International Journal of Advanced Scientific Research
ISSN: 2456-0421; Impact Factor: RJIF 5.32
www.allscientificjournal.com
Volume 2; Issue 1; January 2017; Page No. 11-16

Intelligent tutoring system for mathematics

Nour N AbuEloun

Department of Information Technology, Faculty of Engineering & Information Technology, Al-Azhar University, Gaza, Palestine

Abstract
In these days, there is an increasing technological development in intelligent tutoring systems. This field has become interesting to many researchers. In this paper, we present an intelligent tutoring system for teaching mathematics that help students understand the basics of math and that helps a lot of students of all ages to understand the topic because it's important for students of adding and subtracting. Through which the student will be able to study the course and solve related problems. An evaluation of the intelligent tutoring systems was carried out and the results were encouraging.

Keywords: intelligent tutoring system, e-learning, mathematics

1. Introduction
Intelligent tutoring systems (ITSs) have been investigated in AI now for several decades. With the enormous development and increasing availability of the program, the application of intelligent learning systems becomes more probable and accurate and research for intelligent features obtains more care than before. As a result, a number of new ITS have been established over the last years, program, and web page [28].
This project is based adaptive learning environment for mathematics. These systems strive for improving long-distance learning, for complementing traditional classroom teaching, and for supporting individual and life-long learning, and allow a user to learn in his own environment and whenever it is appropriate for him [28].

2. Literature Review
There are many ITS that were developed for: ITS for Learning Java Objects [4], ITS teaching grammar English tenses [10], Java Expression Evaluation [3], Linear Programming [23, 26, 27], ITS for Teaching Mongo Database[18], ITS for C# Language [7], effectiveness of e-learning [5, 31], effectiveness of the CPP-Tutor [25], teaching AI searching algorithms [30], teaching database [24], and ITS for Teaching the 7 Characteristics for Living Things [17], ITS for teaching the right letter pronunciation in reciting the Holy Quran [6], ITS for Health problems related to addiction of video game playing [8], ITS for teaching advanced topics in information security [19], Oracle Intelligent Tutoring System (OITS) [9], ITS for learning Computer Theory[14], e-learning system [29], ADO-Tutor: Intelligent Tutoring System for leaning ADO.NET [15], ITS for Parameter Passing in Java Programming [22], and Predicting learners performance using NT and ITS [27], CPP-Tutor for C++ Programming Language [20], a comparative study between Animated Intelligent Tutoring Systems (AITS) and Video-based Intelligent Tutoring Systems (VITS) [21], ITS for stomach disease Intelligent Tutoring System [13], ITS for diabetes [12], Computer Networks [11], DSE-Tutor for Teaching DES Information Security Algorithm [16].

3. ITS Architecture
In this paper, we used ITSB authoring tool [28]. This tool designed and developed by Professor Samy S. Abu Naser [28]. He used Delphi Embarcadero XE8, 2015 [2]; this tool supported two languages: English and Arabic and has two systems in one application. The first system is the teacher system where it allows the teachers to add course materials, questions and answers. The second system is the student system where it allows the student to study course materials and answer exercises.
This tool contains four modules: domain module, teaching module, student module and user interfaces module. The first module stores and organizes the material in chapters or lessons. The second module works as control engine. The third module gives the system all essential information so it can adapt itself to the student. The last module has two sections - one for the student and the other for the teacher as shown in Fig 1.

