

Chapter 21

Emotions and Social Evolution: A Computational Approach

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ABSTRACT

Emotion and social processes are evolutionarily intertwined. In this chapter, the authors present their TPR, TPR 2.0 and The Game of Emotions simulations along with the justification of necessary ideas in order to achieve the next level of research. This chapter describes a defense of the epistemological value of computer simulations for the analysis of emotions and social interactions. Finally, the elements of the model are described and defined with a sketch of the basic control algorithm.

1. WHY DO WE NEED ARTIFICIAL EMOTIONS?

Living entities increase their range of possible interactions and behavior according to the complexity of their embedded information processing systems, which reached a maximum level with the emergence of central nervous system and brain. Encephalization, adjusted by the Encephalization Quotient (EQ), understood by early modern researchers, was cognition at a high capacity of cognitive tasks, situating symbolic thinking at the top of possible brain performances. Leading intelligence, symbolic thought and encephalization considered as correlated variables. In this model, emotions had no place or role, but were even considered noisy or fuzzy elements that should be minimized or avoided. What we learned is that all these ideas were incorrect, at least in that naïve form. First, cognition not only happens into the brain, but there are morphological constraints that affect and direct cognition; second, extended cognitive processes are at the core of the cognition and make possible to understand how brains evolved towards the use of symbolic elements following auxiliary elements like external memories or graphical notations for better visualization; and finally, emotions have demonstrated to play a determinant role in the cognitive processes. This has proven valid for any cognitive system emerged from natural evolution, and consequently, for human beings.

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But what about artificial intelligence? Have machines been reproducing this naturalistic approach? The answer is a rotund ‘no’. Despite several biologically inspired strategies like genetic algorithms, a-life, biorobotics, evolutionary computation and electronics, swarm intelligence, and artificial neural nets or cellular automata among a long list (see the excellent compendium of Floreano and Mattiussi, 2008), the presence of emotions is close to zero. There is an exception though: the environments in which machines must interact directly with human beings; only these contexts explain the existence of the affective computing and social robotics research fields.

Perhaps we can find some small clues that show basic interest among AI communities towards emotions, like the idea of ‘drive nodes’ from Stephen Grossberg, a pioneer of Artificial Neural Networks (inspired by the experimental results of 1971 by Walle Nauta on how brain frontal lobes controlled the interoceptive censorship of plans), or the basic Cognitive Architectures of Aaron Sloman in the 1980’s (after the revival into the study of emotions supported by Ekman, Ortony, Scherer, Oatley, et al.). Even the emergence of Affective Computing, by Rosalyn Picard at MIT in 1995 followed the publication of a seminal and very influential work or a Neurologist: *Descartes Error*, by Antonio Damasio, in 1994.

Perhaps emotions are not the backbone of AI systems since they neither have a real or strong presence in most economic and social sciences computer simulations. It’s something absurd and shocking that those models, which try to explain human collective behavior, do not include into the models the emotions that drive human life. Over-simplistic variables like ‘hunger’ ‘friendship/enemy’ or ‘sexual mating’ seems to be lacking. Human beings do not run cost-benefit analysis before any daily activity: they just act according to their previous ideas about the world and internal emotional states. Simulations regarding emergence and evolution of social strategies must include emotional aspects of a human life. It is true that basic emotions are related to survival actions like feeding (individual survival) or mating (survival as species through gene transferring), but only with them human societies and symbolic thinking would have not emerged. At the same time, from protoemotional positive-negative basic input processing as pleasant-painful data, we cannot explain sophisticated social strategies or emotions like cooperation, shame, fear, guilt, or pride, ...most of which involve moral regulation of human communities. This fact also requires another technical element: the innate ability of human beings to share and understand internal feelings, thanks to their holistic expression (body gestures, voice tone, eyes gaze, cultural signs). These signals are understood by the virtue of specialized neurons, called mirror neurons, and allow the ‘feeling of the other’s feelings’ and thus, a direct and deep sharing of experiences with meaning... this is the social signaling process.

As a consequence we can affirm that: a) emotions are basic cognitive elements necessary to explain not only human thinking but also to design systems that must take decisions under complex, dynamic and fuzzy conditions; b) emotional mechanisms explain the basic bonds and modulations among individuals that create societies.

Thus, we need to implement emotions at several levels in order to obtain reasonable mechanisms to explain individual and social behaviors. The range of the individual behaviors have been here defined only under the umbrella of the epistemic activities, but emotions affect the whole system; about social dynamics, emotions provide the answers about why societies emerged and their managed strategies.

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