Emohawk: Learning Virtual Characters by Doing

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Abstract. Emohawk is a narrative-based serious game designed to be a supportive tool for teaching basics of virtual agents development at universities and high-schools. Emohawk is built utilizing a free version of Unreal Engine 2 and it features an interactive scenario with four virtual agents controlled by an appraisal-driven architecture playing out a story approximately 5-10 minutes long. Students are engaged in solving game-based tasks with increasing complexity and simple programming tasks related to various parts of the virtual agents curricula. The Emohawk distribution includes documentation, graphical debugging tools and tutorials. The project is in continuous development and we plan a large evaluation for the 2010/2011 academic year.

1   Introduction

Serious games are becoming increasingly important as educational aids. Despite some skepticism about integrating games within formal schooling environments, e.g. [4], the recent data suggest this approach as promising, e.g. [3].

The discipline of studying virtual characters (VC) matures; however educational issues in this field remain largely unaddressed [2]. To address the existing gap, we have been developing a serious game called Emohawk [5]. The game's goal is to provide support for the education in VC development. In particular, it should assist in teaching: a) basics of 3D VC control, e.g. steering and reactive planning, b) appraisal-driven architectures, c) coordination of multiple characters; i.e., unfolding "atomic bits" of a story, d) composing a story from these "atomic bits". The primary audience is university students and teachers of general computer sciences, social sciences, computer games and new media and art. However, our game should also serve as a tool for teaching high-school students, both girls and boys, basics of programming and graphics and promoting them to study technical disciplines at universities. Therefore, we have designed it to attract attention of this audience as well.

The Emohawk's scenario is situated within a 3D virtual town with modern architecture (Fig. 1a-c) featuring six different virtual characters (two boys, three girls and an alien creature called emohawk) with hundreds of animations. Students proceed in the game through several game levels corresponding to various parts of a typical university VC course, e.g. [2] (presently, two levels are finished). Each level represents an interactive task, in which the student is expected to build in his or her mind mental models related to particular aspects of VCs. This should happen while

the student actively explores the underlying mechanisms producing the overall narrative.

For instance, in one game level, students can switch on/off individual steering rules, investigating the impact on the resulting walking behavior. Another level provides students with control over individual appraisal rules. A third level gives the opportunity to add objects, which may distract the characters to the environment and investigate agent's attention mechanisms. In general, the game-play comprises constrained interaction with the environment from the observer's perspective.
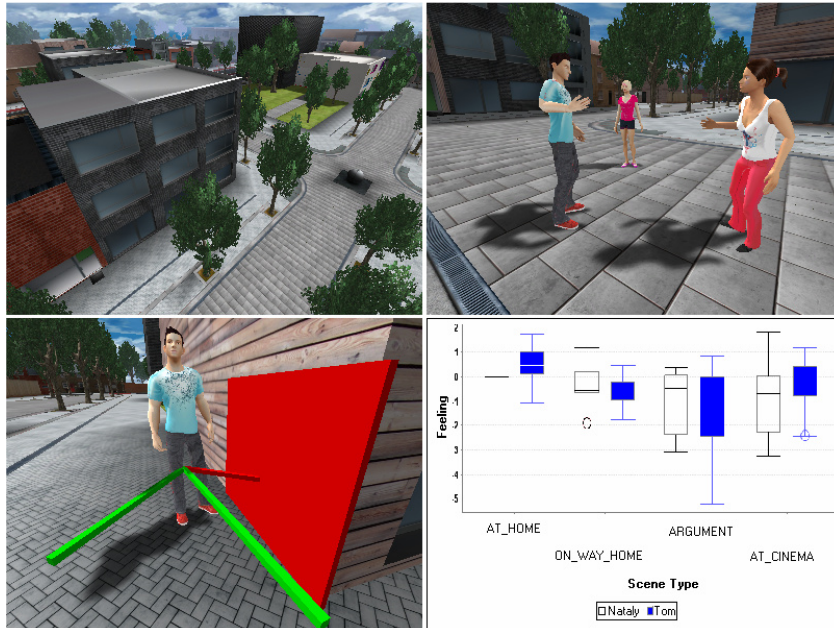

Fig. 1. Emohawk content in Unreal Engine 2: a) a virtual city, b) three characters arguing, c) a character with ray-tracing visualization, and d) one of output graphs.

