Supporting Characters in Interactive Storytelling

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Figure 1: Supporting characters in the Logtell system, walking (left) and watching a fight (right)

Abstract

This paper presents a model of a Supporting Characters Director for interactive storytelling systems. The model can enhance the dramatization, improve the realism, and increase the duration of the stories being generated. The Director generates and manages three types of supporting characters. Some has the ability to interact with the main characters, while others are just used to populate the scenarios.

Keywords: supporting characters, crowd simulation, emotional agents, interactive storytelling

1. Introduction

Interactive narrative is a new form of digital entertainment that combines the traditional way of telling stories with the capability of user intervention.

It comes to modify the way the audience interacts with stories, both in terms of branching paths and dramatization possibilities. Moreover, interactive narratives can be used in a wide number of entertainment platforms, from movies to digital games.

Interactive storytelling systems are used to manage interactive narratives. They control the way the story unfolds and allow user intervention at certain levels according to a plot or character-based approach. Also those systems control de way the story is presented, usually in a 3D graphics style.

Generally, stories are composed by a set of events and a limited set of characters. The task of managing a large number of events, relations and characters is very complex, both in terms of CPU demands and authoring needs. In this way, story dramatization in terms of quality and duration is not comparable with traditional movies. Stories are composed by high levels events that take into account only few main characters. It is rare, in interactive storytelling systems, to find supporting characters interacting with leading characters, what results in a poor dramatization.

Supporting characters can be used in a number of ways: to enrich the scenario, to highlight routes to be followed by main characters, and to allow different levels of interactions between different types of characters. Furthermore, they do not interfere in the plot planning processes, that is: planning is executed as if supporting characters did not exist.

This works presents a model of a supporting characters director for interactive storytelling systems. The proposed director module is incorporated to the Logtell system (POZZER, 2005; LIMA, 2010), a system based on a plot-based approach that allows user intervention during plot composition.

This paper is organized as follows. Related works are presented in section 2. Section 3 describes the architecture of Logtell. Section 4 presents the supporting characters director proposed in this paper. Results can be found in section 5. Section 6 presents concluding remarks.

2. Related Works

There are few references in the literature related to the use of supporting characters in interactive storytelling. In this section, we describe some of these works.

In interactive storytelling, Cavazza et al. (2001) present the characters-based approach and uses Hierarchical Task Networks (HTN) to model the behavior of the main characters. They also emphasize the importance of secondary characters to the story, but do not go deeper into details about these characters. They only explain that they should be modeled as reactive agents and influence only the emotional state of the main characters. In another work, Charles and Cavazza (2005) argue that secondary characters are important to extend the duration of the narratives and preserve the story pace. These later authors model the main characters and the secondary characters with very simple HTNs. However, in their study they conclude that secondary characters do not contribute with any significant event to extend the narratives in contrast with the addition of new main characters.

Analyzing supporting characters from the gaming point of view, one may find similarities between non-player characters and supporting characters, especially in massively multiplayer online role-playing games (MMORPGs). However, there are fundamental differences between them. Non-player characters are modeled as fixed entities, somehow connected to the story of the game, that usually follow the same script. In interactive storytelling, the story is continuously changing according to the user interactions and the supporting characters must adapt themselves to the storylines. The number of stories that can be generated by an interactive storytelling system is large, so manually programming the behavior of supporting characters based on every possible story (as usually occurs in games) may be an impossible or very time consuming task.

Crowd simulation is not the focus of this work, but it is somehow related to it, because some supporting characters are used to dwell the scenarios as crowds. In this way, crowd simulation techniques are important parts of the process of adding supporting characters to virtual scenarios. In this regard, Pettre et al. (2006) propose a model for the generation of realistic crowds in a generic scenario. Their technique involves the definition of the environment, paths through the scenario, and the real-time crowd simulation. In this later work, the user basically defines two points to create a path for the crowd. After defining these points, the Dijsktra algorithm is used to find the shortest path between these two points. Then, the algorithm is used again to find other alternative paths. After finding the paths, a number of waypoints are created depending on the accuracy established by the user.

