Abstract. Memory gives us identity, shapes our personality and drives our reactions to different situations in life. We actively create expectations, track the fulfilment of these expectations and dynamically modify our memory when new experiences demand it. Yet up to date, many important social aspects of human memory to artificial intelligent social agents have not been given much attention. Thus, this article is going to review on the current state-of-the-art of memory models for social companions, particularly on memory aspects that have been explored and proved useful and other potential memory aspects that would be beneficial if included.

1 Introduction

The term ‘Companion’ has recently gained popularity in the field of artificial intelligence and robotics. In the recent decade, the number of ‘Companion’ related projects has been mushrooming including

- COGNIRON, aiming to develop cognitive robots that interact with humans, able to perceive, decide, communicate and learn in an open-ended way
- Companions, that has developed virtual conversational companions aiming to change the way people think about human-computer relationships and the Internet
- LIREC that focuses on establishing a multi-faceted theory of artificial long-term companions that can establish long-term relationships with humans, embodies this theory in robust and innovative technology and experimentally verifies both the theory and technology in real social environments

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1 http://www.cogniron.org/final/Home.php
2 http://www.companions-project.org/about/faqs.cfm
3 http://www.lirec.eu
SEMAMINE\footnote{http://www.semaine-project.eu/}, with the objective to build a Sensitive Artificial Listener with social interaction skills needed for a prolonged conversation with a human user

SERAE\footnote{http://project-sera.eu/}, that aims to study social interaction between users and a robot in real life situations

It is sometimes unclear what a ‘Companion’ really is. In the listed projects, the term ‘Companion’ is used to refer to either a robot or a virtual conversational agent that possesses a certain level of intelligence and autonomy as well as social skills that allow it to establish and maintain long-term relationships with users. The ‘Companion’ will be accessible to users over a long period of time, interact with users in a friendly way, assist users in real life situations and help them make sense of information. All these projects emphasise the importance of cognitive and social skills. This type of ‘Companion’ that I termed ‘Intelligent Social Companion’ (ISC) is the focus of discussion in this article despite the fact that Tamagotchi, virtual pets\footnote{http://virtualpet.com/vp/} and dolls such as Prima Puel\footnote{http://medgadget.com/archives/2005/04/primo_puel_doll.html} are sometimes suggested as ‘Companions’.

The emergence of ISC technologies is turning simple human-computer and human-robot interaction into relationship building between technological artifacts and humans \cite{9}. This means that an ISC will be more than just a tool but a technological artifact that takes into consideration users’ wants and needs and has the ability to form mutual attachments with users. However, due to the infancy of the field, ISCs that are able to satisfy these functions are yet to be developed. Current ISCs still have limited social intelligence and interaction capabilities owing to the lack of life-likeness and proneness to repetitive behaviour that jeopardise its believability and naturalness.

In order to establish long-term and pleasing relationships, social and emotional investment is very important \cite{15}. According to Fiske \cite{39} there are five unifying motives for the establishment and maintenance of successful long-term relationships:

- **Belonging** – need for strong, stable relationships
- **Understanding** – need for shared meaning and prediction
- **Trusting** – need for viewing others as basically benign
- **Controlling** – need for perceived contingency between behaviour and outcomes
- **Self-Enhancing** – need for viewing self as basically worthy or improvable

To satisfy these motives, an ISC will need to be able to provide a personalised interaction experience, exhibits its own internal states, understand users’ emotional states, act reliably and appropriately, performs its tasks autonomously and effectively and increase users’ self-esteem under suitable circumstances. This implies the need for an ISC to remember users’ preferences and make use of this information in sensible and plausible ways to ensure coherent interaction throughout the relationships. In other words, there needs to be a means to organise relevant interaction