Affective Interactive Narrative in the CALLAS Project

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1 Introduction

Interactive Narrative relies on the ability for the user (and spectator) to intervene in the course of events so as to influence the unfolding of the story. This influence is obviously different depending on the Interactive Narrative paradigm being implemented, i.e. the user being a spectator or taking part in the action herself as a character. If we consider the case of an active spectator influencing the narrative, most systems implemented to date [1] have been based on the direct intervention of the user either on physical objects staged in the virtual narrative environment or on the characters themselves via natural language input [1] [3]. While this is certainly empowering the spectator, there may be limitations as to the realism of that mode of interaction if we were to transpose Interactive Narrative for a vast audience.

Spontaneous audience reactions are not always as structured and well-defined as previous Interactive Narrative systems have assumed. If we consider that the narrative experience can be essentially interpreted as generating various emotional states (e.g. tension) which derive from its aesthetic qualities (e.g. suspense [6]), a logical consequence would be to analyse spectator's emotional reactions and use these as an input to an Interactive Narrative system. Such an approach would actually constitute a "feedback loop" between an Interactive Narrative inducing emotions and the analysis of the quality and intensity of such emotions expressed by the user. It is notoriously difficult to accurately detect and categorise spontaneous affective states occurring when users are engaged with various media. This is why we have revised the affective loop described above and, in an attempt to improve the elicitation of user emotional reactions we have inserted a virtual agent, acting as a co-spectator into that loop (see an illustration of the installation in Fig. 1).

The system can now be described as comprising i) an interactive narrative using traditional plan-based generative techniques, which is able to create situations exhibiting different levels of tension or suspense (by featuring the main character in

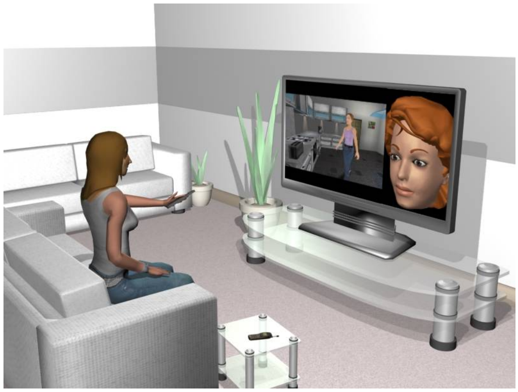

Fig. 1. Affective Interactive Narrative installation

dangerous situations) ii) an expressive virtual character (implemented using the Greta system [4]) whose role is, by accessing the internal data of the narrative planner, to exaggerate the emotional value of a given scene so as to make it more visible to the user and iii) affective input devices, which at the current stage of development of the system are limited to an affective speech detection system (EmoVoice [5]) and a multi-keyword spotting system detecting emotionally charged words and expressions.

Overall, the system operates by generating narrative situations of various levels of intensity and tension, which are conveyed to the user via the additional channel of the expressive character. The system then detects in real-time the emotional state of the user, in this first version mostly through its vocal reactions[1]. Finally, the emotion detected is used as a feedback on the story generation system to reinforce (positive feedback) or slow down (negative feedback) the narrative tension of the generated story.

2 System Overview and Results

We present a brief overview of the integrated system for the Affective Interactive Narrative installation (see Fig. 2) as well as some early results. The visualisation component is drawn from the character-based interactive storytelling system developed by Cavazza et al. [1] on top of the UT 2003™ computer game engine (Epic Games).

The narrative engine is essentially a HTN planner determining for the main virtual actor what action it should take next. The actions selected are passed to the game engine, in which they are associated to corresponding scripts describing the physical realisation of the action (including specific animations). Our first experimental prototype is based on a similar plot to Lugrin's *Death Kitchen* interactive narrative [2].

[1] Because vocal reactions correspond to a strong level of arousal, the expressive character plays an active role in increasing the user's reactivity. Future versions of the system will include the analysis of paralinguistic input (including silence) and video analysis of user's posture.

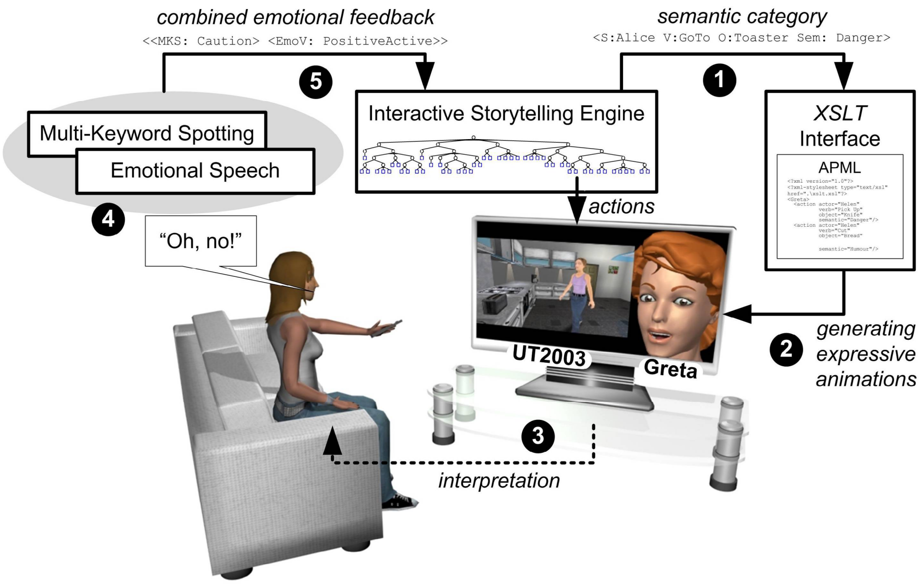

Fig. 2. System overview illustrating the sequence of processes

The overall plot consists in having the virtual character carry out everyday tasks in the kitchen where there is a great potential for dangerous tasks to take place. Unlike Lugrin's system which is based on emergent narrative paradigm, our prototype supports the specification of the narrative via the description of the virtual character's behaviour using a plan-based representation of everyday activities. The influence on the interactive storytelling engine comes from the emotional feedback portrayed by the user visualising the plot unfolding on the screen.

For instance, the virtual character is about to carry out a dangerous task in the kitchen, such as walking over a spillage on the floor. This dangerous situation is highlighted by the expressive virtual agent by playing the animations of the appropriate facial expression generated in real-time using our Java-based software interface which translates the information provided by the interactive storytelling engine into the appropriate APML commands using XSLT. The reaction from the user can be to warn the virtual character by shouting utterances such as *"Oh no!"*, *"Ah no!"*, *"Oh my god!"*, which are interpreted by the multi-keyword spotting component as a cautionary utterance. The EmoVoice component analyses the acoustic features of the utterance to recognise the emotional aspects of speech. This component incorporates so far three emotional classifications: *Neutral*, *PositiveActive*, and *NegativePassive*. The level of arousal (*PositiveActive*) defined from the user's utterance generates a high value of influence on the narrative engine by means of a dynamic change in the heuristic value. The remaining planning process is then influenced by the modified heuristic steering the subsequent selection of tasks towards a less dangerous set of situations.

3 Conclusion

We have described a first proof-of-concept implementation of our system, whose purpose was mostly to validate the concept of feedback loop and experiment with the various constraints on the system's response times. Such a prototype would not be able to support user reactions to narrative "instantaneous" events (fall of an object, impact of a missile) unless these are somehow announced or the action is artificially slowed down. We are however devising mechanisms for progressive tension generation that would be able to announce events of intense narrative significance before these are actually generated by the system. This would in turn make possible to process the user's emotional reaction to actually have an influence of the story unfolding, rather than just record emotions and reactions *a posteriori.*

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