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Towards a Fuzzy Cognitive Map for Opinion Mining

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Abstract

In this paper, we propose a Fuzzy Cognitive Map (FCM) to opinion mining, with special attention to media influence on public opinion. Particularly, in this paper, we describe the FCM, the concepts and relationships among them. Our opinion mining model is based on a multilevel FCM, to distribute the concepts according to the aspects that describe the elements conforming public opinion, which are: social, technological and biological. We carry out preliminary tests, and the results are very encouraging.

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1 Introduction

Opinion conformation is a very important subject in order to define opinion mining systems. We need to know the different aspects that influence the conformation of the opinions, in order to build correct opinion mining models, including the influence of communication media, via technological devices. There are diverse hidden aspects related to media influence on public opinion (Aguilar, 2012): a) The media try to seduce us into wasting time; b) The media allow over-sharing and loss of privacy; c) the media influence our personal opinion; d) the media allow certain agencies to study user's preferences and induces uncontrolled commercial consumption.

Particularly, the influence of media on the public opinion is an aspect that deserves careful attention and to be studied, especially the process of opinion formation on social media. This process is more complicated than in real society, due to that the information is fuzzy and evolves more rapidly. There are several reasons for this: users discuss with others anonymously, users do not know the personality and internal opinions of the others, etc. There are recent works of sociologists, computer scientists, psychologists, etc. aimed at understanding better, and predicts the behavior of opinions throughout social networks (Aguilar & Terán, 2015). Certain researchers have shown how social media can be used to direct public opinion toward topics of interest to social groups.

In this work, we consider three domains to conform the opinion. The first one is linked to the technologies, and particularly the influence of the media, Internet, etc. in the public. Additionally, the biological aspect linked to the brain, and in general, psychology of the individuals, is very important to understand, in order to know the mechanism inside of each individual to build an opinion. Finally, the social context also has its influence in the conformation of the opinion, the cultural, and social networks are determinant for the conformation of the opinion. In this paper, we analyze these aspects, and propose to represent them via a FCM model (Aguilar, 2004; Aguilar, 2010; Aguilar, 2013; Aguilar et al. 2016; Chrysafiadi, 2013), which can be used to infer the evolution of an opinion in a given context, or to understand why an opinion appears in a social context. The literature presents some papers about opinion mining systems, but our approach is the first based on the concepts of FCM.

2 Characteristics of the human brain exploited by social media

Certain aspects, such as decontextualized feelings, moods and stress, have an important impact in our form of understanding, behavior and opinion, and seem to be importantly influenced by the media, as these affect important areas of human decision making and opinion formation. Reference (Aguilar & Terán, 2015) describes two routes for appraisal: *Bottom-up processes* allow the individual to make situational analysis, predominantly via its cerebral cortex. The *top-down route* or appraisal reinstatement involves the limbic and the reptilian brains, and permits the individual to give meaning (simultaneously, emotions appear) from similarity (association) of a current situation to a past situation, by prototype-based categorization. In the case of normal emotions, prototypes are defined on characteristics of events and objects. Prototype-based categorization is exploited by the media, when establishing the *Frames**, in accordance to the *Agenda-Setting[†]* (see (Aguilar & Terán, 2015)).

Subliminal messages consist in stimulus (primus) involving a person for only a few milliseconds, and are below the threshold of perception, or sensory awareness. *Supraliminal messages* involve people for much longer periods of time than a few milliseconds, and are above the threshold of perception of a stimulus. In subliminal messages awareness of the primes is blocked by a second message. Consequently, the meaning is activated, but the memory is not informed about the origin of the meaning, as this has been blocked. The prime (inappropriately) adheres to the subsequent messages/stimulus, so that it is over-rated (either positively or negatively). Then concepts, categories and feeling originally linked to the message, free-float and will be associated with other events or objects, and surprising emotions as phobias could emerge. However, not only subliminal messages, but also supraliminal messages whose context are poor, or inexistent, are often used by media for social manipulation, even when in this case the local memory is informed, though inadequately.

The effect of media, via decontextualized and subliminal messages, conditions people. Conditioning is understood as the association of a stimulus with a certain response of the human brain. There are two paired stimulus: a stimulus that is innately or intrinsically aversive (or attractive), and a neutral stimulus. After repetitively suffering the paired stimulus, a person becomes *conditioned* to generate the innate response originally shown against the aversive stimulus also against the neutral stimulus presented alone. Alike emotional conditioning, emotional contagion fundamentally has an unconscious character. This human capacity seems to be innate, no learned (LeDoux, 2002). In general, many emotions are transmitted via observation or indirect experience, as a complement to conditioning or direct experience.

It has been proved that the limbic system and in particular the amygdala, as well as the reptilian system, are involved in social contagion of emotions, in animals and humans. For instance, in (Clore &

¹ Frames are considered as spatial and temporal attachments (bonds) of a set of interactive messages

² The Agenda-setting theory determines which stories will be newsworthy in accordance to the concern of powerful actors such as transnational companies, governments of developed countries, and groups of interest. The Agenda is implemented specially via Frames.

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