Modeling Imitational Behavior Via Social Comparison Theory
(Extended Abstract)

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Abstract. Modeling crowd behaviors is an important challenge for intelligent virtual agents. We propose a general cognitive model of simulating crowd behaviors, based on Festinger's Social Comparison Theory (SCT), a prominent social psychology theory. We present the use of the SCT model (using the Soar cognitive architecture) in the generation of imitational behavior in loosely-coupled groups and show that SCT generates behavior more in-tune with human crowd behavior.

1 Introduction

Existing computer science models of crowd behavior often focus only on a specific phenomenon (e.g., flocking, pedestrian movement), and thus must be switched depending on the goals of the simulation. We propose a novel model of crowd behavior, based on Social Comparison Theory (*SCT*) [1], a popular social psychology theory. The key idea in this theory is that humans, lacking objective means to evaluate their state, compare themselves to others that are similar.

Elsewhere [2], we described the SCT algorithm and showed that SCT covers a variety of pedestrian movement phenomena. In this short abstract we describe the implementation of SCT model in Soar cognitive architecture. We evaluate the use of SCT in the generation of imitational behavior and show that SCT generates behavior more in-tune with human crowd behavior.

2 SCT Implementation in Soar

We implemented SCT in the Soar [4]. Soar was connected to the GameBots virtual environment [3]. SCT was implemented as a secondary parallel thread within Soar. Whereas normally, operators are proposed (and selected) by Soar based on their suitability for a current goal (e.g., through means-end analysis), in our agent operators were also proposed based on their suitability for SCT. The SCT thread proposed operators by following the algorithm described in [2], though in a way that is adopted for Soar's decision cycle: At every cycle, for each observed agent and for each difference with the agent, the SCT process would propose an operator that would minimize the difference. Then, a set of preference rules is triggered that ranks the proposals based on the SCT algorithm. At the end, only one SCT operator is supported.

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3 Evaluation of Imitational Behavior

We conducted experiments to evaluate whether SCT can account for imitational behavior in groups. We rely on experiments with human subjects, which judged the human crowd behavior and the resulting SCT behavior in comparison to completely individual behavior (i.e., arbitrary decisions by each agent, independently of its peers), and to completely synchronized behavior (i.e.,all agents act in complete unison).

The first hypothesis underlying the experiments was that groups controlled by SCT would generate behavior that would be ranked somewhere in-between the individual and perfect-coordination models. Another hypothesis is that human crowd behavior would also be ranked somewhere in-between the individual and perfect-coordinated behaviors.

To examine the first hypothesis, we created three screen-capture movies of 11 Soar agents in action. In all, the agents were fixed to their initial locations, and the only actions available to them were to do nothing, or turn at some angle. In all screen-capture movies there is one blue agent that stands in a front and turn up to 90° left or right. All others are red agents that act according to one of the models. We asked 12 subjects to fill a questionnaire after each movie, based on what they saw. The questions examined different aspects of the coordination of the agents, using an ordinal scale of 1–6, with 1 being a low result (associated with more individual behavior), and 6 being a high result (associated with perfect unison).

To examine the second hypothesis, we used a TV news clip, which showed a group of people standing and waiting for some event to occur; the only action they performed was to occasionally turn. 12 new subjects were asked to fill the same questionnaire after seeing *only the news clip*.

In general, the responses to the questions placed the SCT model and the human crowd in between the individual and unison models. Across all questions, the responses for the SCT model were found to be significantly different from the results of the individual-choice and unison models. The human crowd results appears to be significantly different from the individual model in all questions, however, it is significantly different from the unison model in the coordination and non-random questions but not in the relationship question.

References

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