BABEŞ-BOLYAI UNIVERSITY
FACULTY OF ECONOMICAL SCIENCES AND BUSINESS MANAGEMENT
DEPARTMENT OF BUSINESS INFORMATICS

CONTRIBUTIONS TO THE DEVELOPMENT OF INFORMATION TECHNOLOGIES USED IN THE EDUCATIONAL PROCESS

~ SUMMARY ~

Scientific coordinator:
Prof. Nicolae Tomai, PhD.

PhD Candidate: Ciprian Ioan Cucu

2011

Thesis table of contents:

INTRODUCTION

RESEARCH MOTIVATION

FIELD OF RESEARCH
PRACTICAL ASPECTS, ECONOMICAL MOTIVATION

1 THE EVOLUTION AND IMPACT OF EDUCATIONAL TECHNOLOGIES ON THE EDUCATIONAL PROCESS

1.1 DTHE DEVELOPMENT OF EDUCATIONAL TECHNOLOGIES. RESEARCH AREAS.
1.2 ELEMENTS REGARDING E-LEARNING SYSTEMS CLASSIFICATION
1.3 SUMMARY

2 INTELLIGENT TUTORING SYSTEMS: HYPOTESIS, TYPOLOGIES AND MODELS

2.1 AUTOMATION OF EVALUATION AND LEARNING PROCESSES
2.2 HYPOTHESIS REGARDING THE DEVELOPMENT OF ITS
2.3 DEFINITION AND CLASSIFICATION OF ITS
2.4 ARHITECTURES, MODELS AND TECHNOLOGIES USED IN ITS
2.5 SUMMARY

3 DEVELOPMENT OF SOCIALS SKILLS THROUGH INTELLIGENT SYSTEMS

3.1 SOCIAL SKILLS: DEFINITION, IMPORTANCE, LEARNING
3.2 PARTICULARITIES REGARDING THE COMPUTERIZED APPROACH OF LEARNING IN THE FIELD OF SOCIAL SKILLS
3.3 REPRESENTATION AND ANALISYS OF HUMAN– COMPUTER COMMUNICATION
3.4 SUMMARY

4 DEVELOPMENT AND IMPLEMENTATION OF AN ARCHITECTURE FOR A SOCIAL SKILLS ITS

4.1 DEFINITION OF RESEARCH PROBLEMS
4.2 THE „CONVERSATIONAL AGENTS" APPROACH
4.3 THE PROPOSED MODEL, GENERAL OVERVIEW
4.4 COMPONENTS OF THE SYSTEM
4.5 BENEFITS AND LIMITATIONS OF THE PROPOSED MODEL
4.6 IMPLEMENTATION: GENERAL OVERVIEW
4.7 IMPLEMENTATION OF THE STUDENT / TUTOR MODULE
4.8 IMPLEMENTATION OF THE EXPERT MODULE
4.9 THE USER INTERFACE
4.10 AUTHORING TOOLS
4.11 UTILIZED TECHNOLOGIES
4.12 SUMMARY

5 CASE STUDIES AND EMPIRICAL RESULTS

5.1 CASE STUDY: „FIRST CUSTOMER MEETING" SCENARIO
5.2 CASE STUDY: „TWO TOWERS" SCENARIO
5.3 CASE STUDY: „THE CREDIT" SCENARIO
5.4 INITIAL TESTING: RESULTS, OBSERVATIONS
5.5 SUMMARY

6 CONCLUSIONS, FUTURE WORK

APPENDIX 1: LIST OF TERMS

APPENDIX 2: LIST OF IMAGES

APPENDIX 3: LIST OF TABLES

REFERENCES

Keywords:

E-learning, Intelligent Tutoring Systems, Social skills

Theses summary:

INTRODUCTION, MOTIVATION

The current paper is localized in a very specific area of the general field of educational technologies, researching the potential use of Intelligent Tutoring Systems (ITS) in the analysis and development of individuals' social skills. The proposed model has been developed in collaboration with the Computer Science Department of the Zurich University, Switzerland and has been implemented in a system that simulates social interactions from the perspective of project management scenarios.

