Interactive Storytelling with Temporal Planning (Demonstration)

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ABSTRACT

Narrative time has an important role to play in Interactive Storytelling (IS) systems. In contrast to prevailing IS approaches which use implicit models of time, in our work we have used an explicit model of narrative time. The goal of the demonstration IS system is to show how this explicit temporal representation and reasoning can help overcome certain problems experienced in IS systems such as the co-ordination of virtual agents and system inflexibility with respect to the staging of virtual agent actions. The fully implemented system features virtual agents and situations inspired by Shakespeare's play *The Merchant of Venice.*

Categories and Subject Descriptors

H5.1 [**Multimedia Information Systems**]: Artificial, augmented and virtual realities

General Terms

Algorithms

Keywords

Interactive Storytelling, Agents in games and virtual environments, Narrative Modelling, Planning

1. INTRODUCTION

The prevailing approach to the handling of time in Interactive Storytelling (IS) has been to use an implicit model of time but, in contrast to this, our approach has been to incorporate explicit representation and reasoning about time into the process of narrative generation.

In the demonstration system our aim is to illustrate a number of important benefits that result from our adoption of an explicit model[1]. In particular, we aim to show how system reliability can be improved since our approach provides a means to overcome problems associated with the timing and co-ordination of virtual agent actions. In addition, we aim to show how this approach provides greater flexibility and opens up a wider range of possibilities for staging and cinematographic aspects of virtual agent actions.

[1]This is a companion paper to our AAMAS paper [4].

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2. DEMONSTRATION SYSTEM

Our IS demonstration system is fully implemented. It features virtual agents and situations inspired by Shakespeare's *"The Merchant of Venice"* [5] which are staged in a 3D world as shown in figure 1. Different narrative variants can be generated by the system depending on which characters' Point of View (PoV) [3] is used for narrative generation. Users can interact with the system, at any time, in order to change character PoV and subsequently continue with the narrative or back up and re-run parts of the narrative from this new perspective. Narratives generated by the system typically span the whole of the play and consist of 40+ actions. The system runs in real-time with average system response time to user interaction well within an upper bound of 1500 ms.

The representation language PDDL3.0 [2] is used to specify the explicit model of the narrative domain. Output narratives are generated using our decomposition planning approach [4] that iteratively invokes the temporal planner Crikey [1] on a series of decomposed sub-problems. As narrative actions are received from Crikey they are sent to a visualisation engine which then stages these actions in the 3D environment using UnrealScript. Our temporal planning approach provides a direct route to mapping between planning actions and their visualisation through the transfer of PDDL3.0 temporal parameters to animation control structures (UnrealScript action descriptions).

Figure 1: The *Merchant of Venice* 3D stage with visualisation of one of the virtual agents, Antonio.