2 Technical Information

Emohawk is built upon the Pogamut platform [7] and uses the Unreal Engine 2 Runtime (UE2) [6] to represent the 3D world. Pogamut is our own toolkit allowing for rapid VC development in Unreal Tournament 2004 and UE2. UE2 offers a free licensed 3D environment with limited environment content. We extended the content (Fig. 1) by creating a 3D virtual city, new objects, and new character models with animations. These extensions are distributed with Emohawk.

Emohawk's game-play is organized around a narrative featuring four main virtual characters controlled by an appraisal-driven architecture. Its setting is as follows:

At the edge of a small city, there is an emohawk farm. An emohawk is a kind of pet that has the ability to suck emotions from people and spit them on other people. Sometimes, an emohawk manages to escape from the farm.

Thomas, age 16-19, lives in the town. He has a girlfriend Barbara and, well, yet another girlfriend Natalie. The girls, of course, do not know about each other.

Thomas and Barbara had a lovely date at the cinema. Now, Thomas has to walk Barbara home and he has to make haste, since Natalie is waiting for him to be taken to the very next movie. Besides all this, there is an escaped emohawk roaming around.

The story is branching and emerges from a centralized story director and appraisal-driven architecture controlling individual characters that combines reactive behavior and a fixed pre-set plan. The fixed pre-set plan defines goals and times when the goals should be activated (e.g. driving Thomas to pick up a girl in the middle of the story). Reactive behavior allows for dynamic addition of goals handling various situations such as "a girl meets the emohawk creature". The centralized story director handles synchronization of characters – it controls the agents during multiple agent interaction, e.g. the boy and the two girls meet and start arguing.

There is no natural language communication between characters in Emohawk. Conversations are mediated via gestures and emoticons.

Debugging is an essential part of development. Emohawk toolkit features debugging windows allowing for inspection of internal states of characters during the story run and presents a set of graphs and text outputs automatically generated at the end of the story, saving the story runs for further analysis (Fig. 1d).

3   Usage

The usage of the Emohawk serious game and its content is threefold. Firstly, users may simply play the game as outlined above. Secondly, Emohawk allows for scripting simple stories. Users may script movement and animations of VC by means of a graphical editor. Users can save the final story and share it with others. Thirdly, Emohawk's content may be used for tutorials or as an environment where students can solve various programming tasks (e.g., building an obstacle avoidance code for characters). While the first two possibilities are aimed at high-school students, the first and the third are suited for university students and researchers.

The second Emohawk usage presents an overlap with the Storytelling ALICE (SA), which was already used with positive results when educating middle school students [8]. SA is more complex than Emohawk's GUI in regard to scripting stories; however, Emohawk presents content suitable for older audiences: e.g high-school students.

4   Conclusion

This paper presented our freeware serious game Emohawk designed to be a supportive tool for teaching basics of virtual agents development and programming.

The target audiences are university and high-school students. Emohawk features a 3D virtual environment, an interactive scenario with virtual characters, tutorials, and graphical debugging tools. On the one hand, Emohawk is a tool designed for teaching. On the other hand, it will present a working example of a storytelling system, complementing few other storytelling systems, such as Façade [9] or FearNot! [1].

Our work on Emohawk still continues, most notably, we improve characters' behavior during interactions and create game levels. Emohawk's graphical content (but not the game as such) was already used on an AAMAS10 tutorial. We conducted a small-scale evaluation of the application's graphical content by high school students during 2009: the results suggested that the graphics was accepted by this otherwise very critical target group. We plan a larger evaluation in the academic year 2010/11.

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