Chapter 40
Dynamic Content Adaptation in Mobile Applications Driven by Intentional Multi-Agent Systems

Milene Serrano
Pontifícia Universidade Católica do Rio de Janeiro, Brasil

Carlos José Pereira de Lucena
Pontifícia Universidade Católica do Rio de Janeiro, Brasil

ABSTRACT

The proliferation of wireless technologies combined with the "anywhere and at any time" paradigm poses new scenarios for content provisioning. These scenarios demand appropriate technological support capable of dynamically adapting different contents according to the context under analysis, which depends on the user preferences, the device features, the network specification, the contract information, and the content description. Therefore, mobile applications must be able to dynamically manage different profiles by considering specific issues, such as: user satisfaction, distributed environments, heterogeneous devices and content personalization. Contributing to this field, the authors propose an approach centered on intentional Multi-Agent Systems to deal with the dynamic content adaptation in mobile applications. A dynamic database based on a meta-architecture supports the storage and the retrieving of the profiles' information. Moreover, the authors developed a framework, which is provided as an API to promote the reuse of our content adaptation approach in different mobile projects. In this chapter, they describe their proposal and present its application to a case study from the dental clinic domain. Moreover, they evaluate the dental clinic application and the experience acquired is also reported on this work. Finally, the authors compare their approach with some related work by emphasizing its benefits and drawbacks.

DOI: 10.4018/978-1-61520-655-1.ch040

INTRODUCTION

Mark Weiser (Weiser 1991) idealized a world in which several smart-spaces are integrated to help users perform their daily activities according to their goals and intentions anywhere and at any time these activities might occur. Weiser's vision is calmly and technically becoming viable nowadays by augmenting the technological support based on heterogeneous devices (e.g. simple cell-phones and Smartphones), different profiles and "calm technology" (Weiser and Brown 1995). This latter technology suggests that computers are personal assistants that must reduce the "frenzy" of information by helping the users without disturbing them or even distracting them.

The Multi-Agent Systems (MASs), the Goal-Orientation (Mylopoulos 2008), the Distributed-Intentionality-based modeling (Yu 1997) and the Belief-Desire-Intention Model (BDI Model) (Pokahr et al. 2005) can be combined to respectively deal with: (i) automation, controlling and personalization by using reasoning and learning techniques to reduce the need for human intervention; (ii) the Goal-Oriented Requirements Engineering (Mylopoulos 2008) focused on the stakeholders' goals to increase the users' satisfaction; (iii) the modeling of the mobile application's requirements based on the stakeholders' goals, softgoals, beliefs, resources and tasks; and (iv) the implementation of the modeled application centered on the stakeholders' beliefs, desires and intentions to improve the goal formation (Dignum and Conte 1997) and the like-me recognition (Gordon 2005). These support sets are examples of traditional and emergent technologies that may help software engineers to develop mobile applications from the requirements to code.

Concentrating our attention on the user and device heterogeneity, issues associated with the content adaptation in ever-changing contexts must be considered in the development of mobile applications. In order to provide support in this field, we propose an approach for dynamic content adaptation in mobile applications driven by intentional Multi-Agent Systems. This approach helped us in the development of an intentional framework for dynamic content adaptation centered on the mentioned technologies.

In this chapter, we first describe the technological support upon which the proposed approach is based. Next, we show details of our proposal by focusing on the developed framework and we also present the approach's application to a case study from the dental clinic cognitive domain. Thus, we discuss the evaluation process of the dental clinic mobile application centered on the user satisfaction issue. Furthermore, we compare our approach with related work. Finally, we conclude by also considering suggestions for future work.

TECHNOLOGICAL SUPPORT

As follows, we briefly describe the conceptual foundation as well as the technological set applied to our approach, based on the investigation of the Computer Science literature.

Intentional Modeling Based on the i* FRAMEWORK

We propose the use of the intentionality abstraction to model mobile applications based on stakeholders' beliefs, desires and intentions in order to improve the modeling of the human practical reasoning (Bratman 1999) in ever-changing contexts. The i* Framework (or iStar, which means Distributed Intentionality) is an initiative of the University of Toronto (UofT) in order to model applications centered on the Goal-Oriented Requirements Engineering (GORE) (Mylopoulos 2008). It proposes an agent-oriented approach to requirements modeling focused on the intentional agents' properties, such as: goals, beliefs, abilities and commitments. Therefore, the i* Framework offers two models: (i) the Strategic-Dependency (SD) model; and (ii) the Strategic-Rationale (SR)