

## Knowledge-based Intelligent Tutoring System for Teaching Mongo Database

MOHANAD M. HILLES

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

SAMY S. ABU NASER<sup>1</sup>

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

### Abstract:

*Recently, Intelligent Tutoring Systems (ITS) got much attention from researchers even though ITS educational technology began in the late 1960s and ITS is just embryonic from laboratories into the field. In this paper we outline an intelligent tutoring system for teaching basics of the databases system called (MDB). The MDB was built as education system by using the authoring tool (ITSB). MDB contains learning materials as a group of lessons for beginner level which include relational database system and lessons in the process to install and set up a database. MDB system has exams for each level of the Lessons. An evaluation was done to see the effectiveness the MDB among learners and instructors. The outcome of the evaluation was promising.*

**Key words:** Intelligent Tutoring System, Database, Mongo database

### INTRODUCTION

This paper presents a Knowledge-based MDB Intelligent Tutoring System which is a problem-solving environment for

---

<sup>1</sup> Corresponding author: abunaser@alazhar.edu.ps

the learners, in which they can practice intangible database design using the Mongo Database. MDB uses constraint-based modeling to model the domain knowledge and generate learner models rules. The paper describes the architecture of system and its functionality. The MDB system observes actions of students and adapts to their knowledge and learning capabilities. MDB has been evaluated in the context of real teaching environment. We present the results of the two initial evaluations with learners enrolled in the database courses, which show that MDB is an effective ITS system. The learners have loved the adaptability of MDB system and appreciated the learning style[1].

Mongo Database is an open-source document database and leading NoSQL database. The MDB intelligent tutoring system help learners comprehend Mongo Database perceptions required to build and deploy a extremely scalable and performance-oriented database [2].

MDB intelligent tutoring divided the teaching materials to lessons, examples, exercises, and exams. The exercises in DMB system ranges from level 1 for beginners to level 5 for advanced users.

MDB intelligent tutoring system was created using ITSB authoring tool for building ITS system [3]. The ITSB Tutor Authoring Tool allows an instructor to add learning by doing to lessons [ 3 ]. ITSB facilitates the creation of intelligent tutoring systems for student problem solving across a variety of problems [3].

## **LITERATURE REVIEW**

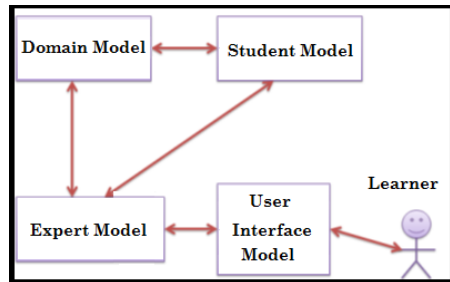
There are a few intelligent tutoring systems that were designed and developed for the purpose of education. These systems help students to learn quickly and increase their self-confidence. Abu-Naser et al. [10] created and designed ITS called JO-Tutor for helping students to learn Java Programming language.

Carter et al. [11] developed an ITS for helping students to learn debugging skills and use case-based reasoning. Abu-Naser. [23] developed an ITS which called CPP-Tutor for helping student to learn C++ Programming Language. Butz et al. [6] created and developed an ITS which called Bits for helping students to learn C++ Programming Language. Mahmoud et al. [9] developed ITS called AG\_TUTOR for helping Arabic language students to learn grammar of the Arabic language. Virvou et al. [13] developed an ITS for helping English Language students to learn the Passive Voice of English Language. Hennessy et al. [5] developed an ITS for helping students who between 8-to12-year-olds to learn Primary Mathematics. Other ITS like: A comparative study between Animated Intelligent Tutoring Systems (AITS) and Video-based Intelligent Tutoring Systems (VITS) [5], An agent based ITS for Parameter Passing In Java Programming[26], Java Expression Evaluation [22], Linear Programming[15,19], effectiveness of e-learning[7], computer aided instruction[18], effectiveness of the CPP-Tutor[12], teaching AI searching algorithms[24], teaching database to sophomore students in Gaza[21], and Predicting learners performance using NT and ITS [17], design and development of diabetes ITS[14 ], ITS teaching grammar English tenses [8 ], ITS for teaching advanced topics in information security[28], development and evaluation of the Oracle Intelligent Tutoring System (OITS)[29], ITS for learning Computer Theory[30], e-learning system[20,16,27], an Intelligent Tutoring System for Entity Relationship Modeling[ 25], an Intelligent Tutoring System Approach to Teaching Primary Mathematics[4].

## **SYSTEM ARCHITECTURE**

This tool contains four modules: domain model, teaching model, student model and user interfaces. The first model arranges and organizes the material in chapters or lessons. The second model works as control engine. The third model provides the

system with all required information so it can adapt itself to the student. The last model has two sections - one for the student and the other for the teacher as shown in Fig 1.