The use of supporting character in interactive storytelling is a topic that is not well explored yet. The majority of the interactive storytelling systems does not incorporate this kind of characters. Researchers focus mainly on the creation of believable main actors and forget that, in conventional films, supporting characters are important parts of the scenarios, give life to the static environments, and can be used to extend the stories.

3. Logtell

The validation of the work presented by this paper was done in the Logtell interactive storytelling system (Ciarlini et al., 2005).

Logtell is an interactive storytelling system that focuses on logical coherence in its strategy of generating narratives. It is based on plot-based approach (Grasbon and Braun, 2001), but uses some features of the character-based approach (Cavazza et al., 2001) by using rules of inference of goals. These rules provide objectives to be achieved by the characters when certain situations are observed. The system has a client/server architecture (Figure 2), which supports multiple users sharing and interacting in the same or in different stories. The client-side is responsible for user interaction and dramatization of stories. At the application server side there is a pool of servers sharing the responsibility of creating and controlling multiple stories, which are presented in different clients.

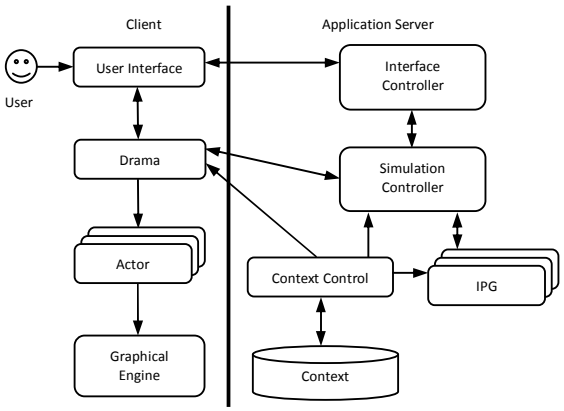

Figure 2: Logtell Architecture.

The idea behind Logtell is to capture the logic of a genre through a temporal logic model and then verify what kind of stories can be generated by simulation combined with user intervention. In this way, Logtell focuses not simply on different ways of telling stories but on the dynamic creation of plots. The temporal logic model is composed of typical events (such as go, attack, fight, and marry) and goal-inference rules.

Plots are generated by multiple cycles of goal-inference, planning and user intervention.

The test scenario used by this system is based on an overly simplified "Swords and Dragons" genre. The virtual world is populated by four main characters: the charming princess Marian, who lives under strict protection at a palace; two brave young knights, sir Brian and sir Hoel, both in love with the princess; and the evil dragon, Draco, constantly waiting for a chance to kidnap the princess. The virtual world is composed of four places: the princess's palace, the dragon castle, a church, and the village where the heroes dwell. An example of a story generated by Logtell is shown in figure 3.

Reduce_Protection(White_Palace)
Go(Draco,White_Palace)
Attack(Draco, White_Palace)
Kidnap(Draco,Marian)
Go(Brian, Red_Castle)
Attack(Brian, Red_Castle)
Fight(Brian, Draco)
Kill(Brian, Draco)
Marry(Brian, Marian)

Figure 3: Story generated by Logtell.

The dramatization system represents the stories generated by the planning system in a 3D environment. The characters are represented through 3D models and their actions through animations. The system provides a set of parameterized actions that can be used to visually represent (dramatize) the generated stories. The dramatization system has the goal of emphasizing the dramatic content of the scenes and presents them in the most attractive and engaging way to the viewers. The architecture of the system is composed by a set of cinematography-inspired autonomous agents that controls the dramatization, actors, cameras, lights, and music. The agents use emotional information of the actors and environment to emphasize the emotion of the scenes using cinematography techniques and concepts.

4. Supporting Characters Director

The goal of the Supporting Characters Director is to enhance the drama of the story, allowing the creation of a more interesting scene for the viewer, inserting and providing alternatives that enhance the interactivity and rendering more dynamism for the plot.

Currently, in Logtell, the events that require further enrichment of the drama are the events "Go" and "Fight". In this context, the goal is to improve routine situations; for instance, when a character moves to a certain location and the camera shows this character walking in an empty city, or when two characters fight in the middle of a city and there is nobody around to watch the fight.

