A PROPOSED EXPERT SYSTEM FOR GUIDING FRESHMAN STUDENTS IN SELECTING A MAJOR IN AL-AZHAR UNIVERSITY, GAZA

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ABSTRACT

In this paper we will present the design and development of a proposed expert system that aims to improve the method of selecting the best suitable faculty/major for student planning to be enrolled in Al-Azhar University. The basic idea of our approach is designing a model for testing and measuring the student capabilities like intelligence, understanding, comprehension, mathematical concepts and others, and applying the module results to a rule-based expert system to determine the compatibility of those capabilities with the available faculties/majors in Al-Azhar University. The result is shown as a list of suggested faculties/majors that are most suitable with the student capabilities and abilities.

Keywords: *Artificial Intelligence, Expert System, Rule-Based System and CLIPS.*

1. INTRODUCTION

After students' completion of high school, they plan to join a university and select a faculty/major to start a new era of their lives in the bachelor degree level. Universities generally identify certain basic criterions for admission policy. The main criterion for admission is the student's high school score and high school branch (Scientific or Art). These criterions for admission vary from one university to another. It is well known that the personal desire in something is not enough alone to make him/her successful in it. Not every one who's desire to work in commerce, industry, or other was successful in it. Some people lost their money and time in a field that is not compatible with their capabilities and abilities. This is similar to a student choosing a faculty or a major in a university. The statistical evidence showed that a lot of students failed in their university studies even though, they receive all the family supports and they are not weak in their studies; but because they did not choose the right faculty/major that was compatible with their capabilities and abilities. Many students choose a university faculty/major because it has a good social reputation or their friends have chosen it.

The student does not know the extent of his real capabilities and abilities, and he does not have adequate capacity to learn capabilities needed for each faculty/major. Expert systems can do this task through the provision of some of the questions asked in various fields to measure student capabilities in these areas.

Expert systems are a branch of Artificial Intelligence (AI)[8]-[10]. AI is a simulation of human intelligence in a machine, so as to make the machine efficient in identifying and using the right piece of "Knowledge" at a given step of solving a problem [1],[11].

Expert systems are computer applications which embody some non-algorithmic expertise for solving certain types of problems. For example, monitor real time systems, underwrite insurance policies, and perform many other services which previously required human expertise [2][12]. A rule-based system is an expert system that contains a general rule-base and an inference engine. The inference engine retrieves rules from the rule-base to solve new problems based on the rules for similar problems stored in the rule-based system. In this way, a rule-based system can exhibit humanlike performance in that knowledge that can

seemingly be acquired through experience [3][13]. We have developed our expert system using CLIPS(C Language Integrated Production System) language. CLIPS is a multi-paradigm programming language that provides support for rule-based, object-oriented, and procedural programming. CLIPS is a forward chaining, rule-based production-system language, which is based on the RETE algorithm for pattern-matching. A command-line interpreter is the default interface for CLIPS language [4].

A few studies and systems have been published on advising students in choosing a university or college. MyMajors [5] has a website that gives the student online advisement report about the suitable universities.

The paper is organized as follows: section 2 describes the general idea of our expert system and problem identification, section 3 presents knowledge base representation and CLIPS rules, section 4 presents student capabilities and evaluation test, the result of the expert system is in section 5, and section 6 concludes the paper and outline direction for future research.

2. PROBLEM IDENTIFICATION

Everyone has many special specific mental abilities, and every university faculty/major needs special abilities and capabilities. So we need a tool to measure some of the student mental abilities accurately and compare then with the university faculty/major required abilities and suggest a suitable faculty/major for the student to be academically successful.

First step: get student general background information like: student name, high school score, high school branch and year of graduation. Second step: the student takes an online abilities test to measure his capabilities and abilities. We have adopted some of the questions from QEYAS (National Center for Assessment in Higher Education in Saudi Arabia) [6] test models and other questions. Arabic language is the default language used in this test module. Applying the results of the test to our knowledge based system is the third step. Finally our expert system determines which faculty/major in general can be suitable for the student.

3. KNOWLEDGE BASE REPRESENTAION

Our main sources for knowledge acquisition are human academic experts and some websites [5]-[7]. We collected all the required criterions, abilities and capabilities for each faculty/major in Al-Azhar University. We converted the knowledge into facts and rules in CLIPS syntax, and store them in the knowledge base of the CLIPS language. CLIPS is a suitable for forward reasoning and can be used easily to build the rules and facts, so that is why we have selected the CLIPS language. Furthermore, we captured all general important background information about the student in CLIPS fact templates. The following sample code shows a student structure for CLIPS template.

```
(deftemplate student "Student Information"
  (slot student-no)
  (slot first-name)
  (slot last-name)
  (slot age)
  (slot high-school-score)
  (slot high-school-type)
  (slot high-school-year)
  (slot sinper)
  (slot intper)
  (slot mathper)
  (slot pioper)
)
```

The rule is represented in the syntax of " If conditions then actions ". That means when the conditions are satisfied then the actions are carried out. Here is an example from our expert system using CLIPS syntax rules for the requirements of the faculty of Engineering:

```
(defrule fo-Engineering
  (student (student-no ?student-no)
    (high-school-score ?high-school-score)
    (high-school-type ?high-school-type)
    (high-school-year ?high-school-year)
    (conper ?conper)
    (intper ?intper)
    (mathper ?mathper)
    (pioper ?pioper)

)

(test (>= ?high-school-score 85))
(test (eq ?high-school-type Science))
(test (>= ?high-school-year 2005))

=>
```

```
(assert (faculty-of-Engineering ?student-no))

(printout fdatao "[Engineering]" crlf
"Accepted=TRUE" crlf)

(if
   (and (>= ?conper 0.6) (>= ?intper 0.8) (>=
?mathper 0.9)  (>= ?pioper 0.3))
 then
  (printout fdatao  "Recommended=TRUE" crlf
crlf)
 else (printout fdatao  "Recommended=FALSE"
crlf crlf))
)
```

