Feeling and Reasoning: A Computational Model for Emotional Characters

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Abstract. Interactive virtual environments (IVEs) are now seen as an engaging new way by which children learn experimental sciences and other disciplines. These environments are populated by synthetic characters that guide and stimulate the children activities. In order to build such environments, one needs to address the problem of how achieve believable and empathic characters that act autonomously. Inspired by the work of traditional character animators, this paper proposes an architectural model to build autonomous characters where the agent's reasoning and behaviour is influenced by its emotional state and personality. We performed a small case evaluation in order to determine if the characters evoked empathic reactions in the users with positive results.

1 Introduction

The art of creating engaging and believable characters is well studied among traditional animators [22]. Traditional characters like *Mickey Mouse*, or more recent 3D characters like *Shrek*, are able to create the illusion of life and allow for the establishement of emotional relations by the viewers. The viewer feels sad when they are sad, angry when something unfair is done to them and so on. These emotional relations are named empathic relations. Empathy can be defined in broad terms as "an observer reacting emotionally because he perceives that another is experiencing or about to experience an emotion" [6].

The use of such empathic characters in virtual learning environments has obvious advantages. Children's didactic software usually uses animated characters (3D or not) to guide the child trough the application and activities. They stimulate the child interaction with the environment, enrich the child experience and captivate their attention. However, such animated characters, like in traditional animation, are scripted for each possible scenario when the application is designed. When the child presses a given button, the character will just play the corresponding scripted behaviour. This does not only forces to create such scripted animations for each possible situation, but also limits the possibilities of the child's interaction.

Ideally, one would like to have Intelligent Virtual Environments (IVEs) inhabited by autonomous agents, which "think" and act on their own. Such

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autonomous agents make the environment neither predictable nor completely controlled, and thus it is not possible to prescript animations for each situation. The narrative can then emerge from the individual performance of each character. However, making autonomous agents believable and empathic it's a quite difficult problem. This paper presents an agent architecture that aims at achieving such empathic autonomous characters, inspired by some of the elements present in traditional animation.

To illustrate our approach, we will look at one particular example of a pedagogical system. FearNot![5] is a computer application developed to tackle and eventually help to reduce bullying problems in schools. Bullying has associated with it a wide variety of behaviours such as hitting, or kicking, in the case of direct bullying, or, in relational bullying, social exclusion or malicious rumour spreading. Thus, the overall objective of the development of FearNot!, was to build an anti-bullying demonstrator in which children age 8 to 12 experience a virtual scenario where they can witness (from a third-person perspective) bullying situations. The child acts as an invisible friend to a victimized character, discussing the problems that arise and proposing coping strategies.

Note that in bullying situations there are quite clear identifiable roles: the bully, the victim, bully-victim (a child that is sometimes the victim and sometimes the bully) and bystander. Therefore it is necessary to build an agent architecture that not only supports believability, but also offers an easy process of building characters with particular behaviours. In sum, the architecture aims at achieving synthetic characters with the following characteristics:

- **Believability and Empathy:** The characters must be believable and be able to produce empathic reactions with users.
- **Reactive and Cognitive Capabilities:** Given the scope of possible domains, characters should react as quickly as necessary in a rapidly changing environment. However, reactive behaviour is too predictable for a truly autonomous character. Believable characters should display motivations, goals and desires, which is only possible if they have cognitive capabilities.
- **User Interaction:** The characters should be able to interact with an external user and receive suggestions. However, any influence the user may perform cannot be direct, because the character cannot take the user suggestions blindly without taking the risk of not acting in character and thus loosing believability.
- **Generality:** The agent architecture should be domain independent, i.e. it must allow the easy creation of different characters with different personalities for different domains.

To determine if the developed architecture is able to achieve believable characters a small evaluation was performed with eleven-year old children. In order to determine the effects of the user's interaction in the story, we compared our results with the results obtained from a scripted version, where the children could not influence the outcome of the story.

The rest of the paper is organized as follows: in section two we present some related work that led us to the final design of our architecture; next we define some of the most relevant concepts used in our model and depict the architecture. Afterwards an illustrative example is presented to explain how the internal