The Trial The Trail, Act 3
A Virtual Reality Drama Using Intelligent Agents

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Abstract

The Trial The Trail is an interactive drama running on an immersive VR system. Imagine Tarkovsky's Stalker, crossed with Alice Through the Looking Glass, crossed with Monty Python and the Holy Grail. Now imagine embarking on a guided journey through this warped yet familiar landscape. Your guides are two intelligent agents, Patofil and Filopat. We consider a virtual reality drama to be a scripted play in which the computational agents are actors who have copies of the script, and one human audience member has been drafted to be a participant, but doesn't have a copy of the script. The computational actors must improvise reactions to the human participant's actions, but keep the play moving along in as close agreement to the script as possible. The goal is to provide the human participant with a specific emotional experience.

Dramatic Structure

The challenge for all interactive fiction is that of dealing with a completely free agent - the human participant - as a central element of the story. Even with a fixed, systematic storyline, we can be inundated by the number of real-time contingencies needed to respond to the participant's actions. Our dramatic structure (Anstey *et al.* 2004), is designed to contextually constrain these contingencies as much as possible, and allow us and our agents to concentrate on continuously interpreting and responding to the participant's actions.

At bottom, our drama is not a story we are communicating but a psychological arc we want the participant to traverse. Narrative elements, design choices, the personalities and performances of the actor-agents, are all selected to evoke certain emotions in the participant and are tightly coupled to the detecting of her state of mind. Our basic dramatic structure, the snare, explicitly attempts to move the participant from one emotional state to the next along that psychological arc. Snares can be of varying lengths, they can be assembled into sequences, and they can be nested. They work very like the acts, scenes, sequences and beats that are typically used to construct drama in plays and films, but with stricter emphasis on how the participant's emotional state may be stimulated and detected.

The Trial The Trail

The Trial The Trail is an interactive drama designed for an immersive VR system, and built on our previous experience with *The Thing Growing* (Anstey, Pape, & Sandin 2000). Imagine Tarkovsky's Stalker, crossed with Alice Through the Looking Glass, crossed with Monty Python and the Holy Grail. Now imagine embarking on a guided journey through this warped yet familiar landscape. As you proceed, your actions and interactions are logged, interpreted psychologically, and used to determine the outcome of your quest.

The two main characters are Patofil and Filopat. As they explain the quest and introduce and take part in a series of absurdist challenges,they take up positions relevant to the psychological terrain of the drama. Patofil is reckless and insouciant, believes the journey is more important that the arrival, and is dubious about the quest's goal—to obtain one's heart's desire. Filopat follows rules, adheres to duty and fervently believes in the quest. Patofil stimulates the participant to disobey. Filopat represents authority and security. The participant is encouraged to side with one, then the other.

In this demonstration, we present act 3, which begins with an entre-acte in which Filopat tells Patofil and the participant that they must stand all night in a vigil at a ruined chapel. In scene 1, Patofil and the participant are teleported to the mound where the chapel stands. After a short time one or the other tires of the vigil. At first they play with whisps that float through the air, and climb the ruins. Then they leave the mound in direct defiance of Filopat's injunctions. At this point they become separated. The scene ends with the participant hearing Patofil scream. In scene 2, the participant sees Patofil running, pursued by five bad guys. Three of these guys break off and surround the participant, taunting and pushing her. The sun rises. Filopat can be heard calling. The bad guys disappear.

The MGLAIR Architecture

The actor-agents are implemented according to the MGLAIR architecture (Shapiro *et al.* 2005), which is a modification of GLAIR (Hexmoor, Lammens, & Shapiro 1993). GLAIR is organized into several layers, which can be summarized as:

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The Mental Layer (ML) is the layer at which conscious reasoning takes place. It is implemented by the SNePS knowledge representation and reasoning system (Shapiro & The SNePS Implementation Group 2004), and its SNeRE (the SNePS Rational Engine) acting subsystem. SNePS, in turn, is implemented in Common Lisp.

The Body Layer (BL) contains the implementations of the actions that are primitive at the ML, and the low-level implementations of the agent's sensors and effectors.

The Environment is built using the Ygdrasil (Pape *et al*. 2003) virtual reality authoring system, C++, and Python. Real-time dynamic behaviors and interaction make use of an event-based structure; messages are passed between nodes in response to events. Messages include actions such as loading models, playing sounds, and moving objects.