**Fig 1: Overall MDB ITS System Architecture.**

## **DOMAIN MODEL ARCHITECTURE**

This model deals with the chapters in the course of designed for Software professionals who are willing to learn Mongo Database in simple and easy steps. It will shed light on Mongo Database concepts.

Mongo Database is a cross-platform, document oriented database that provides, high performance, high availability, and easy scalability. Mongo Database works on concept of collection and document. System offers a series of lessons from one to twenty-five your knowledge about databases to become the student is able to understand and accommodate the databases in a smart way and access to the stage where the student can work for the deployment and use of data sitting with one of the languages of programming.

## **STUDENT MODEL**

A new student account must be created to have a profile where it allows the student to study course materials and answer exercises. The profile has information about the student such as session date, student name, student number, current score,

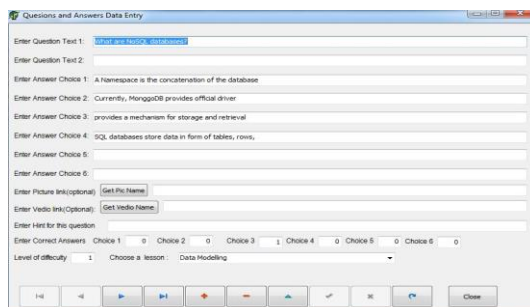
overall score, level of difficulty, and problem number during the each session. The current score represents student score for each level of a lesson. The overall score represents student score for all levels of a lesson.

## EXPERT MODEL

Expert system module or Teaching module works as a coordinator that controls the functionality of the whole system. Through this model, a student can answer questions on the first level and if he/she gets 70% mark or more, he/she can move to the second level. But if he/she fails to get the marks, he/she repeats to the examination at the same level.

## USER INTERFACE MODEL

This tool has one interface; it supports two classes of users, teachers, and students. When the teacher's log in the system, the teacher can add lessons, exercises, answers, initial information about the student, configure and adjust the color, font name, and size of all buttons, menus, comboboxes etc. Thus, this interface provides the system with the required robustness and flexibility. A screenshot of the teacher's interface is shown in Fig 2, to Fig 6.



**Fig 2: Form for adding questions and answers**

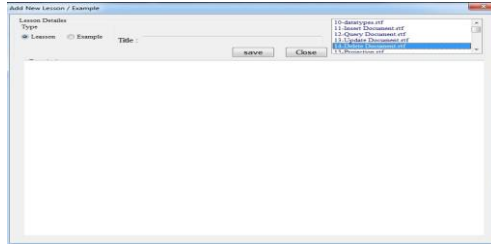


Fig. 3: Form for adding Lessons and Examples

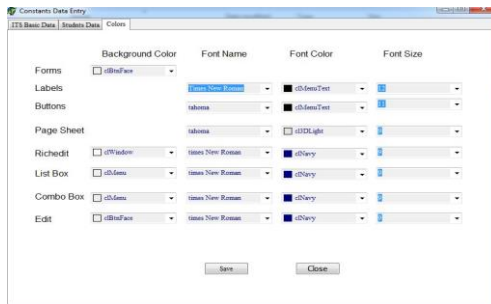


Fig. 4: Form for adjusting Fonts of all screens of the system

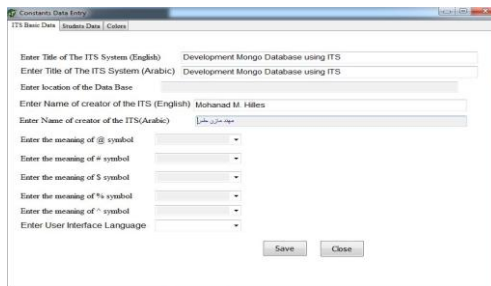


Fig. 5: Form for adding constants of the system

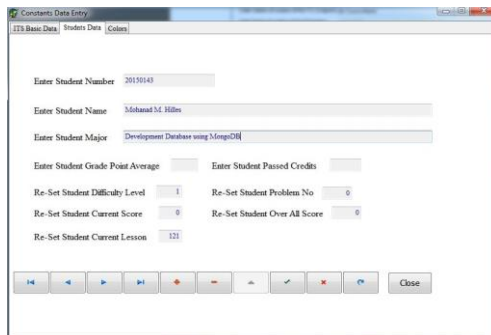
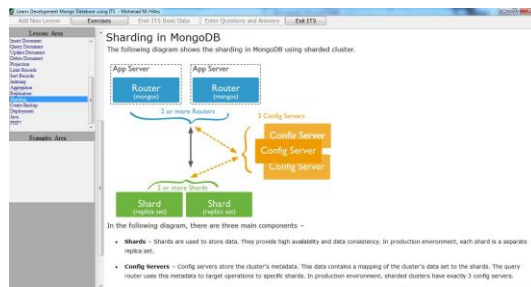


Fig. 6: Form for adding initial students' information

When the student log into the system, he/she will be able to see the lessons, examples and questions.