For the generation of supporting characters, it was adopted the technique proposed by Pettre et al. (2006), with certain adaptations to deal with interactive stories. While Pettre et al. (2006) suggest the generation of massive crowds, with the focus on the movement of the characters, our work aims to generate a few supporting characters having a greater interaction with the environment and other characters. The generation of supporting characters consists of two processes, one that occurs before and another that occurs during the execution of the story. These processes are presented in this section.

4.1. Waypoints generation

Waypoint generation is the first phase of the proposed model and must be performed only once for each scenario. This phase consists in generating points at which the supporting characters can move. The waypoint generation is based on Pettre et al. (2006), mainly because of their ability to dynamically generate waypoints, regardless of the scenario. Thus this model can be applied to generate, in a generic way, any scenario of Logtell. The steps to generate waypoints are as follows:

(1) Collision Array: Firstly we consider each scenario as a two-dimensional array, where the length is given by the x component of the scenario and the depth is given by the z component. For each point of the two-dimensional array of the scenario, a raycast on the y axis is performed, checking for possible collision points, such as walls and water. A two-dimensional array is generated by storing binary values indicating whether each point represents an obstacle or not.

(2) Clearance Map: Clearance is the distance from each point to its nearest obstacle (edge point). An edge point is a neighbor of a point of collision. To generate the Clearance Map is necessary to find all edge points in the collision array and then calculate the clearance of each point. The final Clearance Map will be a two-dimensional array, where each point indicates its distance to the nearest edge point.

(3) Waypoints Generation: It is created a circumference for each point of the Clearance Map whose radius is equal to the clearance. Circumferences that are completely inserted inside another circumference with a larger radius are ignored. With all the circumferences generated, it is made an intersection between them. Then it is created a corridor for the common points of the

circumferences and, at the midpoint, the waypoint is generated. An example can be seen in Figure 4, where the blue dots correspond to the points of intersection of the circumferences, blue lines connecting the blue dots illustrate the corridor, and the red dots are the waypoints. The darker area shows the obstacles.

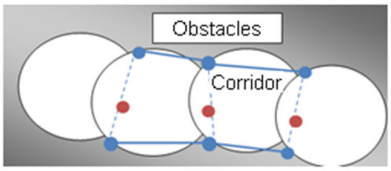

Figure 4: Illustration of Waypoints Generation. Source: Adapted from Pettre et al. (2006)

4.2. Characters Generation

The generation of characters occurs when the Supporting Characters Director receives an event such as "Go", which determines that the main character moves from one city (scenario) to another. In this event the Supporting Characters Director is triggered to generate Supporting characters in cities where the main character is moving.

The first experiments produced characters moving in indian file, without providing a satisfactory realism to the story. A solution to this problem was to create groups of supporting characters, allowing locomotion similar to those that occur in real urban environments.

Supporting characters in groups move more realistically. Each group has one to three characters that share the same paths. The path for each group is randomly chosen from four directions: north, south, east, and west. Each supporting character, from his particular group, will move to the maximum in the direction of his path until another direction is determined. The method chosen for the characters path satisfies the needs required for the realism of the dramatization. A more elaborate method for defining the path of the characters is not required. The task of calculating paths for each supporting character in runtime is very costly. However, since each character will be shot only in small intervals of time in the dramatization of the story, it is not necessary to implement more detailed algorithms.

4.3. Static Supporting Characters

Static supporting characters do not have the ability to move through the scenario, in opposite to ones presented in previous section. They are located in some strategic points and serve to enrich the representation of the regions, performing specific action and animations. These Static Supporting Characters may stay on the balcony of a house talking or simply watching the scene.

The Static Supporting Characters are distributed at strategic points through which the main characters go more often. For instance, considering the event where the main character Brian is moving towards the castle of the Dragon, a common event in the generated stories by Logtell. Experiments showed that ten Static Supporting Characters strategically positioned on every region are sufficient.

4.4. Second Level Supporting Characters

Even with the generation of the two classes of Supporting Characters above mentioned, a greater interaction between the main characters and supporting characters is still required to increase the dramatization of stories. Second Level Supporting Characters have greater interaction level with the main characters. They are located at strategic points in some regions and dialogue with the main character when it passes by.

