Building a social robot as a game companion in a card game

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***Abstract*—In this video we present a social robotic player that is able to play a traditional card game in a social manner. The interaction takes place in a rich environment in which two teams of two players each compete to win the card game. Therefore, the robotic game player has a partner, and an opponent team of two other players. During each game, the robot explores both competitiveness with the opponent team and cooperation with its partner, conciliating the performance of players and the social dynamics that emerge during the game-play.**

I. Introduction

Games are interactive and amusing scenarios that provide entertaining and pleasant moments for any age group. We created a robotic companion to play a traditional card game, in which it has to manage the dynamics of the opponents and its team partner. This work is part of the PArCEIRO project[1] that aims to create social robots capable of integrating social environments with humans, making them part of a context where reciprocity and interaction takes place. The main goal of this scenario was to create an entertaining activity for elderly people, so they can engage in social interactions with others and with the artificial player. The motivation to develop this scenario underlies previous user-studies performed with this population to understand their real needs (e.g., social isolation) [1]. The first study conducted with this system involved mostly the university community. In future studies we aim to study how the senior population engages with this card-game activity.

II. System overview

The architecture presented in Figure 1 organises all the components involved in this system and their communications. It considers a scenario where an embodied agent plays a physical card game against human players on a multitouch table. The basic work-flow of the system is as follows:

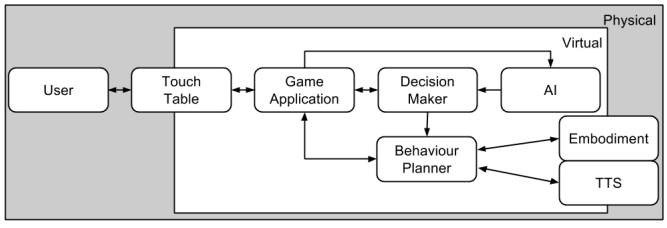

Fig. 1. Architecture of a social robotic card game player.

The human players, *Users*, play with physical cards, which are recognised by the *Touch Table*. Their game actions are managed by the *Game Application* and communicated to both the *Artificial Intelligence (AI)* and the *Decision Maker*. The *AI* performs all the reasoning about the game and decides the next move of the artificial player. However, the *Embodiment* (Robot) should not only play a certain card, but also produce social behaviors. Therefore, the *Decision Maker* balances the *AI* decisions and game information to produce an appropriate intention to send to the *Behaviour Planner*. The *Behaviour Planner*, upon receiving such high-level intention-directed instructions, selects a plan from a pre-authored library and executes it in both the *Game Application*, the *TTS* and on the embodiment (using Nutty Tracks [2]). The balance between the *AI* and *Decision Maker* modules results in human-like behaviors that allow the robot to be perceived as a social and intelligent entity. This relationship between rational game computations and social interactions produces an emotional agent capable of expressively communicating. Implementation details are described in [3].

[1] http://gaips.inesc-id.pt/parceiro/

III. Video description

The video shows a robot playing a card game with human players using physical cards. The behavior of the robot was inspired in real human behaviors when playing the same card game, targeting the end-user population, i.e., elderly. The interaction was tested with younger users and the video shows differences in interaction styles between the robot's opponents and partner. Moreover, it shows interesting moments of the interaction where participants answered the robot or even engaged in a conversation with it spontaneously.

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