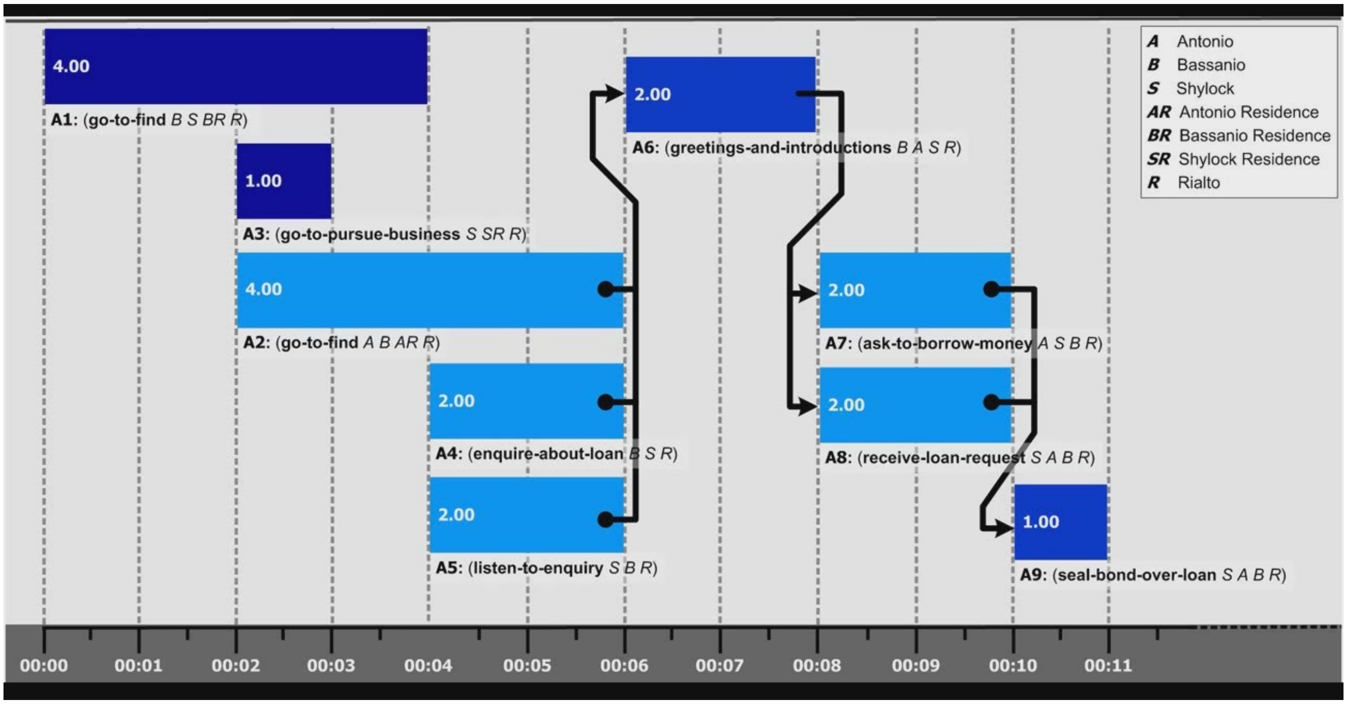

Figure 2: Demo System Timeline Window: time points are plotted across the bottom and narrative actions are positioned according to their scheduled start and end times. This provides a view of parts of the narrative that feature required concurrency between actions (e.g actions A2, A4 and A5 at time 00.04 to 00.06).

3. DEMONSTRATION SCENARIO

The objective of the demonstration system is to highlight how explicit temporal reasoning provides a principled means to overcome a number of problems that can arise in IS.

One such problem is the synchronisation of virtual agents as generated narratives are visualised – if the staged execution time of actions is ignored during plan generation then this omission may only become clear at the point of visualisation with the possibility of real-time system failure (e.g. an agent fails to meet up with another agent because they arrive too late, after the other agent has already left). Such examples arise in our *Merchant of Venice* system and the demonstration system enables user exploration of them.

Another problem which our explicit temporal reasoning approach helps address is system inflexibility with respect to staging and cinematographic aspects of virtual agent actions. The output of our temporal planning approach is generated narratives that include scheduled start times for each agent action, their duration and required overlap – precisely the information that can be utilised for staging actions in different ways. Narratives featuring such overlapping actions are output by our demonstrator (as shown in figure 2) and the system enables users to explore different possibilities for the staging of these narrative segments.

4. USER SESSION

During a typical session the user is able to interact with an interactive narrative window in which actions from a generated narrative are staged in the 3D world (as shown in figure 1). Users are also able to interact via a timeline window which gives a high level view of the narrative as it is being staged and any required concurrency between actions (as shown in figure 2). Users are free, at any time, to change PoV and replay parts of the narrative. It is also possible to replay segments of the narrative to run through different possible ways of staging the actions in the 3D world.

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5. REFERENCES

[1] A. I. Coles, M. Fox, K. Halsey, D. Long, and A. Smith. Managing concurrency in temporal planning using planner-scheduler interaction. *Artificial Intelligence*, 173:1–44, 2009.

[2] A. Gerevini and D. Long. BNF Description of PDDL3.0. Technical report, 2005. http://www.cs.yale.edu/homes/dvm/papers/pddl-bnf.pdf.

[3] J. Porteous, M. Cavazza, and F. Charles. Narrative generation through characters' point of view. In *Proc. of 9th Int. Conf. on Autonomous Agents and MultiAgent Systems (AAMAS 2010)*, 2010.

[4] J. Porteous, J. Teutenberg, F. Charles, and M. Cavazza. Controlling narrative time in interactive storytelling. In *Proc. of 10th Int. Conf. on Autonomous Agents and MultiAgent Systems (AAMAS 2011)*, 2011.

[5] W. Shakespeare. *The Merchant of Venice*. Penguin Classics (New Ed edition), 2005.