Second Level Supporting Characters have a sphere collider. This SphereCollider serves to detect the collision with the main characters. When a Main Character collides with the SphereCollider, the Supporting Characters Director sends a message to this main character to wait. The Supporting Character will move close the main character and will start a dialogue. When the dialogue ends, the Director sends a message releasing the main character to follow their route and the Second Level Supporting Character returns to its initial state.

4.5. Fight Scene

The Supporting Characters Director is triggered in two main events of the IPG, the event "Go" and the event "Fight". In the "Go" event, as explained in section 4.2, there is the generation of supporting characters that will move within the scenarios. In the event "Fight", the Supporting Characters Director takes as parameter the characters CH1 and CH2 that will fight.

The Supporting Characters Director verifies the information of the main characters and selects the supporting characters that are close to the event to generate an audience to watch the fight. The Supporting Characters Director takes the midpoint between the two main characters and creates a circle. The supporting characters will be positioned on the circumference, added to a random shift of the position, to prevent a very regular formation, which showed be unrealistic.

4.6. Camera Manipulation

For a better integration of Supporting Characters in the stories, there is a need for specific cameras capable of shooting better their performance in the scenarios. In the "Go" event, for instance, there were

two cameras in the Logtell system to film the main character's journey. The two cameras are placed at the same height as the main character, switching only if the character is shot in front or behind. In Logtell there is a cameraman who is responsible for managing the cameras and for detecting whether there is a collision of the camera with some object in the scene. With the Supporting Characters, many times, both the camera's front and back were involved in a collision, thus requiring the creation of a new camera for these situations.

In order to better contextualize new scenarios as the main characters move from one region to other, new cameras for the Go event are created. These cameras, called introduction cameras, are designed to introduce the viewer to the new region in which the main character is coming in. As in the movies, the main tasks of these cameras are: to reveal some strategic points of the region; to show an overview of the region from above; to show the movement and positioning of the supporting characters in the scene. In the proposed model, there are four introduction cameras for each region. To avoid repetition of the sequence of takes, only the target region of the main character will be introduced, regardless of how many places the characters passes before reaching the target. Also to avoid showing always the same place in each region, only two cameras are randomly chosen among the four available.

In the event "Fight" was also generated new cameras. As in the case of "Go", the cameras that already exist in Logtell cannot show the supporting characters in a satisfactory way. For the "Fight" event, two new camera are created: a wide-angle to show the audience during the fight; and one to show the supporting characters fleeing in case of the victory of the villain.

4.7. Supporting Characters Emotion

A story generated by the IPG contains only major events, as shown in Figure 3. In a default story, the villain Draco attacks the White Castle and kidnaps the princess. The hero Brian goes to the Red Castle and fights the villain Draco. Brian kills Draco and saves the princess. Marian and Brian get married. This story contains only major events with few parameters. The system allows user interaction, who may wish, for example, that the villain wins the fight, thus changing the course of story. The Supporting Characters Director does not know what will happen in upcoming events, thereby reducing the ability of expression of the supporting characters.

One method found to increase the expressiveness of the Supporting characters was to add a new parameter in the events received by the Supporting Characters Director that expresses the emotion of the scene. Because this parameter is not incorporated into the planner (IPG), it was added "manually" with the sole purpose of validating the proposed technique.

Instead of the Supporting Characters Director receive the event “Go (CH1, PL)”, it receives the event Go (CH1, PL, EM) which EM is the parameter that indicates the emotion that the supporting characters must express during the scene. It should be noticed that this information should be provided by the planner, given the fact that it knows, for example, whether an event of type Go (CH1, PL) is a simple walk or a tense journey to free the princess who is under the clutches of the evil dragon. With this information, the supporting characters can adapt their behavior to each situation, thereby increasing the dramatic aspect of the story.

The four types of parameters of emotion to the supporting characters are:

- **Terror:** Supporting Characters are afraid of the Main Character. Can be used when a villain is going to perform an evil action;
- **Success:** Supporting Characters celebrate the success of the Main Character.
- **Quest:** Supporting Characters encourage the Main Character in his mission.
- **Normal:** Supporting Characters do not have major reactions to the Main Character.

