Preface

EDITOR’S INTRODUCTION

The widespread availability of wireless network has created the possibility of realization of ubiquitous multimedia paradigm. The multimedia users are equipped with handheld mobile devices having wireless networking capabilities. This has created a platform to design different kinds of mobile multimedia applications, where the mobile users are seamlessly connected to the remote multimedia servers. However, the characteristics of wireless networking environment obstructs the possibility of seamless streaming of media contents to the users. Wireless networking environment is plagued by random variation of bandwidth and reliability. Hence, static reservation protocols for optimal use of resources in order to maintain QoS (Quality of Service) are not completely suitable in mobile multimedia paradigm. In addition, the other two challenges confronted by mobile multimedia paradigm are, 1) online content adaptation and 2) resource limitations of the handheld devices. The heterogeneity of the mobile handheld devices has created the need to adapt the media content of the server to the capabilities of the mobile clients. Such multimedia content adaptation should be online based on the requirements as well as the capabilities of individual mobile devices. The limitation of battery power of the mobile devices is another challenge in realizing the seamless mobile multimedia applications.

A straight forward design approach to the quality-aware mobile multimedia applications is to employ software agents. A software agent is an intelligent entity, which can perform certain tasks effectively and efficiently on behalf of the users. It is interesting that the software agents can be made mobile. Hence, a software agent can migrate from the mobile device of one user to the multimedia server to perform a set of tasks intelligently and the agent can migrate back to the mobile device of the user along with the results. For example, an agent from a mobile device of a user can compose all the necessary information regarding the resource availability as well as the capabilities of the corresponding mobile device and can migrate to the multimedia server to render the media content suitably before starting the streaming to the mobile client. There is a large set of autonomous tasks those can be performed by software agents to realize mobile multimedia applications. The employment of software agents brings in a set of advantages and performance enhancements. For example, the application of software agents in the context of mobile multimedia systems can save bandwidth requirements between mobile clients and servers. However, the security of the software agents and also the system hosting the mobile agents has remained as a research challenge. In order to establish a secured and performance enhancing agent-based system, it is necessary to protect the software agents from crash, to authenticate the validity of an identity of a mobile agent and also, the host system should accommodate the execution of the software agent while protecting its owner host-environment.
Hence, it is worth to note that, hybridization of mobile multimedia system and the software agents is an interesting direction to realize seamless as well as high-performing quality-aware mobile multimedia streaming applications. On the other hand, this hybridized model opens up a set of research challenges. In this book, the hybridization of software agents and mobile multimedia paradigm is presented. It is illustrated how to deal with different challenges emanating from the hybridized model.

This book is comprised of twelve chapters and the chapters are organized as follows.

**Chapter 1:** First chapter presents a detailed view about the QoS requirement of mobile multimedia systems in the presence of heterogeneous wireless networking environments. It is illustrated how the mobility of a user can be effectively and efficiently managed in order to maintain the QoS of the media content delivery to the mobile user under heterogeneous wireless environments. An efficient hand-over mechanism is discussed.

**Chapter 2:** In the second chapter, a detailed overview about the mobile agent technology is introduced. The various use-cases of the mobile agents are discussed. The set of advantages and disadvantages of the application of mobile agent technology is also outlined in second chapter.

**Chapter 3:** In chapter three, it is illustrated how mobile agents can be employed to adapt multimedia contents in the ubiquitous computing environment. A new agent-based recommender-system is proposed in chapter three in order to achieve multimedia adaptation.

**Chapter 4:** In fourth chapter, the representation of personalized multimedia contents are discussed employing the different types of specialized mobile agents. In addition to mobile agents, the interface agents are used to design a hybridized framework in order to handle the presentation of the rendered media content to the users.

**Chapter 5:** Fifth chapter details about the requirements of collaborative computing framework and illustrates how mobile agent technology can be utilized to realize the framework. A special attention is made to the resource limitation of the mobile client devices while designing the proposed architecture. This chapter illustrates how the application of mobile agents can solve some of the challenges of mobile computing which involves mobility of clients and the resource restriction of the mobile devices.

**Chapter 6:** Sixth chapter contains the mechanism of applying the mobile agents technology in order to discover the multimedia contents in geo-distributed large-scale systems. It is illustrated that internet-based distributed multimedia contents can be discovered by the application of mobile agents.

**Chapter 7:** In the seventh chapter, techniques of agent mediated content adaptation are introduced. Mobile agents can be a suitable mediator as an intelligent and informed software entity. In the e-learning environment, the adaptive delivery of contents through mobile agents is a promising direction. This chapter details about such agent-mediated adaptive e-learning systems.

**Chapter 8:** Chapter eight describes how mobile agents can be suitable to realize, not only the distributed multimedia systems, but also the workflow management system. A hybridization of the domains of software agents and software workflow systems is considered in order to combine the respective advantages from both the technologies.

**Chapter 9:** Chapter nine describes a very important aspect of mobile agent technology and that is, the security as well as survival of the mobile agents in the hostile execution environments in a distributed network. It is illustrated in this chapter, how a mobile agent can be provided a protected execution environment at hosts and can be rolled-back after the execution completion. A recovery model for the mobile agents is presented.
Chapter 10: Tenth chapter provides the details of design of algorithm for secured delivery of multimedia contents at the mobile devices in the ubiquitous computing environment. The details of key management and multimedia data encryption mechanism are presented.

Chapter 11: Chapter eleven discusses about distributed multimedia contents, such as video, coding and analysis techniques, while considering the resource constrained mobile devices.

Chapter 12: Chapter twelve introduces the security management in computing systems at a different dimension. System and data security is an important aspect of distributed sensor networking systems. Nodes of such system are resource constrained and limited network coverage area for individual nodes. This chapter introduces the methods for realizing secured distributed sensor network, where the system is heterogeneous in nature.

Overall, this book covers a wide spectrum in the domains of mobile agents, multimedia systems and distributed sensors providing a rich source of recent advancements in the fields and future research approaches. The chapters based on hybridized inter-disciplinary topics would be providing stimulation for novel research approaches in the respective domains.

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