Preface

The rapid development of the contemporary new Web technologies and methods made online education increasingly accessible, open and adaptable; allowed new techniques, approaches and models to emerge and reasoned the revolution in the digital knowledge age that enabled greater and faster human (social) communication and collaboration and led to fundamentally new forms of economic activity that produced the knowledge economy and required changes in education. The increasing need for quality education requires expertise which is continually being developed. The integration of e-learning (short form of Electronic Learning) into the education system is viewed as one way to meet this growing need for high-quality education.

This monograph brings a result of our attempts to represent the most important aspects of current theory and practice in emergent e-learning approaches, systems and environments. As a specific case study we will present in details Web-based tutoring system we have been developing for last several years. This system incorporates a lot of contemporary techniques and methods from e-learning and technology-enhanced learning areas.

The material covered in the monograph is addressed to students, teachers, researchers and practitioners in the areas of e-learning, recommender systems (RS), semantic Web and machine learning.

This monograph is organized into five major parts. Part I: *Preliminaries*, which includes Chap. 1 of the monograph—*Introduction*, introduces the motivation and objectives studied in the subsequently presented research, and presents major standards and specifications in e-learning.

Part II: *E-learning Systems Personalization*, which consists of Chaps. 2–7, provides an overview of personalization techniques in e-learning systems. Chapter 2—*Personalisation and Adaptation in E-Learning Systems* shows the most popular adaptation forms of educational materials to learners. Chapter 3—*Personalisation Based on Learning Styles* presents the bases of electronic learning techniques for personalization of learning process based on individual learning styles and the possibilities of their integration into e-learning systems. The most popular

adaptation techniques used in e-learning environments are presented in Chap. 4. Following chapter—*Agents in E-Learning Environments*—presents current trends in use of intelligent agents for personalization. Chapter 6—*Recommender Systems in E-Learning Environments*—provides an overview of techniques for recommender systems, folksonomy and tag-based recommender systems to assist the reader in understanding the material which follows. The overview, presented in Chap. 7 includes descriptions of content-based recommender systems, collaborative filtering systems, hybrid approach, memory-based and model-based algorithms, features of collaborative tagging that are generally attributed to their success and popularity, as well as a model for tagging activities and tag-based recommender systems.

Part III: *Semantic Web Technologies in E-Learning* contains a review of the basic elements of semantic Web, as well as the possibilities of applying semantic Web technologies in e-learning. Chapter 9—*Design and Implementation of General Tutoring System Model*—displays the details of a general tutoring system model, supported with semantic Web technologies as well as the principles of creating courses in different domains supported by this model.

Part IV: *Case Study: Design and Implementation of Tutoring System*, which consists of Chaps. 10 and 11, presents the most important requests for implementation of personalization options in e-learning environments, as well as design, architecture and interface of Protus 2.1 system. Chapter 10 presents the details about previous versions of the system, defined user requirements for the new version of the system, architecture details, as well as general principles for application of defined general tutoring model for implementation of programming courses in Protus 2.1. Chapter 11 presents Protus 2.1 functionalities as well as personalization options from the end-user perspective.

Part V: *Evaluation and Discussion*, which contains Chaps. 12 and 13, highlights the results of the evaluation and discussion of analysis of the results regarding the validity of the system. Finally, Chap. 13 concludes this monograph, summarizing the main contributions and discussing the possibilities for future work.

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