The parameter of the emotion also applies to the second level supporting characters. Depending on the emotion parameter received by the Supporting Characters Director, the dialogue between the second level supporting character and the main character will be influenced.

4.8. Logtell new Architecture

In this section, it is detailed how the supporting character director was inserted into the dramatization module of Logtell (Figure 5). The Screenwriter is the communication between the IPG and the Drama System. The Main Director makes the connection with the other directors and the editor, sending commands to the actors.

The Director of Photography is responsible for the visual aspect of the scenario and the Director of Music has the function of working with the soundtracks of the drama. The Cameraman creates a set of possible outlets to shoot a particular scene and sends information to the Editor. The editor selects the best scene for the shooting (LIMA, 2010).

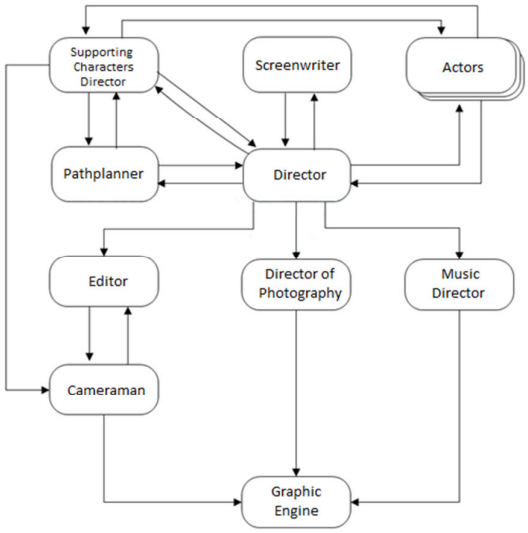

Figure 5: Logtell new Architecture.

The Supporting Characters Director is also triggered by the Main Director. When the Main Director receives a new event from the Screenwriter it will trigger the Supporting Character Director whether this event is "Go" or "Fight" type.

In the case of the Event "Go", the Main Director activates both the Path planner and the Supporting Characters Director. The Path planner determines the path that the main character should follow to reach the target location. This path varies according to the user interests. If the user chooses a longer story, the path generated will include a larger number of intermediate places in the scenario before reaching the final target.

The supporting characters director places supporting characters in the region near the Path created by the Path planner, providing greater realism and enhancing the dramatization during the walk of the main character.

Most of the time of the execution of the Supporting Characters Director, the other Directors are still running their functions. For example, at the event "Go", the Supporting Characters Director runs in parallel to the Main Director most of the time, except in two moments. The first is when the Main Character moves from one region to another. Now, with cameras filming the introduction of the new region, the Supporting Characters Director asks permission to stop the progress of the main story and be able to show the region for the viewer. The other moment is when a dialog between main and second level supporting characters occurs. This time the Supporting Characters Director turns asking the actors to wait for the main character while the supporting character moves close to the main character and starts a dialogue.

5. Results

This section presents the results of using supporting characters in the Interactive Storytelling System Logtell (implemented over the Unity engine (Unity3D, 2011)). Also the results are compared with the previous version without supporting characters.

The Event “Go” is the event where the Supporting Character Director has the biggest influence over the dramatized scenes. It manages supporting characters that move like simple citizens over the city and supporting characters that interact and dialogue directly with the main character. The figure 6 presents a comparison between images using the Logtell version with the Supporting Characters Director and the previous Logtell version that did not use Supporting Characters.

A comparison between fighting scenes in both Logtell versions is presented in Figure 7. In Figure 8 it is shown an example of story generated by Logtell with the interference of the Supporting Characters Director.

6. Conclusion

This paper presents a Supporting Characters Director model for Interactive Storytelling systems. In this model, supporting characters are capable of interacting with main characters in order to enrich dramatized scenes. Also new cameras were generated to give a best view of the supporting characters in the story.

