Implementation of a course in "artificial intelligence and expert systems" on top of a distance-learning platform

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Abstract

In the current paper, presented is an implementation of a distance-learning course on the subject of "Artificial Intelligence and Expert Systems" for students pursuing bachelor's degree in the field of "Informatics and Information Technologies". The distance-learning platform used by the university is based on Moodle. The teaching materials are in the form of lectures, promoting discussions. For verification of the knowledge gained by the students, tests and analysis of the results are performed.

Keywords: distance learning platform, distance learning, course, test, discipline

1 Introduction

Distance-learning is becoming one of the most popular ways for offering courses in higher education institutions today [3, 4].

Experience shows that courses developed under the project BG051PO001-4.3.04-0020 "Modernization of the Distance Learning Center in *Konstantin Preslavsky* University of Shumen using electronic teaching methods" are well accepted among students and help increasing their results [6].

This is an introductory course in the field of artificial intelligence systems, which is thought under the "Informatics and Information Technologies" major in the university [5, 6]. For its implementation, a platform is used based on a Learning Management System (LMS) – Moodle [8].

2 Distance-learning course internals

The course content is divided into two modules. In the first one are included: basic terminology in artificial intelligence, intelligent agents, algorithms for solving tasks using unsupervised and heuristic search, tasks for satisfying limitations, modeling of games and planning.

The second module describes the models for representing knowledge, expert systems, methods of communication, social models: neural networks and genetic algorithms and tools for creating artificial intelligence systems.

The content is in line with the standards set by the top education institutions in the field of artificial intelligence [5]. Some of the study materials used are the books of P. Jackson and S. Russell [9], D. Luger [7], I. Bratko[1] and others, cited at the end of the current paper [2, 10, 11].

The home page of the course presents its structure (Figure 1) and contains a brief introduction of the content along with the keywords and terms.

The course can be found on the university's distance-learning center's page [5] and is delivered to both full-time and part-time students.

FIGURE 1 Introduction to the course "Artificial Intelligence and expert systems"

It is worthy to note the importance of carefully choosing the keywords, thus allowing the students to quickly get into the terminology of the subject and clearly understand the content of the course. This is a guarantee for getting their attention and successfully adopting new knowledge.

The main part of the course is presented in the form of lectures, backed up with examples in various forms – graphics, text, etc. (Figure 2).
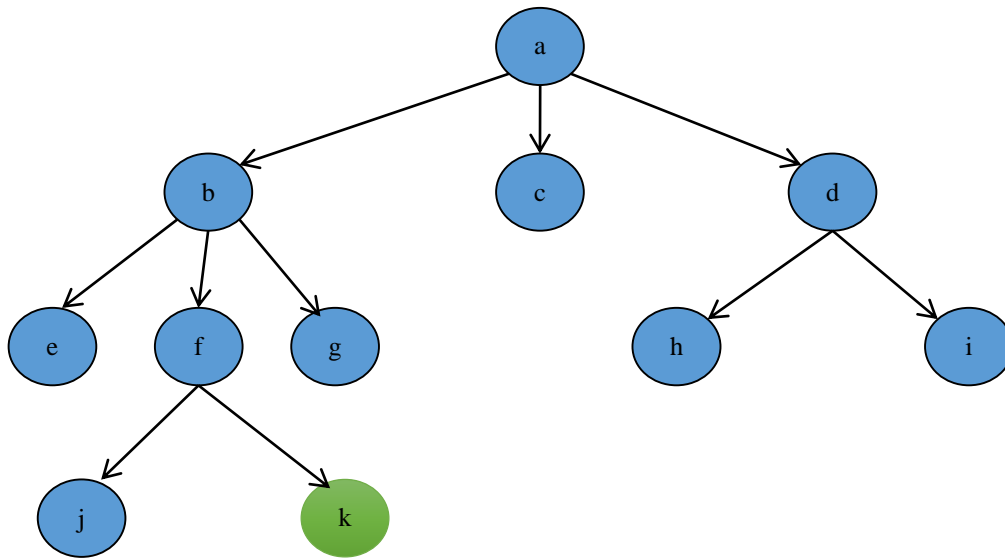
FIGURE 2 Part of the lecture course

One example for state space graph State1
State₁= [N₁, A₁, S₁,G₁],

N_1 = [a,b,c,d,e,f,g,h,I,j,k],
A_1 = [a,b; a,c; a,d; d,h; d,i; b,e; b,f; b,g; f,j; f,k],
S_1 = [a],
G_1 = [k],

where operators (arcs) are separated by - ; (semicolon).

Lectures are constructed in a way that they contain the information in a clear and concise manner. Important element for the good understanding are the examples given, that present possible interpretations of the discussed problems.

The test for assessing student's knowledge consists of 50 questions related to various parts of the course content. The platform allows randomizing the order of appearance of the questions. This provides relatively objective assessment of the student's knowledge. Below are shown some of the results from a test that has been conducted.

12 students have participated in the test, each having 51 answer attempts and maximum time of 60 minutes.

