ABSTRACT

This paper investigates and discusses the persuasive principles of social actors in relation to other theories of technologies as social agents, particularly within the field of Social Robotics and Persuasive Educational and Entertainment Robotics (PEERs). Based on related research and results from a case study on social robots as persuasive social actors in education an extension of the persuasive principles is proposed and related design guidelines for Persuasive Technology as social actors in teaching are presented.

INTRODUCTION

From a Persuasive Technology (PT) perspective, the act of teaching can be considered a persuasive intervention since participating in learning activities entails attitude and behaviour change. The teacher thus often acts as a designer, creating materials and activities that motivate students to engage in learning. When applying technologies to educational environments, those too should be able to motivate learning, e.g. through the role as social actors. In this context, social robots are often viewed as social actors since their main purpose is to engage in social interaction with humans. Thus, one might consider the principles of PT when designing social robots for education. From a Social Robotics (SR) perspective, though, the design of robots for particular (often persuasive) purposes, has also received great attention in recent years. Thus, this paper argues that a lot can be gained from looking at the taxonomies of SR when designing persuasive social actors for teaching. Furthermore, this paper argues that for technologies to be persuasive, particularly within an educational context, one must consider the specific social relations that characterize this context as a condition for the persuasive intervention. Specifically, this paper proposes the combination of PT, SR and didactics as a framework not only for designing robots that motivate learning, but also as a way of extending the persuasive principles of technologies as social actors in general, with a particular
attention to the embedded social relationships of the educational context. In the following section a brief overview of the principles of persuasive social actors and related research is provided, and the notion of embedded social relations as a context for persuasion is discussed. This is followed with an introduction to Persuasive Educational and Entertainment Robotics (PEERs) as the intersection between PT, SR and didactics and based on results from a case study, the principles of persuasive social actors are discussed and extended and new guidelines for future design of persuasive social actors in teaching and learning are suggested.

**Technologies as Persuasive Social Actors**

Within Persuasive Technology (PT), the social actor is one of three roles (tool, media and social actor) that a technology can take on when attempting to motivate behaviour change (Fogg, 2003). This includes both virtual social actors, i.e. avatars (also termed Relational Agents (Bickmore & Cassell, 2001) and embodied social actors (Social Robots). In PT the persuasive potential of social actors is narrowed down to the following five principles:

1. **Attractiveness**: Technologies that are visually attractive to users are more persuasive
2. **Similarity**: People are more persuaded by technologies that are similar to themselves
3. **Praise**: Praise (words, images, symbols, sounds) lead users to be open to persuasion
4. **Reciprocity**: People reciprocate when a technology has done a favour for them
5. **Authority**: Technologies that assume roles of authority are more persuasive

Similar principles can be found in Relational Agent theory (e.g. familiarity, power and solidarity) (Bickmore & Cassell, 2001) describing characteristics from human communication that relational agents should be able to recognize and utilize to maintain natural, engaging interaction with users. This has been investigated particularly in the application of relational agents in healthcare (Watson et al., 2012; Ellis et al, 2013).

Within PT, several aspects of persuasive social actors have been investigated e.g. the effects of social messages from mobile phones (Revelle et al., 2007) or the persuasive power of human-machine dialogue (Ramachandran & Canny, 2008). Others focus on the differences between virtual and embodied persuasive social actors (Lee et al., 2006) or users’ ability to form social relations with inanimate but socially interactive objects (McCalley & Mertens, 2007). Although not reflected in the original principles of social actors, many of these studies show that social relations should not only be considered a possible outcome or strategy of persuasive interventions, but also as constituting the context for these interventions and as a framework for predicting and understanding the outcome of such interventions.

**Social Relations and Roles as a Context for Persuasion**

As argued in (Gram-Hansen, Schärfe & Dinesen, 2012 and Gram-Hansen, 2013) the traditional approach to PT principles as a context-independent framework limits its applicability as a design tool. In this research the importance of context-adaptation in relation to persuasive learning designs is discussed and through an extended view of the context based on the concept of Kairos, it is argued the appropriate manner of persuasion (how the technology persuades) is indeed of equal importance to that of the appropriate time and place of persuasion. This paper adds to this the social relations between persuader and persuadee(s) as an important part of the context for persuasion, which affects the appropriate manner of persuasion within a given context. This means, that the effects of persuasive principles are not constant over time or across context, rather they are mediated by the power structure and the relationship between persuader and persuadee. For instance, the Self-Determination Theory (Ryan & Deci, 2000) suggests that the effects of rewards are mediated by the level of self-determination.
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