With the inclusion of the emotion parameter, the supporting characters were capable of having different types of reactions in different situations, giving more realism and emotion to the stories. The static supporting characters situated in balconies and sidewalks, just as the supporting characters that moved through the cities, enriched the scenes. The second level supporting characters were able to increase the duration of stories and also increase the interaction between supporting characters and main characters. The new cameras were able to present the supporting characters appropriately. The takes to introduce new scenes helped to increase the time of stories and to give more realism in the dramatization.

7. Acknowledgements

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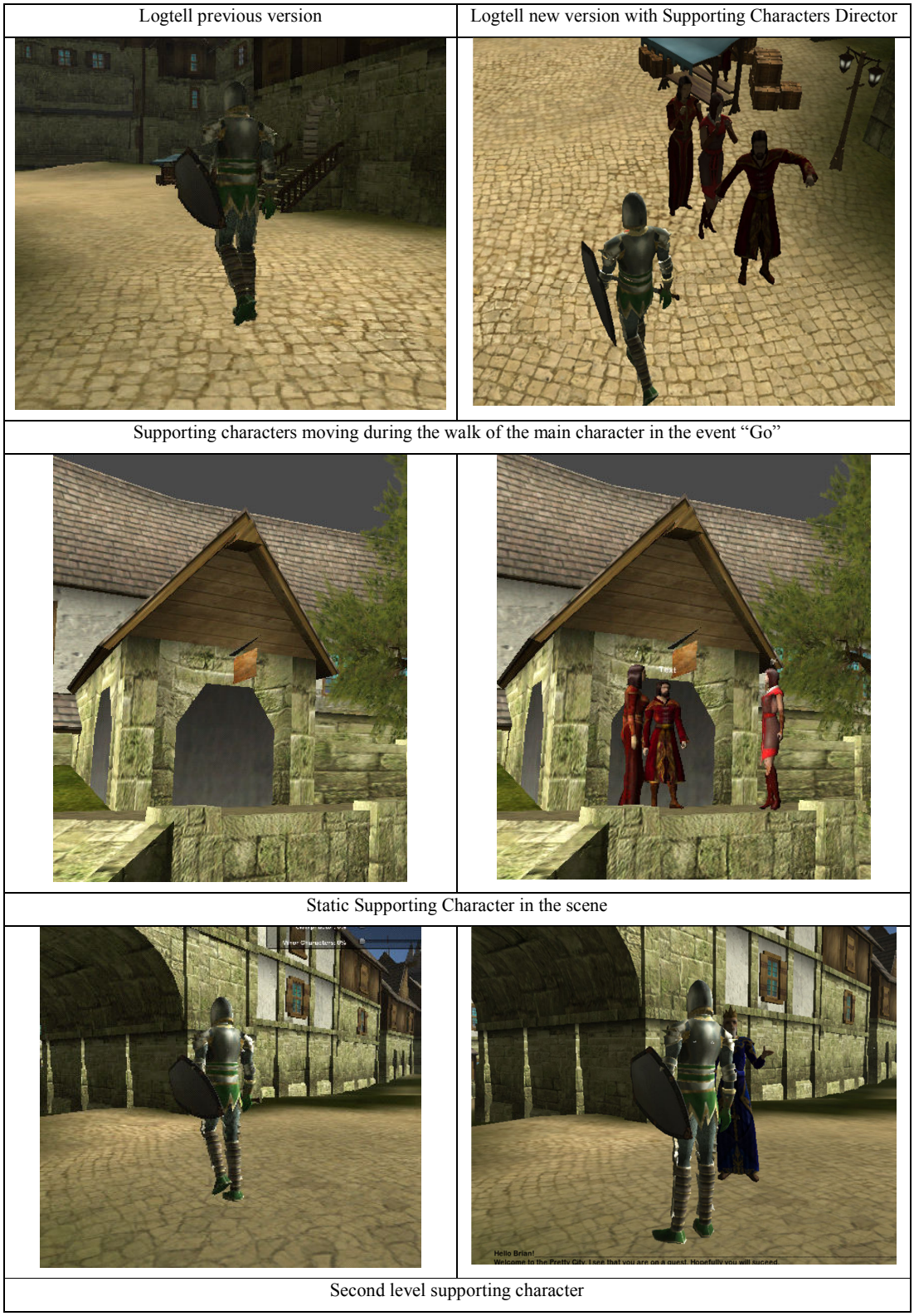

Figure 6: Comparison between Logtell versions.

