

Blame on Them, Shame on Us: Combining Affective and Normative Behaviour in Intelligent Virtual Agents

(Extended Abstract)

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ABSTRACT

Virtual environments often try to simulate situations where agents should display socially acceptable behaviour, as described by social norms. Actions that fulfil or violate norms can be potential sources for emotions, not just for the agent responsible, but for all agents that witness the event. We claim that the type and intensity of those emotions depends, not only on the salience (importance) of the norm, but also on the social relations between agents. We present a model to generate emotions triggered by a norm-related event, based on a subjective evaluation (appraisal) of this event made by every agent that witnessed it. This appraisal takes into account the salience of the norms and the social relations in order to create more believable agents.

Categories and Subject Descriptors

H.1.2 [Models and Principles]: User/Machine Systems—*Human Factors*
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Human Factors, Theory

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Emotions, Norms, Appraisal, Social Relations

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1. INTRODUCTION

Emotions are essential to build believable agents in virtual environments. Agents that are able to react emotionally to events that affect them will be far more engaging than those who appear purely ‘*rational*’. Certain emotions, like satisfaction or fear, are related to events that help or hinder the character’s goals, while others, such as love or hate are related to the character’s personal preferences. Significant work has been done in the Virtual Agents community in trying to capture these types of emotions in different application areas [3] [4] [6]. However, another type of emotions, more social and related to appropriate or inappropriate behaviours in social situations, are also particularly important to capture. By appropriate behaviours we mean those that conform with the behaviour prescribed by the norms of that society, while inappropriate behaviours are those that do not. For example, when an agent does not act according to a social norm, social emotions, such as reproach, can arise in other agents that witness this behaviour.

Norms can be seen as prescriptions for the behaviour that should be displayed by members of a group in a given context. Although agents should comply with social norms, they can violate them instead, either by choice or by lack of resources. Therefore, in virtual environments that try to simulate situations where the virtual agents need to obey certain norms, believable agents must also be able to react emotionally to appropriate and inappropriate behaviours. We claim that these emotional reactions depend not only on the salience of the norms (with salience, we refer to the perceived degree of importance and strength of a norm [7]), but also on the social relations between characters. A misbehaviour from a friend is more likely to embarrass you, while a misbehaviour from a stranger is more likely to upset you. We propose a model that is able to generate social emotions by evaluating (appraising) such actions.

2. A COMPUTATIONAL MODEL FOR NORMATIVE EMOTIONAL AGENTS

In a society where each agent has its own personal goals that may conflict with the goals of other agents, the introduction of norms balances the internal goals of the agents with the needs of the society. The fulfilment, and especially the violation of a norm can trigger strong emotions and emotional expressions. Norms and emotions are inherently complex and with wide influence in the agent's reasoning process. For instance, emotions influence how agents perceive the world and how agents deliberate when choosing their most important goal at any given time. Norms can generate and suspend goals and can influence how agents build plans to achieve them. There is also a strong bidirectional relation between norms and emotions. By influencing goal deliberation, some emotions, like anger, increase the likelihood that agents shall disregard norms that conflict with their personal goals. On the other hand, norms, or more concretely, the appraisal of the actions that fulfil a norm can be a source of positive emotions, such as pride, while the violation of norms can trigger negative emotions such as shame.

Our model is focused on the generation of social emotions via the appraisal of norm-related actions. Simply, the model is composed by two main components: (a) the normative component, which recognizes when an action causes the fulfilment or violation of a norm, and (b) the emotional component, which generates emotions by appraising those actions.

The normative component is based on the work presented in [1] and [2]. It is constantly evaluating the state of the world to identify if the agent is expected to enact or abandon a social role. When the agent enacts a social role, it becomes responsible to follow a certain behaviour prescribed by a set of norms linked to that role. Whenever the state of the world is such that one of those norms becomes active, the agent must decide whether to behave according to the norm or to pursue personal goals that conflict with it. Regardless of this decision, all active norms are kept in the agent's mind so that it can evaluate when its actions (or the actions of others) cause the fulfilment or violation of one of those norms. This is achieved by comparing the (normative) conditions in the norm that specify the social acceptable behaviour with the state of the world after the action was performed.

When the fulfilment or violation of a norm is detected by the normative component, the action that triggered this event is appraised in the emotional component. This component uses the OCC cognitive theory of emotions (named after its creators Ortony, Clore and Collins) [5]. The appraisal of such events is made regarding the agent's standards created by the active norms. When the action does not meet those normative standards, as in the case of a norm's violation, the emotions that can arise are negative (shame if the perpetrator is the agent itself or someone that the agent likes or respects, and reproach otherwise). If the action meets the standards, positive emotions can emerge (pride when the action was performed by the agent itself or by someone that shares a bond with it, and admiration otherwise).

3. CONCLUSIONS AND FUTURE WORK

We have discussed the importance of having agents that are able to behave taking into account the normative expectations of the society and to react emotionally when actions

conform or defy these expectations. We proposed a model that focus on how norm-related events can trigger emotions and emotional reactions via the appraisal of these events. Our model is composed by a normative component, inspired by the research done in normative systems, that is able to recognize when an action causes the violation or fulfilment of norms, and an emotional component, based on the OCC appraisal theory, that generates an emotional state by evaluating how the action deviates or conforms to the expected behaviour, taking into account the salience of the norm and the social relation between agents. In a future work, we want to conduct a comprehensive evaluation to test if the emotions generated by the model are similar, both in type and intensity, to those typically felt by humans when a norm-related event occurs.

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6. REFERENCES

- [1] F. Dignum. Autonomous agents with norms. *Artificial Intelligence and Law*, 7(1):69–79, 1999.
- [2] N. Ferreira, S. Mascarenhas, A. Paiva, F. Dignum, J. Mc Breen, N. Degens, and G. Hofstede. Generating norm-related emotions in virtual agents. In *Intelligent Virtual Agents*, pages 97–104. Springer, 2012.
- [3] J. Gratch. Émile: Marshalling passions in training and education. In *Proceedings of the fourth international conference on Autonomous agents*, pages 325–332. ACM, 2000.
- [4] S. Marsella, W. Johnson, and C. LaBore. Interactive pedagogical drama. In *Proceedings of the fourth international conference on Autonomous agents*, pages 301–308. ACM, 2000.
- [5] A. Ortony, G. L. Clore, and A. Collins. *The Cognitive Structure of Emotions*. Cambridge University Press, 1988.
- [6] A. Sloman et al. Beyond shallow models of emotion. *Cognitive Processing: International Quarterly of Cognitive Science*, 2(1):177–198, 2001.
- [7] D. Villatoro, J. Sabater-Mir, and S. Sen. Social instruments for robust convention emergence. In *Proceedings of the Twenty-Second international joint conference on Artificial Intelligence-Volume Volume One*, pages 420–425. AAAI Press, 2011.