		Име / Фамилия	Идентификатор	Започнат	Завършен	Продължил	Оценяване/50	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
☐	👤	Петър Енев	1250136101	1 декември 2014, 09:48	1 декември 2014, 10:34	45 мин. 31 сек	29	--/1	--/1	--/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1	1/1
☐	👤	Нуртен Салиева	1250136102	1 декември 2014, 09:47	1 декември 2014, 10:36	49 мин. 1 сек	31	--/1	--/1	--/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1	1/1
☐	👤	Илхан Юсеин	1250136103	1 декември 2014, 09:49	1 декември 2014, 10:35	46 мин.	32	--/1	--/1	--/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1	1/1
☐	👤	Мехмед Асан	1250136106	1 декември 2014, 09:49	1 декември 2014, 10:35	46 мин. 5 сек	36	--/1	--/1	--/1	1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1
☐	👤	Мая Георгиева	1250136109	1 декември 2014, 09:46	1 декември 2014, 10:36	49 мин. 56 сек	30	--/1	--/1	--/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1	1/1
☐	👤	Васко Михайлов	1250136110	1 декември 2014, 09:49	1 декември 2014, 10:35	45 мин. 36 сек	33	--/1	--/1	--/1	1/1	1/1	1/1	0/1	0/1	1/1	1/1	0/1	1/1
☐	👤	Камен Петков	1250136117	1 декември 2014, 09:48	1 декември 2014, 10:39	51 мин. 27 сек	29	--/1	--/1	--/1	1/1	1/1	1/1	1/1	1/1	0/1	0/1	1/1	0/1

FIGURE 3 The results of the final test of the course

The system provides possibilities for detailed analysis of the answers: from each participant and from the group as a whole, thus allowing to identify common mistakes and weaknesses in the teaching process. In the table below is shown an example of analytical data for one of the test questions for a group that has taken it.

TABLE 1 Part of the table of elements of the analysis

Question	Answers	Score	Number of responses / total number of attempts	% answers
What are meta-knowledge?	Knowledge about relationships between objects and facts	0	13 / 51	35%
	Knowledge for knowledge itself	1	30 / 51	59%
	Knowledge of objects and facts	0	3 / 51	6%

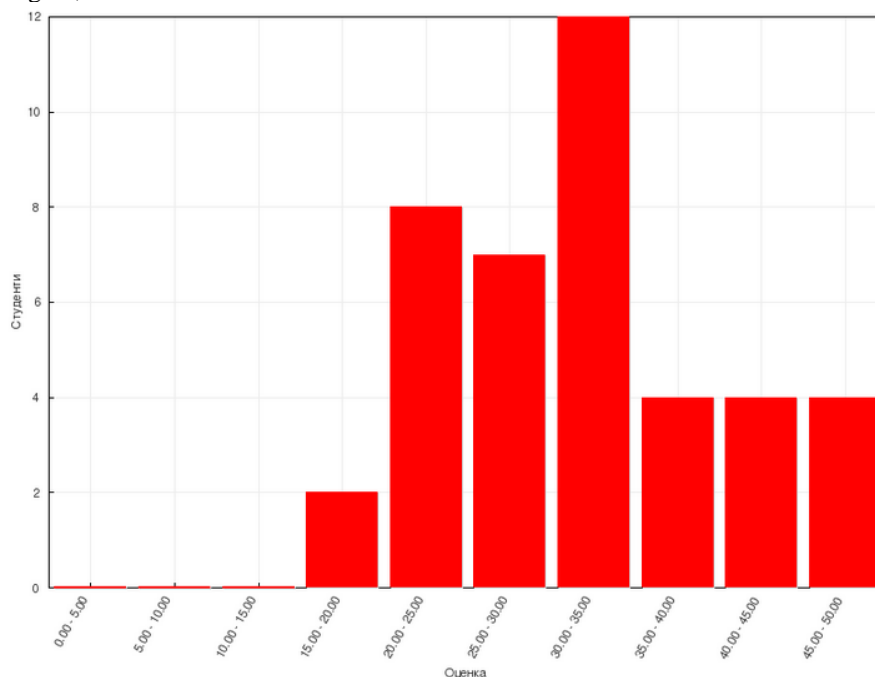On the next figure, statistics is shown for the correct answers of 12 students that have taken the test.

FIGURE 5 Analytical data on the results of the final test

The analysis allows assessing the results of the teaching process for a given subject and identifying ways for improvement, related both to the content and to the way it is taught.

The capabilities of the distance-learning platform are standard and allow importing and exporting data from external files as well as using graphics, sound and animations for most appropriate representation of key indicators used when teaching and examination.

3 Conclusion

The presented realization of a course for distance-learning does not pretend for uniqueness. The results prove the effectiveness of the chosen methodology of teaching and can be used for the development of a more complex distance learning system in the university.

The course can be of use for full-time or part-time students with various majors, pursuing a degree in a related field. It can be of interest to any specialty that need to provide fundamentals in the field of artificial intelligence.

As a direction for improvement can be pointed better adapting the course materials and content for mobile devices. This could help increase the number of targeted students and their interest in the field.

Acknowledgments

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