Information Technology program is labelled by code and catalogue number. Students can take from three to six courses per term. In selecting courses, the student must know the possibilities of courses’ combination taking into account the academic pre-requisites condition. However, the Information Technology’s program for each major is segmented into eight terms. The student need to complete 128 credit hours of his/her degree program with a minimum grade point average of 2.00. From the above description, we can notice courses selection is not an easy work and selection of the optimal plan manually would be time consuming work for both the student and advisors. The risk of selecting wrong courses is high in the manual academic advising system and that would affect the student’s performance through his/her academic life. For this reason we suggest to adopt intelligent techniques in the ICD system that would bring the effectiveness to the advising task.

4. Intelligent aCadmeic aDvising(ICD)

An Intelligent aCadmeic aDvising (ICD) is the new trend of Evolutionary Computation computer-based education system which is able to support students and advisors. Indeed, ICD is an automated system that is intended to automate the process of academic advising at the College of Applied Science[17]. Such a system would use Evolutionary Computation with some components to help the advisor and student to decide the right decision about student course grading. In addition, ICD is a management information System.
that uses database information to support students and advisors to make the right decisions for managing their study life.

ICD consists of two intelligent units. The main purpose of these proposed units is to support advisors and students with valuable information to assist them and make their educational decisions relevant. More precisely, in order to obtain high quality advising, additional units and tools need to be combined with an ICD. All the proposed units and tools of ICD system are presented in Figure 1.

![ICD System Units](image)

**Figure 1. ICD System Architecture.**

### 4.1 Plan Chart Unit

One of the management information units in ICD system is a Plan Chart Unit (PCU). PCU is meant to help students and advisors to develop a student’s plan chart. This unit is capable to provide the information that the students and advisors need. Such unit is based on displaying visually a complete hierarchal chart for the student’s courses that have been completed as well as the courses that have not completed yet. In addition, all the prerequisite courses of the displayed courses are also being represented in the hierarchy chart. All the visual information will be uploaded on a designed webpage. PCU retrieves all the required information from the student’s academic plan database with their specialization, and then displaying on the student’s major, all the grade points will be retrieved for each course. According to the retrieved information from the database, the information will be used as an input to display all the courses that belong to the student’s study plan. Then the student grades for each semester will be displayed for all the courses that involved in that semester. Indeed, this unit will sketch the courses’ chain as a way to represent the relationships between the study plan’s courses. In addition, this unit helps to support students and advisors to represent all the major electives and Non major electives for all the courses in the student’s academic plan. PCU will generate a hierarchal chart to the student’s academic plan after retrieving all the required information from the database.

### 4.2 Study Plan Unit (SPU)

The idea of this unit for academic advising is an enticing one. The benefits of modelling this unit in ICD system are manifold. Such a unit will improve the advising process and help the students and advisors to simplify their tasks such as:

- Help to save the time and the effort of the advisors for inputting the grades of all previously or currently registered courses.
- Help to prevent human induced errors.
- Help to enhance the manual academic advising system and help the college to introduce new technologies.
- Help the advisors and the students to concentrate on the advising issues such as developing the short-term curricular schedule for the next semester.

SPU is capable to display the grades for all previously passed and failed registered courses and all the information about courses. In addition, such a unit will provide the advisors and the students about courses’ information such as the number of credit hours, course’s code, course’s title, semester’s level, and the prerequisites for each course. Moreover, this unit displays the registered courses of the current semester in case the student had finished his/her registration.

SPU retrieves all the required information from ICD’s database by extracting student information and courses’ information. This information spans the list of courses that the student has completed according to the student major. In addition, this component acquires all the details about the courses, student plan and student’s grade that the student has completed according to his/her major. This unit arranges the courses in the study plan page according to their semester. In addition, all the details that are related to each course such as course code, course title and prerequisites will be displayed. Moreover, this unit displays the grades that the student has been completed. SPU is capable to estimate student’s GPA, student’s attempted credit hours. Also, it will show all the calculated information such as current registered courses, all completed credits and current registered credits.