Modalities

MGLAIR (Modal GLAIR) differs from GLAIR in that the BL is organized into modalities. A modality is a hardware or software resource utilized by an intelligent agent for either sensing or acting. A single modality can support only a limited number of behaviors at a time, but behaviors that occupy different modalities can be simultaneous. The modalities used by the actor-agents in *The Trial The Trail* are animation, hearing, mood, navigation, speech, and vision.

The Trial, The Trail runs on several computers, the ML and upper BL of each agent on one computer, the lower BL and the environment on another. Communication is via IP sockets organized by modality, one socket for each. The sockets provide the mind-body connection, with the "mind" running on one computer, and the "body" on another.

Several modalities provide feedback about what the agent, itself, says or does. This keeps her from starting one action while still performing the previous action. For example, Patofil's hearing her own lines prevents her from starting to say something while she is still delivering her previous lines.

Triggers

Just as a stage actor uses various cues to know when to take some action or deliver some lines, our actor-agents use triggers that are implemented in the world-model to identify the actions and locations of the virtual objects, agents, and the participant. We also use a stage direction agent, similar to a set manager, that is in charge of certain procedural tasks, such as initiating the beginning and ending of each scene, starting and ending the action of other interactive objects (i.e. the flow of whisps), and controlling the lighting of the scene (i.e. setting the sun, raising the moon).

The Scripts

Each actor-agent has a script, which constitutes a set of beliefs in its ML specifying how and when it should say its lines and perform its actions. Some actions are strictly sequenced; some involve arbitrary choice among several possibilities; some are event-driven. The script is expressed in SNePSLOG (Shapiro & The SNePS Implementation Group 2004, Chapter 7), a symbolic-logic-like interface language to SNePS.

Timers

Occasionally, an actor-agent is to engage in an activity for a set amount of time (unless interrupted). To do this, she may make use of an arbitrary number of timers, which can be set to expire in some number of seconds, triggering some other act, and may be paused, restarted, and cancelled. During the vigil, after 14 seconds of neither Patofil nor the participant doing anything, Patofil will start giggling.

Contingencies

The main line of the script is written assuming a compliant participant. Some deviations can be ignored; some are handled while pausing a timer; others may cancel the rest of a agent's goal-directed action sequence.

The Cast as a Multi-Agent System

The cast of computational actor-agents constitutes a multi-agent system, especially in act 3, scene 2, where three bad guys are required to cooperatively harass the human participant. They engage in two types of cooperative behavior: sequential actions and blocking actions. Just as Patofil perceives her own utterances to maintain the scripted order of her lines, these agents perceive their own and each others' utterances to follow the scripted order of their lines. Blocking actions, like jostling or pushing the user, must not be interfered with. Whenever an agent perceives that another agent is performing one of these actions, it will only perform actions that will not interfere. This restriction is lifted when the blocking action is finished, as indicated by a message from the virtual world via the agent's vision modality.

References

Anstey, J.; Pape, D.; Shapiro, S. C.; Telhan, O.; and Nayak, T. D. 2004. Psycho-drama in VR. In *Proceedings of The Fourth Conference on Computation Semiotics (COSIGN 2004)*, 5–13. Croatia: University of Split.

Anstey, J.; Pape, D.; and Sandin, D. 2000. The Thing Growing: Autonomous characters in virtual reality interactive fiction. In *IEEE Virtual Reality 2000*. IEEE.

Hexmoor, H.; Lammens, J.; and Shapiro, S. C. 1993. Embodiment in GLAIR: a grounded layered architecture with integrated reasoning for autonomous agents. In Dankel II, D. D., and Stewman, J., eds., *Proc. FLAIRS 93*. The Florida AI Research Society. 325–329.

Pape, D.; Anstey, J.; Dolinsky, M.; and Dambik, E. J. 2003. Ygdrasil—a framework for composing shared virtual worlds. *Future Generation Computer Systems* 19(6):1041–1049.

Shapiro, S. C., and The SNePS Implementation Group. 2004. *SNePS 2.6.1 User's Manual*. Department of Computer Science and Engineering, University at Buffalo, The State University of New York, Buffalo, NY.

Shapiro, S. C.; Anstey, J.; Pape, D. E.; Nayak, T. D.; Kandefer, M.; and Telhan, O. 2005. MGLAIR agents in a virtual reality drama. Technical Report 2005-08, Department of Computer Science & Engineering, University at Buffalo, Buffalo, NY. Submitted for publication.