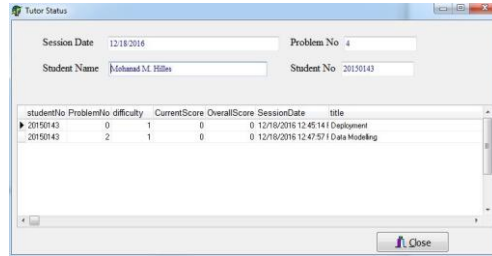
The lessons will appear in the form with the name lessons area and the example for each lesson will appear under the lessons called example area. When the student clicks on Exercises button student will be able to see Questions screen. Thus, be able to answer these questions. To ensure they are correct answers the student must click on check button. When the student wants to see his performance must click on a stats button as seen in Fig 7 to Fig 9.



**Fig. 7: Student lessons and examples form**

The screenshot shows a window titled 'Choose One Lesson Data Modelling'. It contains a 'New Problem' button, a 'Check' button, a 'Solution' button, a 'Stats' button, a 'Help' button, and a 'Close' button. Below the buttons, it displays 'Problem # 2' and 'Difficulty Level # 1'. The main area contains the question: 'Which language is MongoDB written in?'. There are four radio button options: Python, JAVA, C#, and C++.

**Fig 8: Student Exercises form.**



The screenshot shows a window titled "Tutor Status" with a light blue header. It contains several input fields and a table. The fields are: "Session Date" (12/18/2016), "Problem No." (4), "Student Name" (Mohanad M. Hilles), and "Student No." (20150143). Below these is a table with the following data:

studentNo	ProblemNo	difficulty	CurrentScore	OverallScore	SessionDate	title
20150143	0	1	0	0	12/18/2016 12:45:14.1	Deployment
20150143	2	1	0	0	12/18/2016 12:47:37.1	Data Modeling

At the bottom right of the window is a "Close" button.

**Fig. 9: Student statistics form.**

## EVALUATION

We have evaluated the MDB Intelligent Tutoring System for teaching Mongo Database by presenting the system to a group of teachers with interest in teaching Database management system and a group of students in Al-Azhar University taken the course. We asked both groups to evaluate the MDB system. Then we asked them to fill a survey about the MDB system. The survey consisted of questions concerning characteristics of MDB system, quality of the material, quality of MDB design and quality of the user interface. The result of the evaluations by teachers and students were very acceptable.

## CONCLUSION

In this paper, we have designed a knowledge based Intelligent Tutoring System called MDB for teaching Mongo Database by using ITSB authoring tool. The system was designed to facilitate learning Mongo Database. MDB System architecture was outlined clearly. We conducted an evaluation of the MDB system by a group of teachers and students and the results were more than acceptable.



## REFERENCES

1. [https://hub.docker.com/\\_/mongo/](https://hub.docker.com/_/mongo/) visited 1-12-2016.
2. <http://db-engines.com/en/system/MongoDB> last visited 2-12-2016.
3. Abu Naser, S. S. (2016). ITSB: An Intelligent Tutoring System Authoring Tool. *Journal of Scientific and Engineering Research*, 3(5), 63-71.
4. Hennessy, Sara, Tim O'Shea, Rick Evertsz, and Ann Floyd. "An Intelligent Tutoring System Approach to Teaching Primary Mathematics." *Educational Studies in Mathematics* 20, no. 3 (1989): 273-92. <http://www.jstor.org/stable/3482472>.
5. Abu Naser, S.S. (2001). A comparative study between Animated Intelligent Tutoring Systems (AITS) and Video-based Intelligent Tutoring Systems (VITS), *Al-Aqsa University Journal*,5,1 Part,1.
6. C. J. Butz, S. Hua, R. B. Maguire, "A web-based Bayesian intelligent tutoring system for computer programming", *Web Intelligence and Agent Systems*, Vol.4, No.1, pp.77-97 · January 2006.
7. Abu-Naser, S., Al-Masri, A., Abu Sultan, Y., & Zaqout, I. (2011). A prototype decision support system for optimizing the effectiveness of e-learning in educational institutions, *International Journal of Data Mining & Knowledge Management Process (IJDKP)*,1, 1-13.
8. Alhabbash, M. I., Mahdi, A. O., & Abu Naser, S.S. (2016). An Intelligent Tutoring System for Teaching Grammar English Tenses, *European Academic Research*, 4(9).
9. Mona H. Mahmoud, Sanaa H. Abo El-Hamayed, "An Intelligent Tutoring System for Teaching the Grammar of the Arabic Language, *Journal of Electrical Systems and Information Technology*", 2016 , Available: <http://dx.doi.org/10.1016/j.jesit.2016.04.001>.