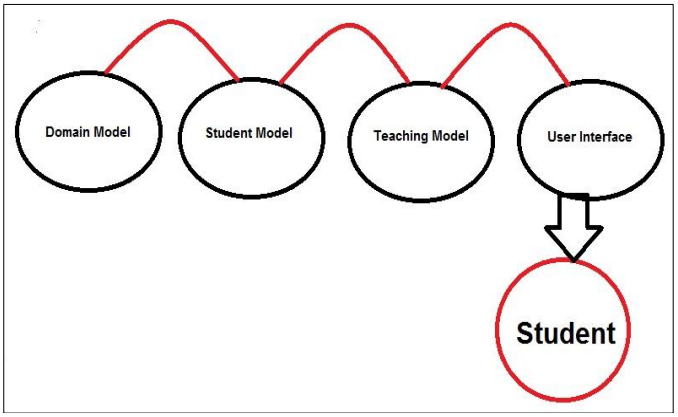

Fig 1: Overall System Architecture

3.1 Domain Module
This model deals with many important topics of interest in the System for Mathematics. The topics covered in intelligent tutoring system are:
- Algebra
- Real numbers
- Integer Exponents
- Roots of real numbers
- Rational exponents
- Radicals polynomials,

- Addition and subtraction and
- Factoring second degree polynomials**.**

3.2 Student Module

A new student account must be created to have a profile where it allows the student to study course materials and answer the exercises. The profile has information about the student such as student name, last session date, student number, current score, overall score, level of difficulty, and problem number during the each session. The current score represents student score for each level. The overall score represents student score for all levels.

3.3 Teaching Module

Teaching module works as a manager that controls the functionality of the entire system. Through this module, a student can answer questions on the first level of difficulty and if he/she gets 75% mark or more, he/she can move to the next level. But if he/she fails to get the marks, he/she repeats to the exercises of the same difficulty level again.

3.4 User Interface Module

The ITSB tool used for building the current ITS system has an interface that supports two classes of users: teachers and students. When the teacher's log into the system, the teacher can add/modify lessons, exercises, answers, initial information about the student, configure/adjust the color, font name, and size of all buttons, menus, and combo boxes. Therefore, this interface provides the system with the required heftiness and suppleness. A screenshot of the teacher's interface is shown in, Fig 4, Fig 5 and Fig 6.

But when the student logs into the system, he/she can study the lessons, examples, solve the exercises for each lesson. A screenshot of the students interface can be seen in Fig 2, Fig 3, Fig 9, and Fig10**.**

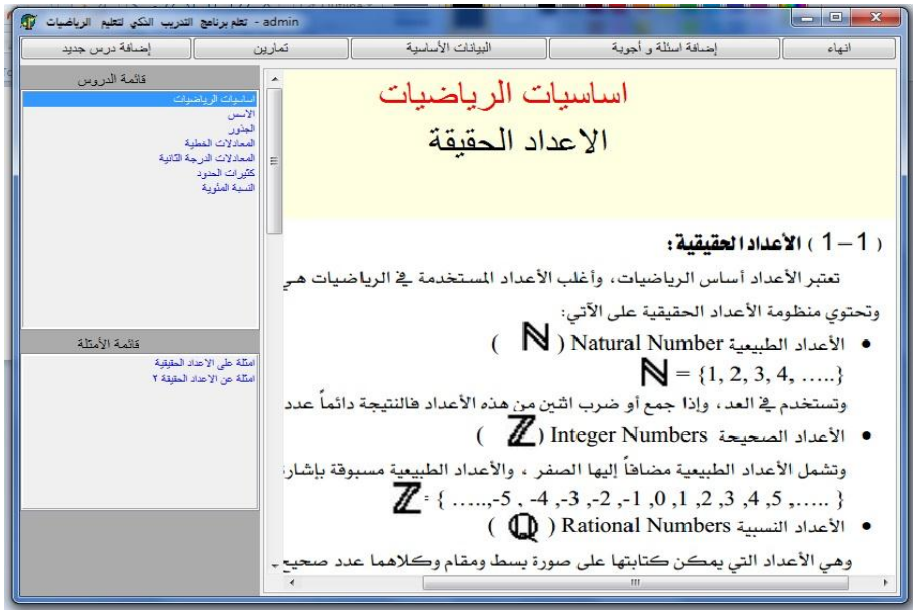

Fig 2: Student lessons form.

