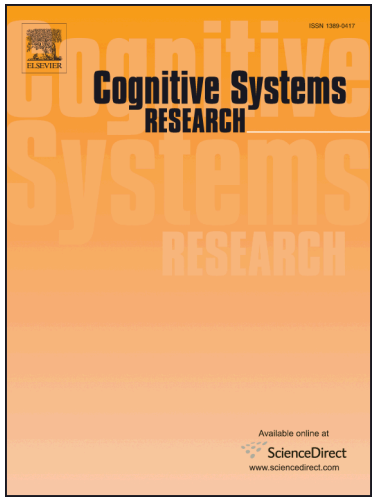

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Personalising game difficulty to keep children motivated to play with a social robot: a Bayesian approach

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Abstract

For effective child education, playing games with a social robot should be motivating for a longer period of time. One aspect that can affect the motivation of a child is the difficulty of a game. The game should be perceived as challenging, while at the same time, the child should be confident to meet the challenge. We designed a user modelling module that adapts the difficulty of a game to the child's skill level, in order to provide children with the optimal challenge. This module applies a Bayesian rating method that estimates the child's skill and game item's difficulty levels to personalise the game progress. In an experiment with 22 children (aged between 10 and 12 years old), we tested whether the personalisation leads to a higher motivation to play with the robot. Although the personalised system did not challenge the participants optimally, this study shows that the Bayesian rating system is in principle able to measure the skill and performance of children in playing a game with a robot (even without accurate estimates of the difficulty of items). We outline multiple ways in which the rating method and module can be used to further personalise and enhance the child-robot interaction, other than adapting the difficulty of games (e.g. by adapting the dialogue and feedback).

Keywords: Social Robotics, User Modeling, Rating System, Child-Robot Interaction, Motivation

1. Introduction

For children, playing educational games with a social robot can be a fun way to learn, to take their mind of their current situation, or simply for the sake of enjoyment. Within the ALIZ-E and PAL projects, educational games are used to teach children with diabetes how to manage their chronic illness. The children need to be able to calculate how much insulin they need to inject based on their food intake and the physical exercise. To this end, a math game and imitation game were developed for the social robot. With these two games the robot can provide the children with a fun way of learning how to calculate the insulin dosage and learn about the relation between physical exercise and

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