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1 Introduction

Story-worlds are virtual worlds inhabited by synthetic characters that provide an environment in which users participate actively in the creation of a narrative. Implementation approaches range from plot-driven to character-based [4,7]. Character-based approaches require synthetic agents with autonomy and personality. Affective agent architectures [13,2] are used to construct such autonomous personality agents, and computational models of emotion are seen as a prerequisite for the required emotional and social competences. The present paper reports on ongoing work based on the experiences gained in earlier work, in particular TABASCO [6] and ActAffAct (Acting Affectively affecting Acting [8,10]). The following section reviews details of the earlier approach towards creating a story-world to generate cliché stories, while the later sections present the changes in scope and approach adopted in our current work.

2 ActAffAct: Goals, Approach and Results

The ActAffAct project researched a bottom-up approach to imitating emotional characters interacting in a story-world. The goal was to achieve the unfolding of a plot-like structure while limiting the use of external macro-level control—as traditionally exerted by, e.g., a director. The ideal level of external control would be none at all, resulting in the emergence of plot from the characters' interaction, effectively turning the agents into reusable roleplayers. A basic assumption of the project was that emotions—as described in appraisal theories [5,12,1]—can provide the links between actions that render a plot plausible. More specifically, the interplay of motivational constructs and the subjective evaluative interpretation of changes in an agent's environment provide for the causal and emotional connections that can lead to the unfolding of a story, given an environment set up to be prone to conflict. We implemented a simple 2D world (see Fig. 1) populated by four agents parameterised to roughly correspond to archetypical dramatic character types: hero, mentor, villain, and victim. Further, the world contained some objects to be used to instigate conflicts by helping, hindering, challenging, and rewarding agents. An appraisal-based architecture was implemented to

control the characters. It used a pragmatic approach to integrate an appraisal theory [5] into a belief-desire-intention type plan-based agent framework [3].

ActAffAct was a first step towards the goal of dramatically and emotionally believable software agents, and it succeeded in creating dramatic structures, if for a rather limited notion of drama. Even so, the direction held promise for further work. A significant aspect of *interactive* drama to remain excluded was interaction itself, i.e., the interaction between one or more human users and the system. For real-time interaction to be possible in an emotionally meaningful way, we concluded that the disambiguation, structuring, and valuation of information acquired in sensorimotor interaction provided as a part of appraisal would need to be integrated at a lower granularity. The simulation of sensing and acting in a virtual world by exchanging pre-structured symbolic information does not match the intricate relation between perception and appraisal in real life. Further, research efforts in the European Network of Excellence Humaine[1] corroborated a focus on the pervasive role of emotion in humans and its operationalisation in a virtual agent.
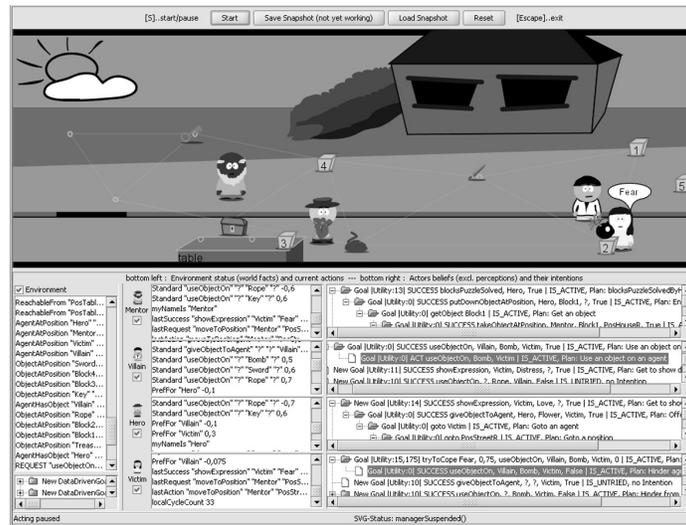

Fig. 1. The ActAffAct viewer application

3   BehBehBeh: Goals and Approach

BehBehBeh (Behaviour Behooving Behaviour [9,11]) is based on reconsidering the building blocks of affective agent architectures in order to provide for a rich

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[1] Human-machine interaction network on emotions, http://emotion-research.net

and reasonably complete integrated agent architecture while delineating clearly all modelling shortcuts due to technical reasons or related to the scenario targeted. For BehBehBeh, the environment was changed to a simulated 3D world including a physics simulation. From the start, the objectives of this new version prioritise interaction with a user. All interaction with the environment is modelled as a dynamic process, and several concurrent modalities are to be included (simplified vision, hearing, smell, movement, and basic object manipulation). In order to achieve such a richer model of the internals of an affective agent, we propose to use concurrent communicating *processes* as model building blocks; these acquire and use *resources* that model the embodied limits of the agent itself. Basic types of resources are the processing time available to the agent and the communication channels for inter-process communication. The agent's abilities to interact with its environment are also abstracted as resources, to be used and controlled in a timely manner by its internal processes. Shortcuts required to achieve practical results are also reflected and marked as resources. While this approach towards a richer model of internal processes initially leads further away from the goal of interactive drama, we consider it a necessary step towards affectively satisfying interaction with virtual beings. In order to reduce the complexity of creating a complete affective model based on these building blocks, we focus on a series of specific emotional phenomena, modelled incrementally; as very first phenomenon we chose an episode of disgust (see Fig. 2).
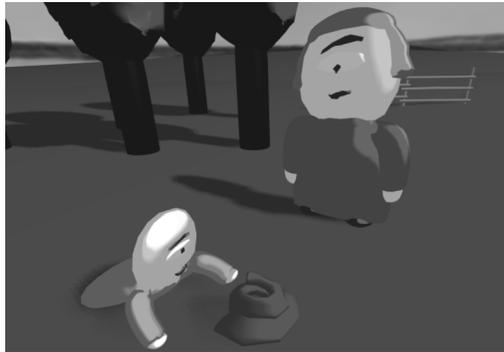
Fig. 2. Disgust, the first episode modelled in BehBehBeh

4   Conclusion and Future Work

BehBehBeh is work in progress, aimed at overcoming limitations identified in earlier work by incrementally modelling emotional episodes using bounded resources and concurrent processes. These building blocks are motivated by the needs of modelling a physical system, by the characterisation of emotion in psychological theories, and by practical implementation concerns. Future work includes the

steady addition of models covering further emotional episodes, building architectural abstractions as the need arises. To verify consistency of the models, they will all be integrated in a single game-like scenario.

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