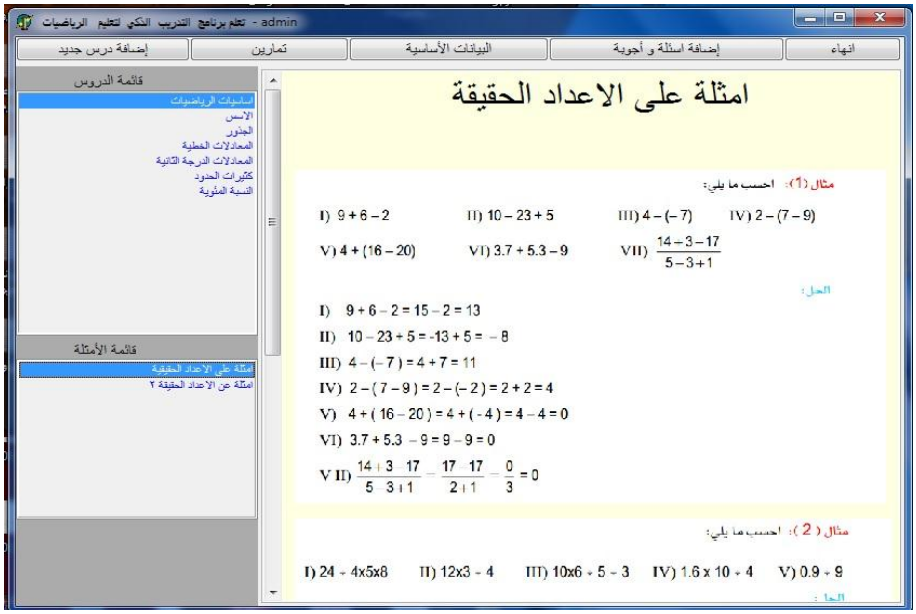

Fig 3: Student lessons and examples form

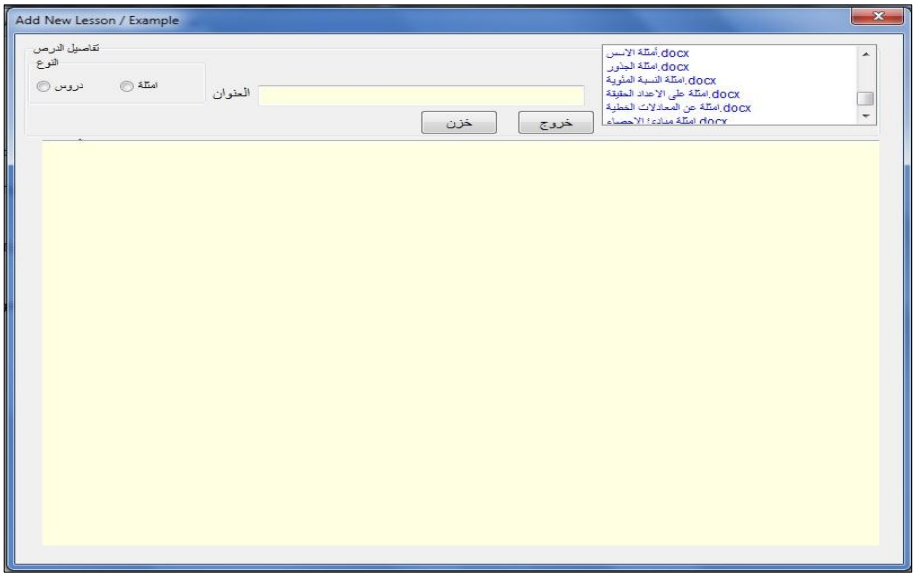

Fig 4: Form for adding Lessons and Examples

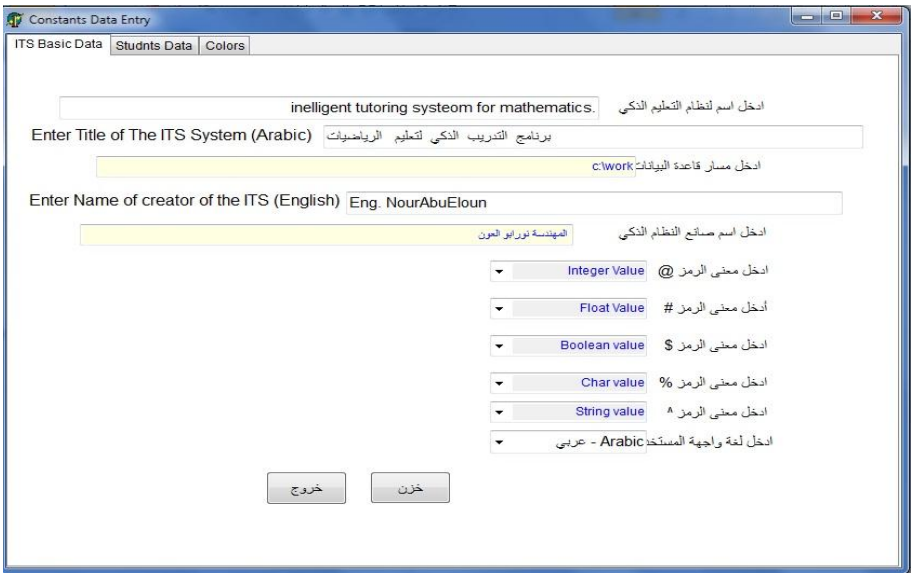

Fig 5: Form for adding constants of the system

Fig 6: Form for adding initial students' information

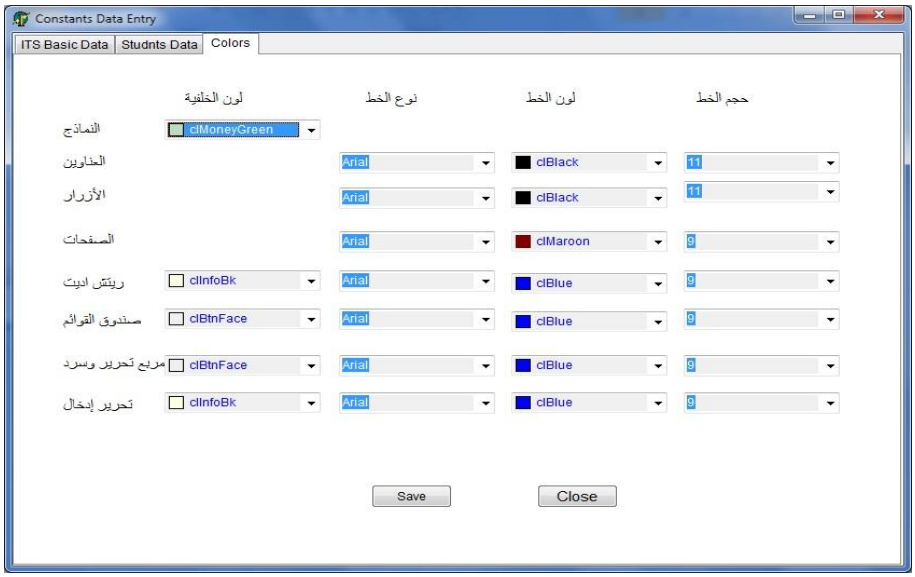

Fig 7: Form for adjusting Fonts of all screens of the system

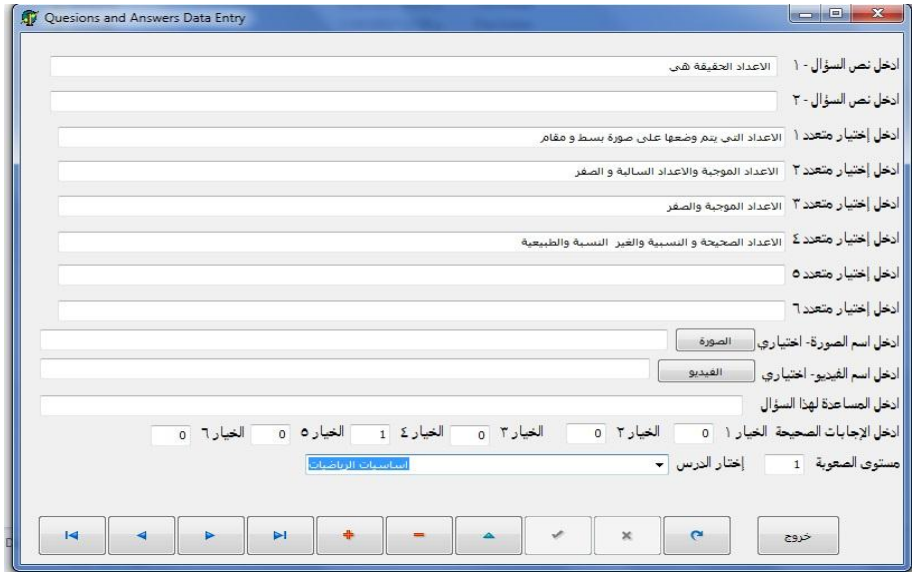

Fig 8: Form for adding questions and answers

Fig 9: Student Exercises form

Fig 10: Student statistics form.

4.Evaluation

We have asked the students who are interested in trying an Intelligent Tutoring System for Mathematics. Almost all students welcomed the idea. After trying the intelligent tutoring system for mathematics, they expressed their felling of the system. They said it is easier for them to study using the new system and it is very efficient in terms of the material and exercises and the difficulty levels of the questions.

5.Conclusion

In this paper, we have designed an Intelligent Tutoring System for teaching Mathematics by using ITSB authoring tool. The system was designed to facilitate the learning Mathematics to overcome the problems students face during their study.

An initial evaluation of the intelligent tutoring system as done using a group of students and the results of the evaluation was encouraging.

References

1. Akkila, A. N. and S. S. Abu Naser (2017). "Teaching the right letter pronunciation in reciting the holy Quran using intelligent tutoring system." International Journal of Advanced Research and Development 2(1): 64-68.
2. Abu Hasanein, H. A. and S. S. Abu Naser (2017). "An intelligent tutoring system for cloud computing.".