10. Abu-Naser, S., Ahmed, A., Al-Masri, N., Deeb, A., Moshtaha, E., & AbuLamdy, M. (2011). An Intelligent Tutoring System for Learning Java Objects, *International Journal of Artificial Intelligence and Applications (IJAIA)*, 2(2).
11. Carter, Elizabeth and Blank, Glenn D, "An Intelligent Tutoring System to Teach Debugging", *Artificial Intelligence in Education: 16th International Conference, AIED 2013, Memphis, TN, USA, July 9-13, 2013*.
12. 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, <http://www.aensiweb.com/JASR/>.
13. Maria Virvou, Dimitris Maras, Victoria Tsiriga, "Student Modeling in an Intelligent Tutoring System for the Passive Voice of English Language", *Educational Technology & Society*, 3(4), 2000.
14. Almurshidi, S. H., & Abu Naser, S. S. (2016). Design and Development of Diabetes Intelligent Tutoring System, *European Academic Research*, 4(9).
15. Naser, S. S. A. (2012). A Qualitative Study of LP-ITS: Linear Programming Intelligent Tutoring System, *International Journal of Computer Science & Information Technology*, 4(1),209-220, Academy & Industry Research Collaboration Center (AIRCC)
16. Mohamed Bouker, and Mohamed Arteimi, "Utilizing learning styles for effective web-based learning" , MSc thesis, Academy of Graduate studies-Libya, 2006.
17. Naser, S. S. A. (2012). Predicting learners performance using artificial neural networks in linear programming intelligent tutoring system, *International Journal of Artificial Intelligence & Applications*, Academy &

- Industry Research Collaboration Center (AIRCC), 3,2, 65-73.
18. Naser, S.S A., & Sulisel, O. (2000). The effect of using computer aided instruction on performance of 10th grade biology in Gaza.
  19. Naser, S. A., Ahmed, A., Al-Masri, N., & Abu Sultan, Y. (2011). Human Computer Interaction Design of the LP-ITS: Linear Programming Intelligent Tutoring Systems, *International Journal of Artificial Intelligence & Applications (IJAIA)*, 2(3),60-70.
  20. Chrstan Wolf, "I-Weaver: Towards learning style-base e-learning in computer science education", proceedings of the Australian Computing Education Conference, 2003.
  21. Naser, S. S. A. (2006). Intelligent tutoring system for teaching database to sophomore students in Gaza and its effect on their performance, *Information Technology Journal, Scialert*,5(5),916-922.
  22. Abu Naser, S. (2008). JEE-Tutor: An Intelligent Tutoring System for Java Expression Evaluation, *Information Technology Journal, Scialert* , 7(3),528-532.
  23. Naser, S.S. A. (2008). Developing an intelligent tutoring system for students learning to program in C++, *Information Technology Journal, Scialert*,7(7),1055-1060.
  24. Naser, S.S.A. (2008). Developing visualization tool for teaching AI searching algorithms, *Information Technology Journal, Scialert*,7(2), 350-355.
  25. Pramuditha Suraweera & Antonija Mitrovic. KERMIT, An Intelligent Tutoring System for Entity Relationship Modelling. Private Bag 4800, Christchurch, New Zealand
  26. Naser, S. A. (2008). An Agent Based Intelligent Tutoring System For Parameter Passing In Java Programming, *Journal of Theoretical & Applied Information Technology*, 4,7.

27. Mahmoud, A. Y., Barakat, M. S., & Ajjour, M. J. (2016). Design And Development Of ELearning University System. (*Journal of Multidisciplinary Engineering Science Studies (JMESS)*), 2(Issue 5, May - 2016), 498-504.
28. Mahdi, A. O., Alhabbash, M. I., & Abu Naser, S. S. (2016). An intelligent tutoring system for teaching advanced topics in information security, *WWJMRD*, 2(12), 1-9.
29. ALDahdooh, R., & Abu Naser, S.S. (2017). Development and Evaluation of the Oracle Intelligent Tutoring System (OITS), *European Academic Research*, 4(10).
30. Al-Nakhal M.A., & Abu Naser, S. S. (2017). An Intelligent Tutoring System for learning Computer Theory, *European Academic Research*, 4(10).
31. Alnajjar, M., & Naser S.S.A. (2015). Improving Quality Of Feedback Mechanism In Un By Using Data Mining Techniques, *International Journal of Soft Computing, Mathematics and Control*, 4(2).
32. Abu Naser, S. (1993). A methodology for expert systems testing and debugging, North Dakota State University, USA 1, 1-130.
33. Naser, S.S.A. (1999). Big O Notation for Measuring Expert Systems complexity, *Islamic University Journal - Gaza* 7 (1), 77-57.