Globalization is a phenomenon that transforms the world economical system even to the level of microeconomics. The new model, that involves an important rethinking of the economical processes, is influenced by the increase of importance given to knowledge (and information in general), proposing a "new economy" built on development of new technologies and on an increased emphasis on interdisciplinary activities (Moore, 2007).

The present research is part of this trend by proposing and information system aimed at increasing the efficiency of organizations through utilizing technological developments in the area of human resources training. The main hypotheses in this regard, are:

1. Human resources strategies and policies, which see the permanent instruction of the employees as a central point, support the organizations' performance.
2. The employees' social skills are directly linked to their performances and should be included in training programs to reach maximum benefits.
1. There is a strong trend to implement e-learning systems in companies to complement or even replace traditional instruction processes.

1. THE EVOLUTION AND IMPACT OF EDUCATIONAL TECHNOLOGIES ON THE EDUCATIONAL PROCESS

Starting from simple tests applied with the help of the computer, E-learning systems have become more complex, implementing functionalities such as content management, synchronous and asynchronous communication and developing interactive systems based on entertainment (such as serious games).

Developments of models and theories of artificial intelligence led to their use in e-learning, to customize the users' experience by adapting the content or delivery to the users. The ideal is to attain the same educational long term effects as through 1:1 tutoring with a human expert tutor.

2. INTELLIGENT TUTORING SYSTEMS: HYPOTESIS, TYPOLOGIES AND MODELS

ITS have offered a wide range of positive results in different fields from mathematics to medicine. This chapter defines the concept of ITS, shows its underlying hypotheses, give a classification of ITS and in the end gives an overview of the main architectures, models and technologies used.

This chapter also provides details regarding the design and implementation of such systems and gives examples of already built systems showing their results and limitations.

3 DEVELOPMENT OF SOCIALS SKILLS THROUGH INTELLIGENT SYSTEMS

Learning social skills is achieved by specific psychology methods such as role-playing, that allows individuals to "experiment the desired behavior in a controlled environment where they can be monitored and can receive reinforcing or corrective feedback". (Segrin & Givertz, 2003).

The chapter presents a series of particularities in using ITS in the field of social skills, in comparison to using ITS in problem-solving type fields.

Also an overview of human – computer communication is provided that proposes a systematic approach on the transformations done in this process.

4. DEVELOPMENT AND IMPLEMENTATION OF AN ARCHITECTURE FOR A SOCIAL SKILLS ITS

This is the main chapter of the thesis, showing the proposed model for social skills' tutoring and its implementation.

Current research (Johnson & Valente, 2009; Hill et al., 2006; Mateas & Stern, 2003) views the issue of computerized analysis of human – computer communication through a "conversational agents" paradigm, implementing the context of communication and its objectives at the level of the simulated characters. This allows for a believable behavior of the simulated characters but implies a high risk of error due to the lack of steps through which a certain state is achieved. This approach also implies an increased design and implementation effort, due to the need to treat every simulated character distinctly according to its scenario.

The proposed model approaches the issue by providing a monitoring system for all user-system interactions and finding predefined patterns of desired / undesired behavior in this sequence of events.

This model is considered to be the main contribution of the current research, showing the insufficiency of current models for social skills development and proposing a different approach based on monitoring events and behavior pattern definition.

This chapter also presents the implementation of the model in a system called the "PM Game", giving an overview of the technologies used as well as detailed information regarding the customizations done to the typical expert model (secondary contributions) to allow the matching of patterns in the user – system interactions.

5 CASE STUDIES AND EMPIRICAL RESULTS

To evaluate the benefits of the proposed model, as well as its limitations, three case studies are presented as well as an initial user study.

The case studies show three distinct scenarios, the first simulating a customer meeting, the second simulating a manager – employee discussion and the third dealing with a discussion regarding a bank loan. Each case study has its own educational objectives which are triggered by specific rules. The main content of each case study is the dialogue between the user and the system, showing the response of the simulated characters and the feedback given to the user by the system.