3. Abu Naser, S. (2008). "An Agent Based Intelligent Tutoring System For Parameter Passing In Java Programming." Journal of Theoretical & Applied Information Technology 4(7).
4. Abu Naser, S. S. (1999). "Big O Notation for Measuring Expert Systems complexity." Islamic University Journal Gaza 7(1): 57-70.
5. Abu Naser, S. S. (2001). "A comparative study between animated intelligent tutoring systems AITS and video-based intelligent tutoring systems VITS." Al-Aqsa Univ. J 5(1): 72-96.
6. Abu Naser, S. S. (2006). "Intelligent tutoring system for teaching database to sophomore students in Gaza and its effect on their performance." Information Technology Journal 5(5): 916-922.
7. Abu Naser, S. S. (2008). "Developing an intelligent tutoring system for students learning to program in C++." Information Technology Journal 7(7).
8. Abu Naser, S. S. (2008). "Developing visualization tool for teaching AI searching algorithms." Information Technology Journal, Scialert 7(2): 350-355.
9. Abu Naser, S. S. (2012). "A Qualitative Study of LP-ITS: Linear Programming Intelligent Tutoring System." International Journal of Computer Science & Information Technology 4(1): 209.
10. Abu Naser, S. S. and I. S. Zaqout (2016). "Knowledge-based systems that determine the appropriate students major: In the faculty of engineering and information technology." World Wide Journal of Multidisciplinary Research and Development 2(10): 26-34.
11. Abu Naser, S. S. and S. H. ALmursheidi (2016). "A Knowledge Based System for Neck Pain Diagnosis." World Wide Journal of Multidisciplinary Research and Development (WWJMRD) 2(4): 12-18.
