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## RESEARCH ARTICLE

# An agent-based model for integrated emotion regulation and contagion in socially affected decision making



Adnan Manzoor, Jan Treur \*

VU University Amsterdam, Agent Systems Research Group, De Boelelaan 1081, 1081 HV Amsterdam, The Netherlands

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### Abstract

This paper addresses an agent-based computational social agent model for the integration of emotion regulation, emotion contagion and decision making in a social context. The model integrates emotion-related valuing, in order to analyse the role of emotions in socially affected decision making. The agent-based model is illustrated for the interaction between two persons. Simulation experiments for different kinds of scenarios help to understand how decisions can be affected by regulating the emotions involved, and how these emotions are affected by emotion regulation and contagion.

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## Introduction

Traditionally emotions have often been considered as standing in the way of adequate decision making. In recent developments on human decision making from a cognitive and neurological perspective a more constructive role of emotions has been found. For the case of individual decision making in particular, this concerns the role of emotions in a process in which a number of action options are considered, for each of which effects are predicted by internal

simulation. By valuing these predicted effects a choice is made (e.g., Phelps, Lempert, & Sokol-Hessner, 2014; Treur & Umair, 2011). In this valuation process emotions play a crucial role: those action options for which the predicted effects associate to a more positive feeling will be valued higher, and therefore will be chosen more often.

In a social context, often decision making processes of different individuals affect each other, by social contagion processes (e.g., Bosse, Duell, Memon, Treur, & van der Wal, 2014; Bosse et al., 2012). A specific form of social contagion relevant in such socially affected decision making processes is emotion contagion. By expressing their emotions associated to different decision options, individuals

\* Corresponding author.

E-mail addresses: [a.manzoorrajper@vu.nl](mailto:a.manzoorrajper@vu.nl) (A. Manzoor), [j.treur@vu.nl](mailto:j.treur@vu.nl) (J. Treur).

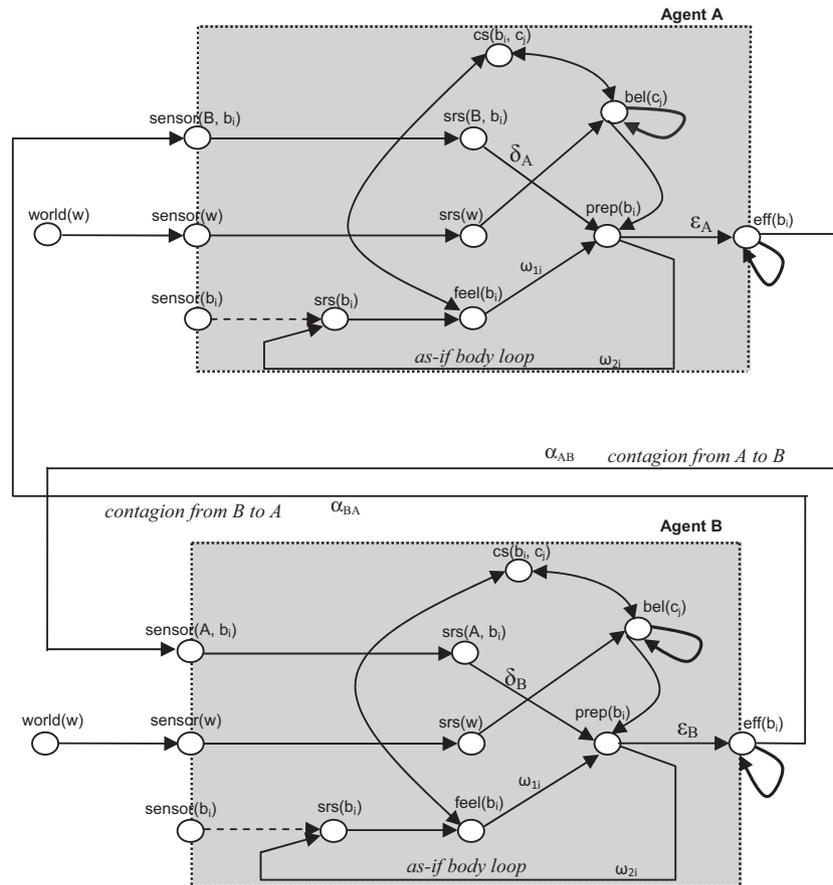


Fig. 1 Overview of the computational model.

affect other individuals in their emotions for these options. Through this an instantaneous social effect on the choice of an action occurs.

In this social decision making process also a form of learning takes place. When a considered action co-occurs with a positive emotion, the association between this option and the emotion will be strengthened, so that in future situations the initial emotional effect is stronger. In this way such social contagion processes may also affect decisions for individuals made in the future.

The strength of how emotions in an individual develop and are transferred to other individuals (contagion), also depends on the extent to which emotions are regulated. Some persons are expressing their emotions less than others. For example, when a person applies a very strong form of emotion regulation so that only a neutral face and body are shown, emotion contagion will not take place, and therefore decision making of others is not affected by such an emotion. Also, for an individual observing the emotion of another individual, if this received emotion is strongly regulated, this may reduce the social effect on the decision making. Such strong emotion regulation may make it more difficult to reach joint decisions in a natural manner.

In this paper a social agent model is presented that covers how socially affected decision making relates to emotion

contagion in interaction with emotion regulation. The work presented here is an extension of [Manzoor and Treur \(2013\)](#). First, in the second section the model itself is explained in some detail. In the third section it is illustrated by means of an example simulation showing how the model works. Next, in the fourth section more refined explorations are discussed of different scenarios showing the role of emotion regulation in the decision making. Finally, fifth section is a discussion.

### A computational social agent model integrating emotion regulation and contagion

As discussed above, in a social context decisions of an individual are not often made independent of other individuals, due to the role of social contagion, in particular of emotions related to decision options. Moreover, these emotions usually are also subject to internal regulation processes. To explore the combination of such processes, the social agent model for socially decision making (see [Fig. 1](#) for an overview) presented here is based on the three key principles, namely:

- emotion-related valuing of decision options,
- emotion contagion,
- emotion regulation.

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