### 4.3 Intelligent Marks Presumption (IMP)

Intelligent Marks Presumption allows the ICD System to determine the marks of the registered courses and seeking to the target GPA. Mark Presumption facilities the efficient automatic discovery of empirical marks by using GA (Genetic Algorithms). GAs are adaptive heuristic search algorithm based on the evolutionary ideas of natural selection and genetics. GAs exploits historical information to direct the search into the region of better performance within the search space [5,7,8,12]. The motivation to include this paradigm in LCD system is that it precisely able to find the best solution automatically. The solutions of this unit is represented the marks of the registered courses that the student needs to reach his/her required GPA.

When the GA is applied to solve Marks Presumption problem, GA works by following the three steps:

1. First encoded the individual (marks).
2. In the second step, mating and mutation need to be applied to recombine features of their parents.
3. Finally the proposed fitness function is decided which individuals are good and represent the best solution of our problem.

The design of this unit will be examined in more detail with respect to the GA’s aspect as follows:

- **Chromosomes and Population**: As mentioned before, GA works by initially representing the solutions of the problem domain. Thus, each individual of the population is coded as a finite length vector of marks to represent candidate solutions. However, vectors of marks are generated randomly to encode the chromosomes. That is, a letter coding strategy is adopted here, in which each chromosome \( x_i = (g_{i,1}, g_{i,2}, \ldots, g_{i,NRC}) \) of NRC genes is represented as a grades vector where NRC is the number of registered courses of the current semester and each gene in \( x_i \) is represent a candidate gene of a letter grade value. Value can be any letter from A through C, i.e., depending on the values of Table 1 excepting failure letter F is avoided from the selection. An example of the letter value encoding is illustrated in Figure 2. As mentioned earlier, all individuals have a fixed length. The size of the population \( PG = \{x_i \mid i = 1, 2, \ldots, PSize\} \) of G generation consists of \( PSize \) chromosomes are generated randomly and is fixed depending on the resulting outcome after running the proposed algorithm with different values of \( PSize \).

![Figure 1: Grade Letter Representation of Individual.](image1)

<table>
<thead>
<tr>
<th>Grades</th>
<th>Grade Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
</tr>
<tr>
<td>A-</td>
<td>3.7</td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
</tr>
<tr>
<td>B-</td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>2.3</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
</tr>
<tr>
<td>C-</td>
<td>1.7</td>
</tr>
<tr>
<td>D+</td>
<td>1.3</td>
</tr>
<tr>
<td>D</td>
<td>1.0</td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Table 1: Grade Scale [17].

- **Fitness Function**: The fitness function is the most important point which can be used to control the application of the GAs’ operators. The decision about whether to take or reject a solution depends only on the calculated value of the proposed fitness function. In current work, the fitness function \( f(x) \) is the absolute value of the difference between target GPA (TGPA) that is determined by the advisor or student and the estimated value of GPA for each of the grades earned for the registered courses in addition to the presumption grades of current registered courses. Thus, \( f(x) \) should be calculated for each individual in the population and the goal of IMP is to minimize the value of \( f(x) \) where a value of 0 represents the perfect solution of our problem.

\[
\begin{align*}
TCA &= \sum_{i=1}^{NRC} C_i + \sum_{i=1}^{NC} NC_i \\
TGPE &= \sum_{i=1}^{NRC} C_i + NGR + \sum_{i=1}^{NC} C_i + NGR \\
GPA &= \frac{TGPE}{TCA} \quad \text{------ (1)} \\
\end{align*}
\]

![Figure 2: The steps of the crossover operator.](image2)

<table>
<thead>
<tr>
<th>Terminology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCA</td>
<td>Total Credits Attempts</td>
</tr>
<tr>
<td>NC</td>
<td>Number of Registered Courses</td>
</tr>
<tr>
<td>NCC</td>
<td>Number of Current Registered Courses</td>
</tr>
<tr>
<td>CVA</td>
<td>Credit Value</td>
</tr>
<tr>
<td>TGPE</td>
<td>Total Grade Point Earned</td>
</tr>
<tr>
<td>NGR</td>
<td>Numeric Grade Points</td>
</tr>
<tr>
<td>GPA</td>
<td>Grade Point Average</td>
</tr>
<tr>
<td>TGPA</td>
<td>Targeted Grade Point Average</td>
</tr>
</tbody>
</table>

Table 2: Description of Terminals of Equations 1-4.