4. CAPABILITIES TEST

This test evaluates student capabilities and abilities in many fields like Science, Mathematics, History, Geography, English language and other capabilities. We used Arabic language for most tests modules and English language for a few test modules because students in high school were taught mostly using Arabic language. Even though, students study English as a second language but not as a medium of instructions. CLIPS language does not support graphical interfaces; but can be integrated with other high level languages like visual basic easily. We developed the test modules using Microsoft visual basic to make communication between students and our expert system much easier.

Figure (1): The form for capturing background information about the student

Before the capabilities test begins, our expert system needs some important background information about the student like his name, high school score, high school branch, year of graduation, age, etc., see figure(1) for details. Then a timed limited module test consisting of 20 questions begins. Figure2 shows a sample question screen from a capabilities module test.

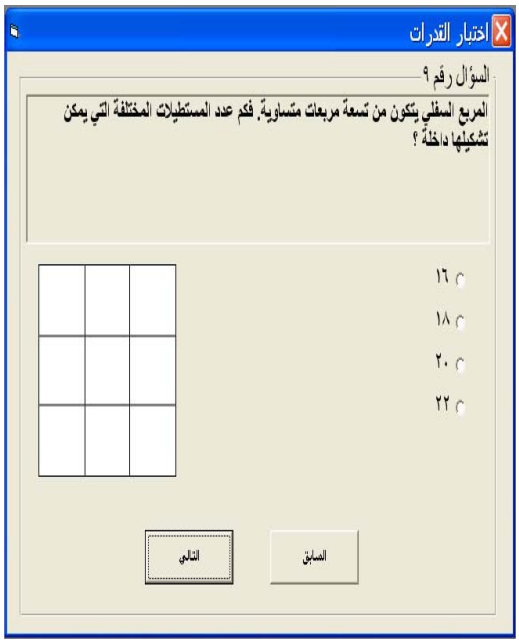

Figure (2): A snap shot that shows sample question of the capabilities test

By the time the student finishes the abilities test, our expert system have all information about the student capabilities and abilities captured. This information then is converted into facts in our CLIPS expert system. The following rule shows how the information is transformed into CLIPS facts:

```
(defrule readdata
          (declare (salience 1000))
          (initial-fact)
          ?factstudent <- (initial-fact)

=>
 (retract ?factstudent)
 (open "data.txt" fdata "r")
 (open "data-output.txt" fdatao "w")
 (bind ?student-no (read fdata))
 (bind ?first-name (read fdata))
 (bind ?last-name (read fdata))
 (bind ?age (read fdata))
```

```
  (bind ?high-school-score (read fdata))
  (bind ?high-school-type (read fdata))
  (bind ?high-school-year (read fdata))
  (bind ?conper (read fdata))
  (bind ?intper (read fdata))
  (bind ?mathper (read fdata))
  (bind ?pioper (read fdata))
 (printout fdatao "[STUINF]" crlf "No="
?student-no crlf "name= " ?first-name " " ?last-
name crlf "Age=" ?age crlf  "HSS=" ?high-school-
score crlf "HST=" ?high-school-type crlf "HSY="
?high-school-year crlf crlf)

  (assert (student
    (student-no ?student-no)
    (first-name ?first-name)
    (last-name ?last-name)
    (age ?age)

    (high-school-score ?high-school-score)
    (high-school-type ?high-school-type)
    (high-school-year ?high-school-year)
    (conper ?conper)
    (intper ?intper)
    (mathper ?mathper)
    (pioper ?pioper)))
   (close fdata)
)
```

5. RESULT OF THE EXPERT SYSTEM

Finally our expert system makes two recommendations for the student:

1. The first recommendation is based on only the analysis of the student's background information and the pre-determined criterions for admission of each faculty or major. A list of faculties/majors is shown to the students to choose one from.

2. The second recommendation is made based on the student's background information and the abilities module test results. Our expert system identify the most suitable faculty or major for the student based on his abilities and capabilities extracted from the test module results. The list of faculties is sorted from the best suitable to worst suitable faculty/major. Furthermore, faculty/major that is not present in the list means it is not suitable for the student. Figure 3 shows a sample for a final result report.

In fact, these results are not 100% accurate, because there are several factors that may affect the student away from the scientific level, such as mental state and health situation for him during the evaluation test, which will affect negatively on the results and therefore we have collected not to express actually on the level of student scientifically.

Figure 3 shows a sample for a final result report

6. CONCLUSION & FUTURE WORK

In this paper we have presented the design and development of a proposed expert system to help the student to select the best suitable faculty or major based on his capabilities and abilities. Our expert system is a rule based system, and we used CLIPS language to store our knowledge base. Using abilities test we can measure some student capabilities and abilities and determine which faculty/major is suitable for him. The fact is measuring abilities and capabilities of the student accurately are complex process. But, as more students being evaluated in the abilities test the more prospect realistic results is withdrawn.

We recommend that our expert system be extended to include other universities faculties and majors to be able to serve more students wishing to be enrolled in other universities than Al-Azhar University.

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