An emotional model for synthetic characters with personality

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1 Background

In recent years, emotional computing has found an important application domain in the field of interactive synthetic characters. Interesting examples of this domain are computer games, interface agents, human-robot interaction, etc. However, few systems in this area include a model of personality, although it plays an important role in differentiating agents and determining the way they experience emotions and the way they behave.

Some work explicitly take into account the personality of the characters. In [3], personality is viewed as a number of weights on different goals of agents. [1] uses formulas that determine how personality influences the way an agent experiences emotion. However, these papers do not focus on how personality influences the feeling and the expression of emotions at every step of the emotional process. In our work, we introduce an emotional model for synthetic characters that relies on a formal model of personality. We use studies from the field of psychology, regarding emotions, personality and the correlation between them in order to define a character able to express appropriate emotions in response to various situations.

Several personality models have been defined in psychology research. These models consist of a set of factors, where every factor is a specific property of the personality. Emotions have already been widely studied in psychology. Much research work, related to *cognitive appraisal theory*, proposes various criteria in order to distinguish emotions (see for example *OCC Model* [4]). However, the emotional process defined in these models is not complete [2], i.e. it does not specify how the personality factors influence the feeling of emotions. Moreover, links between emotions and their intensity, and the intensity thresholds corresponding to the activation of each emotion are not defined.

2 Proposed model

We propose an emotional model based on an explicit representation of personality and emotions and the correlation between them. This correlation represents the influence of each personality factors on the sensitivity to emotion categories.

The emotional process, that we have developed, lists steps that characters follow from the initial categorization of an event to the resulting emotional state. Thus, in the first stage, the character evaluates the event in order to define the emotion categories affected and their potentials. In the second stage, we calculate the influence of this emotional potential on the character emotions taking into account its personality. This emotional value will interact with the current emotional state of the character stored in the emotional memory. In this process, we also take into account the decay of emotions over time.

Formally, we represent the personality factors with a vector p of n dimension and the emotional state at time t by a vector $e(t)$ with m dimension. The influence of each personality factor ($p_i \in p$) on the sensitivity of each emotional category ($e_j \in e$) is represented by a function $f(p_i, e_j)$. Thus, a matrix M_{n*m} of functions is formed representing all influences of each personality factor on each emotional categories. With this matrix, we can calculate the influence on the character of the emotional potentials of the environmental stimuli.

We consider the decay of each emotion with a decreasing monotonous function whose pace depends on the personality and which tends towards the baseline emotion intensity of the character. The updating of the emotional state combines the influence of stimuli and the decay of previous emotions.

In order to validate our model, we have developed a tool for the simulation of emotional processes. We have created three characters with different personalities. Thereafter, we have submitted each one of these three characters to the same scenario. Our evaluation shows significative differences in emotional reactions according to each character personality.

3 Perspectives

We are currently working on the influence of the emotional state on the dialog and the decision-making process. It consists in generating behavior adapted to the situation and the character's emotional state.

References

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