- **Crossover Operator**: One-point crossover [10,14] operator is adopted here to produce two new offsprings by randomly selecting one crossover point within an individual in the range [2, .., NRC-1]. However, tow parents \( p_1 \) and \( p_2 \) of NCR length are aligned with each other and one crossover point \( cp \) is chosen at random over the range [2, .., NRC-1]. The selected crossover point will divide \( p_1 \) and \( p_2 \) into two parts. And so, the two generated parts from the selected parents are interchanging the genes after the selected crossover point \( cp \) to form two offspring. Figure 2 illustrate the process of the selected crossover operator.

- **Selection**: Next new populations are generated by applying GA’s operators. One of the main operators is the selection. IMP uses two techniques to select new parents in a given generation of GA. The first technique applied here is elitism, where the best individual is copied and passed into the next generation. The advantage of using elitism is that it can increase the performance of GA rapidly and meanwhile prevents losing the best individuals. In addition, the binary tournament selection is adopted here. Binary tournament selection selects two individuals randomly from the PGi-1 and the better of the two selected individuals are returned as a parent. Once the parents are selected, then they are passed to carry out the next operators of GA.
- **Mutation Operator:** After the crossover operator, mutation is carried out by randomly generating a new random gene’s value to replace the current gene’s value which is selected randomly according to the individual length (i.e., \( g \in [1...NRC] \)).

- **Termination Criteria and Solution:** The GA’s engine is processed iteratively until an upper limit on the number of generations is reached or an optimal solution is found.

The marks that have been predicted by IMP will be deployed to Study Plan Unit (SPU). Indeed, all marks of the past registered courses with the predicted marks of the current registered courses are entered in the designed sheet of the SPU. SPU automatically estimates the GPA and the enrolled credit hours of the entered courses in the design sheet of SPU. This unit deploys the predicted marks with a color marker. This technique will help the students and the advisors to see a glance for the required marks that the student needs to be gained for the new registered courses in the current semester.

4.4 Decision Course Unit (DCU)

DCU used the Decision Tree mechanism to help the users to take decisions about dropping any course. DCU is retrieving all the registered courses to allow the student to choose the course that he/she wants to drop. Then, the information about the selected course is retrieved from the database. This unit is capable of providing the most proper useful information about the consequences of dropping any course. As mentioned before, this unit uses the decision tree mechanism. The levels of the decision tree have been organized as shown in Figure 3. The most general conditions have located at the top (root node) of the decision tree for example the GPA followed by the other specific conditions. In the leaf nodes will be the result that describes the situation after dropping the course. Moreover, DCU also will display the remaining semesters that the student needs to finish the program after dropping the course. Such unit informs users that the dropped course will be a prerequisite to other courses in his/her academic plan, in case this dropped course has some prerequisite. The number of delayed semester is also shown by this unit.

4.5 ICD Extra Embedded Tools

In addition to the mentioned main units, the ICD provides some additional tools to enhance the functionality and flexibility of the system. These tools will allow the student to communicate with his advisor using the ICD emailing tool, print and save his/her major plan with student’s grades. More details about these tools will be presented in the following:

- **ICD Email Tool:** Email is a very common way tool for communication. Most of the systems provide specific emails to the users, so the ICD system will provide Email service for the students and instructors to enhance the communication between them. So the ICD mailing service will allow the students to contact with his advisor only. Also, the adviser able to choose one or more students from his list to contact them.

