

Design of an Autobiographical Memory for a Social Robot Supporting Human-Robot Interactions

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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Date:

Dr.A.G.B.P.Jayasekara

Abstract

Artificial companions harnessed with long-term interaction capabilities are useful for a variety of applications. The ability of recalling past memories during ongoing interactions and adapting behavior according to the interaction partner are the reinforcements of a successful long-term interaction. Memory has been figured out as the underlying mechanism which governs these behaviors. Even though a number of efforts have been taken, the capabilities of existing artificial companions have not reached to human level. Modeling the memory is still remains as one of the challenges for achieving long-term human robot interaction (HRI). Memory based system have been designed for remembering users, their preferences and past emotionally salient events with them. However, these systems face difficulties when interacting with a group of users. They have certain limitations including remembering user groups, relationships between users to mention a few. The requirement of memory model that has human-like capabilities has not been fulfilled yet.

This work presents an Autobiographical Memory (AM) based intelligent system which can be applied for HRI. The AM comprises of three layers namely self layer, people layer and episode layer. Methods have been developed for extracting, storing, updating and recalling user information during HRI. A system has been designed for learning user preferences through human friendly interactions and providing user adaptive services for each user in a multi-user domestic environment. Furthermore, the system is capable of adapting according to users hidden preference and changes of preferences. The robots memory has been structured in such a way that it can easily remember the user groups and the relationship between users.

The proposed AM is also capable of remembering spatial information and sequence of past actions. A novel method has been proposed for arranging a set of objects in a surface while interpreting uncertain spatial and qualitative distance information in user commands. Performance of the system has been validated by using a set of experiments. The proposed AM based intelligent system is capable of supporting long-term human-robot interactions.

***Keywords-* Social robotics, Autobiographical memory, Human-robot interactions, Social interactions, Long-term human-robot interactions**

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