The Peace Mediator effect: Heterogeneous agents can foster consensus in continuous opinion models

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H I G H L I G H T S

- A continuous opinion model with heterogeneous agents is studied.
- We prove that inserting special agents ("Peace Mediators") into a population may easily foster final consensus.
- We determine the Peace Mediators' support for consensus according to their properties and distribution.

A R T I C L E   I N F O

A B S T R A C T

Statistical mechanics has proven to be able to capture the fundamental rules underlying phenomena of social aggregation and opinion dynamics, well studied in disciplines like sociology and psychology. This approach is based on the underlying paradigm that the interesting dynamics of multi-agent systems emerge from the correct definition of few parameters governing the evolution of each individual. In this context, we propose a particular model of opinion dynamics based on the psychological construct named "cognitive dissonance". Our system is made of interacting individuals, the agents, each bearing only two dynamical variables (respectively "opinion" and "affinity") self-consistently adjusted during time evolution. We also define two special classes of interacting entities, both acting for a peace mediation process but via different course of action: "*diplomats*" and "*auctoritates*". The behavior of the system with and without peace mediators (*PM*s) is investigated and discussed with reference to corresponding psychological and social implications.

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1. Introduction

In recent years we have seen the emergence of a new breed of professionals broadly called Peace Mediators, *PM*s for short, involved in the process of peace (re)construction. They are usually deployed in countries torn by conflict or post-conflict areas in order to create conditions for sustainable peace. *PM*s actions aim to reduce the fragmentation among different parts of the society until a widespread consensus is achieved and peace can be maintained.

Our model is based on the assumption that it is possible to study the evolution of a social phenomenon directly by considering a few attributes of the individuals coupled by specific interaction rules. For these reasons, we adopt an agent based model, in which local rules are inspired by the *cognitive dissonance* [1], a cognitive construct that rules the evolution of human social cognition [2]. According to the Cognitive Dissonance Theory, when unknown individuals interact, they experiment an *internal conflicting state* because of their reciprocal lack of information. In order to avoid the cognitive dissonance, individuals adopt heuristics strategies with the aid of *mental schemes* [3], that is, symbolic and synthetic representations built up through inferential, imaginative and emotional processes. Because mental schemes can be upgraded in real time during interactions with other individuals, they are utilized as a guidance for quick decisions in stereotypical situations. For instance, the mutual affinity is the mental scheme employed by agents to overcome the lack of information about the others (that is, the cognitive dissonance) and to perform the optimal choice in terms of opinion production. In particular, two heuristic strategies are mainly employed:

(A) if the affinity towards the interacting partner is below some threshold, the individual tends to crystallize his/her actual opinion, while for higher values of affinity he/she will change opinion in the direction of the partner's one;
(B) if the opinion difference between the two interacting agents is below a critical value, then each one will increase his/her affinity towards the partner, otherwise the affinity scores will decrease.

These two ways of acting are modulated by external factors, as for example the possibility of interacting given by the social system, and especially by internal ones, such as the *openness of mind* and the *confidence*. The openness of mind is the limit of permissiveness that an individual introduces interacting with other people, and allows to ignore the perception of incompatibilities existing between oneself and the others; consequently, it makes possible to interact with individuals having very distant opinions. On the other hand, the confidence is the minimal reputation an individual requires to a stranger to accept instances from him/her. In practice, I will be more available to uniform my opinions with the opinions of someone with a large affinity with myself. Moreover, affinity acts as a long term memory in which individuals can store information useful to solve similar future situations.

By formalizing agents in such a way, we obtain a dynamical population where interacting agents share their opinions by trying to maintain an acceptable level of dissonance. The asymptotic states of such system are either a global consensus (i.e. into an hypothetical opinion space, a mono-clustered state) or a social fragmentation (i.e. crystallization of no longer interacting clusters of opinion). Of course, in the vision of the *PM*s, social fragmentation has to be considered a dangerous state, since once obliged to interact, the low level of mutual affinity and the differences in opinion, may lead to strong social contrasts between these agents. For this reasons, the goal of the *PM*s can be translated into a reduction of the social fragmentation, namely into a reduction of opinion distances among agents into the opinion space.

The aim of this paper is to present two possible models of *PM* behavior. In the first case, we emphasize principally the skill of interacting and negotiating with people along large opinion distances. We label these *PM*s as "*diplomats*" and we tag their most prominent characteristic as a larger openness of mind. Classical examples are actual diplomats, transactors, intermediaries, etc. On the other hand, we consider as another fundamental attribute of a *PM* his/her reputation. Hence, we label this *PM* figure as an "*auctoritas*" ("authority"), which is characterized by an established good reputation and the aptitude to influence the society by their prestige. For example, we can set in this category Mahatma Gandhi and Nelson Mandela.

Targets of this work are to obtain a mathematical representation of both *PM* figures and to investigate by means of numerical simulations how they can affect a formalized social system of *normal* agents in order to reach a widespread social consensus.

The paper is organized as follows. The next section is dedicated to describe the model. Then, in Section 3 we present the numerical results. Sections 4 and 5 are devoted to analytical considerations and theoretical discussion, respectively. Finally, in the last section we will sum up and talk about future perspectives.

2. The model

We approach the problem by means of the tools and methods of sociophysics [4,5]. In particular, the adopted model, without *PM*s, has already been studied in previous studies [2,6,7]: indeed, we are going to refine it in the present paper. Therefore, we briefly recall its main features. The model is characterized by a continuous opinion and a random binary encounter dynamics, as in the Deffuant Model [8,9], which ours is inspired to (at least the part concerning the evolution of the opinions). We consider a system made up of N autonomous agents, the individuals, each one identified by the index $i = 1, \ldots, N$ and characterized by the two (constant) parameters ΔO_c^i and α_c^i, which are the openness of mind and the confidence [10], respectively. Moreover, each agent i is in general described by the two internal variables O_i, its opinion, and