- **Remaining Semesters Calculator:** The remaining semester calculator will allow the student to calculate the remaining semesters to finish his/her program. This tool will display the student’s completed credits and the current registered courses. Also the number of remaining credits will be calculated. The result of this tool presented in a table that represent the number of credits with the required number of semesters needed by the student to finish his program.

5. Database of ICD

The basic structure of ICD database is made of a set of tables where information about a particular entity (Course, Student, etc.) is represented in columns and rows. The data pool adopted in ICD system is the data pool of the student’s transcript and academic plan Information Technology’s programs at College of Applied Science. The descriptions of the main tables used in the proposed system are:

1. Student table is used to store the essential information about the student. This table contains nine fields as presents in Figure 4(a).
2. Course table is used to specify the Course information. The information of this table is shown in Figure 4(b).
3. Course Plan table is used to determine course type and the relationship with its major and its semester. This table contains four fields whereas the schemata of this table are illustrated in Figure 4(c).
4. Instructor table which is used to express the instructor name, email, office number and the number of instructor’s phone. The schema of concept table is presented in Figure 4(d).
5. Major table is used to express majors of IT department. This table comprises of three fields as presented in Figure 4(e).
6. User table is used to determine user type, password and user ID. This table contains 3 fields as presents in Figure 4(f).

Figure 4: The Main Tables of the Database in the ICD System

6. Experimental Work

The experimental work in evaluating and analyzing ICD system is presented here whereas the evaluation is conducted in terms of the following criteria:
1. Show how ICD is a user friendly and easy to use.
2. Show how IMP able to find the optimal solutions.
3. Show how ICD is applicable in the College of Applied Science.

6.1 ICD’s Requirements

A personal computer with a Pentium Core i5 GHz CPU, 8 GB RAMS, and 500 GB hard disk is used as a platform for evaluating ICD system. ICD has been implemented in the Windows XP Professional environment with Net Beans program language. ICD is developed with two databases: the administrative database and the student database. Both databases are built within web applications employing Apache Web Server, MySQL, Java Server Pages and NetBeans. For manipulating and retrieving data stored in the database a Sequential Query Language (SQL) is used. The web pages of ICD are designed using HTML5 and CSS.

6.2 ICD’s Administration

The objective of this section is to show how the main pages of the proposed system are easy to use and friendly.

- **Home Page of ICD System:** Figure 5 illustrates the Home web page of ICD. Home Page consists of a set of links that will lead to a set of different web pages of different functions. The linked web pages will be displayed after the required login to the home page is successful.

- **Grading Web Page:** This page is the overview of the grade presentation which is consisting of two linked pages includes: Study Plan and Plan Chart Pages. Study Plan page displays the academic program of the student depending on his/her major. Such page is designed to retrieve student’s marks for the courses that he/she have been completed along with the REG to indicate the courses of the students that have been registered. At the bottom level of this page, the details of other information will be calculated includes GPA, Completed Credit Hours, Gained Credit Hours, Failed Credit Hours, Current Credit Hours, and Remaining Credit Hours. The benefit of using such page is to easily the task of entering marks by instructors and reducing the chances of making mistakes that occur in the manual academic system. Figure 6 illustrates the web page of the Study Plan page. Plan chart enables web users to view student’s marks graphically. This interface explains all courses’ code of the student academic program graphically based on the information that has been pre-prepared from the student profile. Indeed, such page attracts the student by marking all the completed courses with a different color. Additionally to displaying course code on the page, this page will represent the courses that are prerequisite to other courses graphically. Figure 7 illustrates sample to result of the plan chart page.

- **Advice Me** web page is designed to support both of the advisors and students to make the right decision about the student’s academic career. It’s designed to include two of the powerful tools in ICD system: IMP and DCU. To estimate target marks of his current registered courses, a user first has to enter his GPA. After that, he/she needs to request the IMP’s engine by choosing a TEST button to provide him with the required output. Figure 8 illustrates IMP web pages. The second intelligent web page is DCU, listed with the Advice Me page, is designed for advising the

Figure 5: Home Page of ICD System.

