Viewpoint Modelling with Emotions: A Case Study

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ABSTRACT

In modern software development, considering the viewpoints of stakeholders is an important step in building the right system. Over the past decade, several authors have proposed solutions to capture and model these viewpoints. While these solutions have been successful, one viewpoint they have largely ignored is the emotional viewpoint of stakeholders. Considering the emotional needs of stakeholders is important, because users’ perceptions of a product are influenced by emotion as much as cognition. Building on their recent work in modelling the emotional goals of stakeholders, the authors extend an existing viewpoint framework to capture emotional viewpoints, and to carry these from early-phase requirements to detailed software design. They demonstrate this with a case study of an emergency alarm system for older people, presenting the entire suite of models for this case study.

KEYWORDS

Agent-Oriented Modelling, Emotional Goals, Smart Home Technologies, Viewpoint Framework

1. INTRODUCTION

Building interactive systems has never been more challenging with the increasing need to understand the social requirements of users. Most people-oriented systems involve a number of stakeholders, and each stakeholder has their own perspective of how the system should be developed. The differing views of stakeholders often conflict, meaning that there exists no set of requirements to satisfy all stakeholders. To accommodate these new challenges and meet customer demands, many organisations are looking for innovative ways to change their strategic business processes (Baxter & Sommerville, 2011; Cernosek, 2004; Demoly, Monticolo, Eynard, Rivest, & Gomes, 2010).

Andrade et al. (2004) state that to solve such a complex problem, we need to first understand the problem through acquisition and conceptualisation activities. That is, we need to start by gathering as much information as we need about the context and then organise or model this information to provide a meaningful picture of the problem at hand. This model, termed the conceptual model of the problem, represents the problem from the viewpoint of the problem owner (Andrade et al., 2004). Since there are multiple stakeholders in projects, we may have different, and possibly conflicting, models representing the different viewpoints of the stakeholders involved. It is therefore important to...
ensure that the conceptualisation process considers everybody’s views and addresses any discrepancies that can result during this process.

Viewpoint modelling has been a commonly used technique by software professionals to resolve discrepancies during the requirements specification process. This approach enables the specification of a complex system by providing different viewpoints, thus facilitating communication with stakeholders at different stages (Andrade et al., 2004; Enders, Heverhagen, Goedicke, Tröpfner, & Tracht, 2002; Finkelstein, Kramer, Nuseibeh, Finkelstein, & Goedicke, 1992; Sterling & Taveter, 2009; Ter Chian Tan & Vasa, 2011). Even though different viewpoint frameworks exist such as the Information Systems Architecture framework, the Reference Model for Open Distributed Processing, the Enterprise Model, and the process modelling framework (Sterling & Taveter, 2009), not all of them can be used to represent a large, complex, distributed and people-oriented systems. Sterling and Taveter (2009) proposed the use of a viewpoint framework to represent large distributed systems through the use of agent-oriented models by taking into account the need to show information about agents, system functionality, interactions between different agents and the behaviour of each agent within the system.

In recent work, we have investigated the use of emotional goals to model the emotional viewpoint of different stakeholders in a project (Miller et al., 2014). Emotional goals are linked to roles, which represent stakeholders in the system, and specify a desired state of emotion or wellbeing of someone playing those roles. Emotional goals represent how people feel, so are a property of people, not of the system. In a case study of an emergency alarm system for older people (Pedell, Lopez-Lorca, Miller, & Sterling, 2014), we demonstrated that by failing to consider the emotional goals of users, modern emergency alarm systems failed in their objective of keeping older people safe, despite being well-engineered and highly reliable systems. For example, many older people choose not to wear their emergency alarm pendant, due to the emotional stigma attached to it, so in an emergency they could not get help. We designed and implemented a new emergency alarm system based on our findings and trialled this in the homes of nine older people. Our findings showed a better user experience over existing emergency alarm systems.

In more recent work (Lopez-Lorca, Miller, Pedell, Sterling, & Kissoon-Curumsing, 2014), we extended the concept of emotional goals to the models of Sterling and Taveter (2009), demonstrating how to model emotional goals in early phase requirements, and to carry these emotional goals through to detailed design. These extensions support straightforward traceability of emotional goals through the development lifecycle.

In this paper, we extend our previous work on emotional modelling. Our contribution is twofold. First, we present a complete set of models for the emergency alarm system, from early-phase requirements to detailed design. We briefly evaluate which models were most useful in the case study and why. Second, we demonstrate how to use the viewpoint framework proposed by Sterling and Taveter (2009) to capture the viewpoints of stakeholders throughout the entire process from early-phase requirements to detailed design. We find that the early-phase models are the most useful and cost-effective of all of the models, which we attribute to the early phases being the most critical in terms of capturing user needs.

In section 2, we discuss existing work relevant to our approach. In section 3, we present the details of the emergency alarm system case study. In Section 4, we present and discuss the entire set of models for the emergency alarm system, and in Section 5, we present a discussion of what we learnt from this exercise. We conclude the paper in section 6.

2. LITERATURE REVIEW

In this section, we provide an overview on related work on agent-oriented modelling, viewpoint frameworks and the use of smart home technologies by older adults.
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