12. Abu Naser, S. S., et al. (2008). "A Proposed Expert System For Guiding Freshman Students In Selecting A Major In Al-Azhar University, Gaza." Journal of Theoretical & Applied Information Technology 4(9).
13. Abu Naser, S., et al. (2011). "Human Computer Interaction Design of the LP-ITS: Linear Programming Intelligent Tutoring Systems." International Journal of Artificial Intelligence & Applications (IJAIA) 2(3).
14. AbuEloun, N. N. and S. S. Abu Naser (2017). "Mathematics intelligent tutoring system." International Journal of Advanced Scientific Research 2(1).
15. AbuEl-Reesh, J. Y. and S. S. Abu-Naser (2018). "An Intelligent Tutoring System for Learning Classical Cryptography Algorithms (CCAITS)." International Journal of Academic and Applied Research (IJAAR).
16. Abu-Naser, S. S. (2008). "JEE-Tutor: An Intelligent Tutoring System for Java Expression Evaluation."
17. Abu-Naser, S. S. (2016). "ITSB: An Intelligent Tutoring System Authoring Tool." Journal of Scientific and Engineering Research 3(5): 63-71.
18. Abu-Naser, S., et al. (1995). "& Beattie, GA (2000)." Expert system methodologies and applications-a decade review from: 9-26.
19. Abu-Naser, S., et al. (2011). "An intelligent tutoring system for learning java objects." International Journal of Artificial Intelligence and Applications.
20. Alawar, M. W. and S. S. Abu Naser (2017). "CSS-Tutor: An intelligent tutoring system for CSS and HTML." International Journal of Academic Research and Development 2(1): 94-98.
21. Al-Bastami, B. G. and S. S. Abu Naser (2017). "Design and Development of an Intelligent Tutoring System for C# Language." EUROPEAN ACADEMIC RESEARCH 6(10): 8795.
22. Albatish, I., et al. (2018). "ARDUINO Tutor: An