Figure 6: The Study Plan Page the ICD System

Figure 7: The Plan Chart Page the ICD System

Figure 8: The IMP Web Pages the ICD System
student in case he wants to drop course from his registered courses. Such page provides a means for Web users to look the student’s performance when the selected course is dropped from his current registered. Indeed, the main decision is forwarded to the web page after the user selecting one course for the list that has been retrieved by DCU’s System Query. Thus, this interface is provide the user with some information that will help him to make the final decision include the prerequisite courses of that course, graduation delay, the number of delayed credits hours , the current credit hours and the number of semesters needed to graduate. Figure 9 illustrates the main items of a DCU Web page.

6.3 Testing the Applicability of ICD System
The objective of this section is to show the applicability and testing ICD system at College of Applied Science domain by addressing the following case study.

The main facts of this case study are that a student using the ICD system has 81 credit hours and student’s GPA is 3.33 (see Figure 10). Thus, such plan has enabled the advisor to check the current registered courses and give him a general view to this student’s performance. However, the expectations of student grades in the current registered courses can be identified by running Intelligent Mark Presumption. Figure 11 illustrates the results of the IMP after determining the target GPA is 3.4. The realized conclusion of this experiment, IMP able to provide the student and advisors with a variety of solutions that is because of using GA in the IMP’s engine.

To evaluate DCU, let us assume this student drops SFDV 3004 from the list of his/her current registered courses. Figure 12 illustrates the result of this experiment. It is noticed that this unit advised this student the possibility to drop SFDV 3004 while the possibility of delays in his academic program might be occurred. In addition, DCU informs users that generally SFDV 3004 will be a prerequisite to four more courses in his/her academic plan. Finally, the number of delayed semesters is also shown. The realized conclusion of this experiment, DCU able to provide the student and advisors with sufficient information to make the final decision.

Figure 7: IMP Page the ICD System

Figure 9: The DCU Page the ICD System

Figure 10: The Study Plan Result.

Figure 11: The result of IMP unit of ICD System

Figure 12: The result of DCU unit of ICD System
7. Conclusion and Future Work

In this paper, ICD system is proposed to solve the problem of the manual academic advising system. The ICD system consists of three main different units, whereas these units come with intelligent approach embedded in their engine. However, the main features of this system are followed:
1. GA was used in the IMP to optimize the process of their solutions.
2. The decision tree model is integrated with DCU.
3. The designed interface of ICD system is user friendly and easy to use.
4. ICD has a reasonable response time for any request that comes from users.
5. ICD’s interface provides mechanisms and tools to help users to make their final decisions.
6. ICD has enhanced the manual academic advising system by integrating some tools and intelligent units that will help both the students and advisors in developing a precise short-term curricular schedule.
7. By using ICD, the advisors able to contact with their students easily by emailing them.
8. In general, ICD gives the required information for the students during the registration time to ensure that the students will not face any problem in their academic life.
9. By Using IMP, ICD supports the student the marks that will help him to increase his GPA.

As we mentioned before, ICD can reduce the cost, time, and effort for both the advisors and students. For this reason, using ICD is considered a good idea to implement it at the colleges and the universities in Oman to track the performance of the Omani students and helping them to success in their academic life.

Furthermore, based on the results of the empirical test were conducted on 20 students; the ICD system can be suitably applied to help the students and advisors. The study also provides quite for a future researcher which will enable advisors to enhance student’s ability to acquire skills and apply knowledge. This in turn will not only save time, but also the proposed system allow a greater transfer of knowledge as well as sharing information.

There are many new directions in which the proposed system can be further investigated. First, we plan to integrate more intelligent functions of the proposed system including predicting the student’s performance, and integrate more criteria to the proposed fitness function of SCU’s engine. Second, we suggest to use Data Mining techniques with an ICD is helping the proposed system to mine the association relationship between student’s data. This will be useful for analyzing and predicting student performance.

References

[17] College of Applied Science Catalog.