The initial user study has been performed on 20 students from the University of Zurich, split into two groups: a control group that has not received any feedback from the system, and a test group that received feedback from the system as they

progressed through the scenarios. Each user has been a first user of the system and each user has been given a 15 minutes training of technical aspects of the system prior to the test. A secondary test occurred one week from the first one, to provide further information.

The test had a series of limitations such as the small dataset, yet the obtained data still allowed for some conclusions such as:

- there are users that ignore the feedback offered by the system, focusing on the dialogue;
- beside exceptional cases, users react immediately and positively to the feedback received from the system;
- repeated use of the system increases attention to the feedback as well as the reaction to it;
- there is a need to implement some proactive hints to point the users' in the right direction when they no longer progress; without such hints, users tend to "explore" the interaction options to get ideas about how to proceed, which is not desired.

PERSONAL CONTRIBUTIONS

The current research proposes a model for automatic analysis of human-computer communication, which has been implemented in an Intelligent Tutoring System aimed to contribute to the increase of organizations' efficiency through development of their human resources in the area of social skills (such as leadership, teamwork, communication).

Intelligent Tutoring Systems have been used with remarkable results in traditional fields such as mathematics, programming or medicine, though the field of social skills presents a series of particularities that imply the necessity of a different approach. The proposed approach is based on identifying behavior patterns in sequences of human-system interactions in order to guide the users through reinforcement or corrective feedback.

The proposed model, considered being the main contribution, as well as its implementation has been realized in collaboration with the Department of Informatics from the University of Zurich, Switzerland, following a nine month research grant that helped focus and complete previous personal research in the field of educational technologies.

The secondary contribution is represented by the customizations performed to the expert model in order to satisfy the requirements of the analysis model proposed, as well as proposing a method for representing educational objectives in the system,

objectives that allow the actual feedback from the system, to help develop the users' skills.

Other contributions are represented by reviews done in the field of e-learning in general (chapter 1) and in the field of Intelligent Tutoring Systems (chapter 2), as well as an overview of the transformations needed for processing human-computer communication and identifying the particularities of social skills development by a computerized system (chapter 3).

DISSEMINATION OF RESULTS

The research activity in the field of educational technologies and in particular in the field of ITS used in social skills has so far been acknowledged by a series of international publications, from which two are indexed in ISI Proceedings, three are indexed in other international databases and two are in the process of indexation:

Cucu, C.I., (2011a). Towards an Intelligent Tutor for Social Skills. In Proceedings of IECT2011 – International Educational Technology Conference, 2011, Istanbul, Turkey. (în curs de indexare)

Cucu, C., I. (2011b). Building an Intelligent Tutor for Social Skills: Lessons Learned. In Proceedings of the 16th International Business Information Management Association (IBIMA) Conference, Kuala Lumpur, Malaysia. (în curs de indexare)

Cucu, C., I.; Cucu, I. (2010), Considerations on using "edutainment" for leadership and communication skills evaluation. In Review of Management and Economic Engineering, Volume 9, No. 1 (35). (BDI)

Cucu, C.; Cucu I. (2009). Information Technologies in Education: a Summary. In Proceedings of the16th International Economic Conference (IECS 2009), "Industrial revolutions, from the globalization and post-globalization perspective", Sibiu, 2009. (ISI)

Cucu, C.; Joldes, R.; Olteanu, E. (2009). Developing a software application for student evaluation and monitoring. In Proceedings of "ICTAMI 2009", Alba Iulia, Romania, 2009. (BDI)

Cucu, C.; Cristescu, M.; Cacovean, L.; Cristescu, I. (2009). Considerations on Using Knowledge Management Principles in the Development of E-learning Platforms. In Proceedings of the 4th Int. Conference on Knowledge Management:Projects, Systems and Technologies, București, Romania. (BDI)