Intelligent Tutoring System for Training on ARDUINO." International Journal of Engineering and Information Systems (IJEAIS) 2(1): 236-245.
23. Al-Bayed, M. H. and S. S. Abu Naser (2017). "An intelligent tutoring system for health problems related to addiction of video game playing." International Journal of Advanced Scientific Research 2(1): 4-10.
24. Al-Bayed, M. H. and S. S. Abu-Naser (2018). "Intelligent Multi-Language Plagiarism Detection System." International Journal of Academic Information Systems Research (IJAISR) 2(3): 19-34.
25. Aldahdooh, R. and S. S. Abu Naser (2017). "Development and Evaluation of the Oracle Intelligent Tutoring System (OITS)." EUROPEAN ACADEMIC RESEARCH 6(10): 8711-8721.
26. Alhabbash, M. I., et al. (2016). "An Intelligent Tutoring System for Teaching Grammar English Tenses." EUROPEAN ACADEMIC RESEARCH 6(9): 7743-7757.
27. Al-Hanjori, M. M., et al. (2017). "Learning computer networks using intelligent tutoring system." International Journal of Advanced Research and Development(2): 1.
28. Almurshidi, S. H. and S. S. Abu Naser (2017). "Design and Development of Diabetes Intelligent Tutoring System." EUROPEAN ACADEMIC RESEARCH 6(9): 8117-8128.
29. Almurshidi, S. H. and S. S. Abu Naser (2017). "Stomach disease intelligent tutoring system." International Journal of Advanced Research and Development 2(1): 26-30.
30. Al-Nakhal, M. A. and S. S. Abu Naser (2017). "Adaptive Intelligent Tutoring System for learning Computer Theory." EUROPEAN ACADEMIC RESEARCH 6(10): 8770-8782.
31. Anderson, J., et al. (2005). "Adaptation of Problem Presentation and Feedback in an Intelligent Mathematics Tutor." Information Technology Journal.
32. Azaab, S., et al. (2000). "A proposed expert system for selecting exploratory factor analysis procedures." Journal of the College of Education 4(2): 9-26.
33. Baker, J., et al. "& Heller, R.(1996)." Information Visualization. Information Technology Journal 7(2).
34. Baker, J., et al. (1996). "Information Visualization." Information Technology Journal 7(2): pp: 403-404.
35. Buhisi, N. I. and S. S. Abu Naser (2009). "Dynamic programming as a tool of decision supporting." Journal of Applied Sciences Research.
36. Chen, R.-S., et al. (2008). "Evaluating structural equation models with unobservable variables and measurement error." Information Technology Journal.
37. El Agha, M. I., et al. (2018). "SQL Tutor for Novice Students." International Journal of Academic Information Systems Research (IJAISR) 2(2): 1-7.
38. El Haddad, I. A. and S. S. Abu Naser (2017). "ADO-Tutor: Intelligent Tutoring System for leaning ADO. NET." EUROPEAN ACADEMIC RESEARCH 6(10): 8810-8821.
39. Elnajjar, A. E. A. and S. S. Abu Naser (2017). "DES-Tutor: An Intelligent Tutoring System for Teaching DES Information Security Algorithm." International Journal of Advanced Research and Development 2(1): 69-73.
