

Action-based content generation for virtual game worlds

MSc project proposal - 2011

The use of procedural content generation (PCG) in games is becoming an active research topic. Two current keys directions are: (i) the control and validation over the playability of the generated game content, and (ii) the use of PCG in response to past and future player actions (one of several types of player data).

The goal of this project is to create an approach where the procedural content generation of game worlds is steered by explicitly declared player actions. This approach will allow that, given a set of actions (player data), game worlds are generated to fit and enable them, thus indirectly assuring the desired playability of the generated content. As an example, consider the case where a game world section is generated (a street containing one empty parking space, a newspaper box and stopped van, adjacent to the empty parking space) in response to the declared actions of 'park car A, collect newspaper and steal another vehicle B'. Or consider the following example for actions, in a first responder serious game for firefighters: 'enter building, go to second floor, turn off elevator'. The generated section would need a building with a safe point of entry, a clear path to the second floor and, for example, a general power generator in the second floor.

Project description

Action-based content generation is intended to be a novel method for steering PCG with player actions. Supported by this method, a generator system should receive as input a set of parameterizable user-declared player actions. The generator results (output) are game world scenes with content which allows, supports and facilitates the execution of those player actions.

During the course of this project, new methods should be created to represent and capture the action-based value and relationships that game content potentially holds for players. Embedding game entities with the awareness of the actions they support can allow reasoning on that semantics and support the generation process.

Some of the landmark deliverables for this project will be:

- a technique for associating and embedding information on player actions with game world content;
- a framework for generating game world content, supported by the above technique;
- an editor that allows the creation of new action-content associations and descriptions;
- an example case study where player actions can be declared and parameterized (via an editor, for example) and the appropriate game world section content is generated and, if possible, played.

The technique, framework and editor should be based around our current research on game world semantics, both using and integrating with it. Semantics is all the information about game world objects, beyond their geometric models. We currently have in place a semantic library that empowers game entities with information about their attributes, relationships, services, etc. This information is currently already being used in layout solving, consistency maintenance, runtime game interactions, declarative modeling and generation of adaptive game worlds.



The outcome of this project will be integrated with our research in the generation of adaptive game worlds. Our library captures player behavior and experience semantics on a game entity level. Case-matching this semantic information with player modeling techniques can allow, for example, the generation of more complex building interiors for a player perceived as bored, in a first responder serious game for firefighters. A new semantic level, based on player actions, can help to better describe and capture, in a more complete way, player behavior and experience (e.g. which actions relate to boredom and excitement). Therefore, using it will improve the results on the generation of adaptive game worlds.