40. Hamed, M. A. and S. S. Abu Naser (2017). "An intelligent tutoring system for teaching the 7 characteristics for living things." International Journal of Advanced Research and Development 2(1): 31-45.
41. Hilles, M. M. and S. S. Abu Naser (2017). "Knowledge-based Intelligent Tutoring System for Teaching Mongo Database." EUROPEAN ACADEMIC RESEARCH 6(10): 8783-8794.
42. Hissi, H. E.-., et al. (2008). "Medical Informatics: Computer Applications in Health Care and Biomedicine." Journal of Artificial Intelligence 3(4).
43. Li, L., et al. (2011). "Hybrid Quantum-inspired genetic algorithm for extracting association rule in data mining." Information Technology Journal 12(4).
44. Mahdi, A. O., et al. (2016). "An intelligent tutoring system for teaching advanced topics in information security." World Wide Journal of Multidisciplinary Research and Development 2(12): 1-9.
45. Naser, S. (2009). "Evaluating the effectiveness of the CPP-Tutor an intelligent tutoring system for students learning to program in C++." Journal of Applied Sciences Research 5(1): 109-114.
46. Ng, S., et al. (2010). "Ad hoc networks based on rough set distance learning method." Information Technology Journal 10(9).
47. Owaied, H. H., et al. (2009). "Using rules to support case-based reasoning for harmonizing melodies." Journal of Applied Sciences 11(14): pp: 31-41.
48. Shaath, M. Z., et al. (2017). "Photoshop (CS6) intelligent tutoring system." International Journal of Academic Research and Development 2(1): 81-87.
49. Sulisel, O., et al. (2005). "Growth and Maturity of Intelligent Tutoring Systems." Information Technology Journal 7(7): 9-37.
50. Khella, R. A. and S. S. Abu-Naser (2018). "An Intelligent Tutoring System for Teaching French." International Journal of Academic Multidisciplinary Research (IJAMR) 2(2): 9-13.
51. Marouf, A., et al. (2018). "An Intelligent Tutoring System for Learning Introduction to Computer Science." International Journal of Academic Multidisciplinary Research (IJAMR) 2(2): 1-8.
52. Mosa, M. J., et al. (2018). "ASP. NET-Tutor: Intelligent Tutoring System for leaning ASP. NET." International Journal of Academic Pedagogical Research (IJAPR) 2(2): 1-8.
53. Qwaider, S. R. and S. S. Abu-Naser (2018). "Excel Intelligent Tutoring System." International Journal of Academic Information Systems Research (IJAISR) 2(2): 8-18.
54. Akkila, A. E.-D. N. and S. S. Abu Naser (2018). ITS-Tutor for Teaching Rules of Tajweed the Holy Quran, Al-Azhar University, Gaza, Palestine.
55. Akkila, A. N. and S. S. Abu-Naser (2018). "Rules of Tajweed the Holy Quran Intelligent Tutoring System." International Journal of Academic Pedagogical Research (IJAPR) 2(3): 7-20.