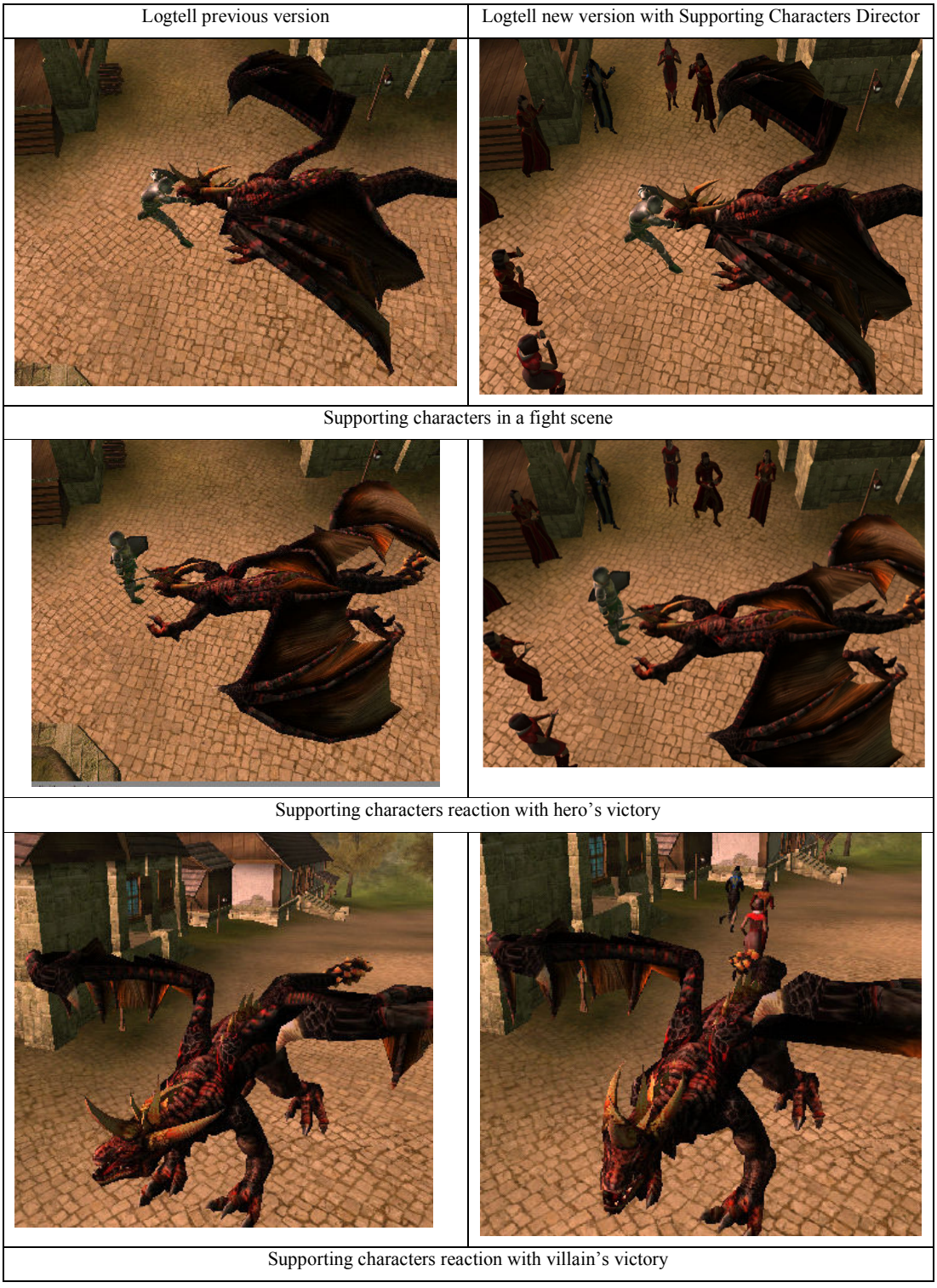

Figure 7: Comparison between Fight scenes.

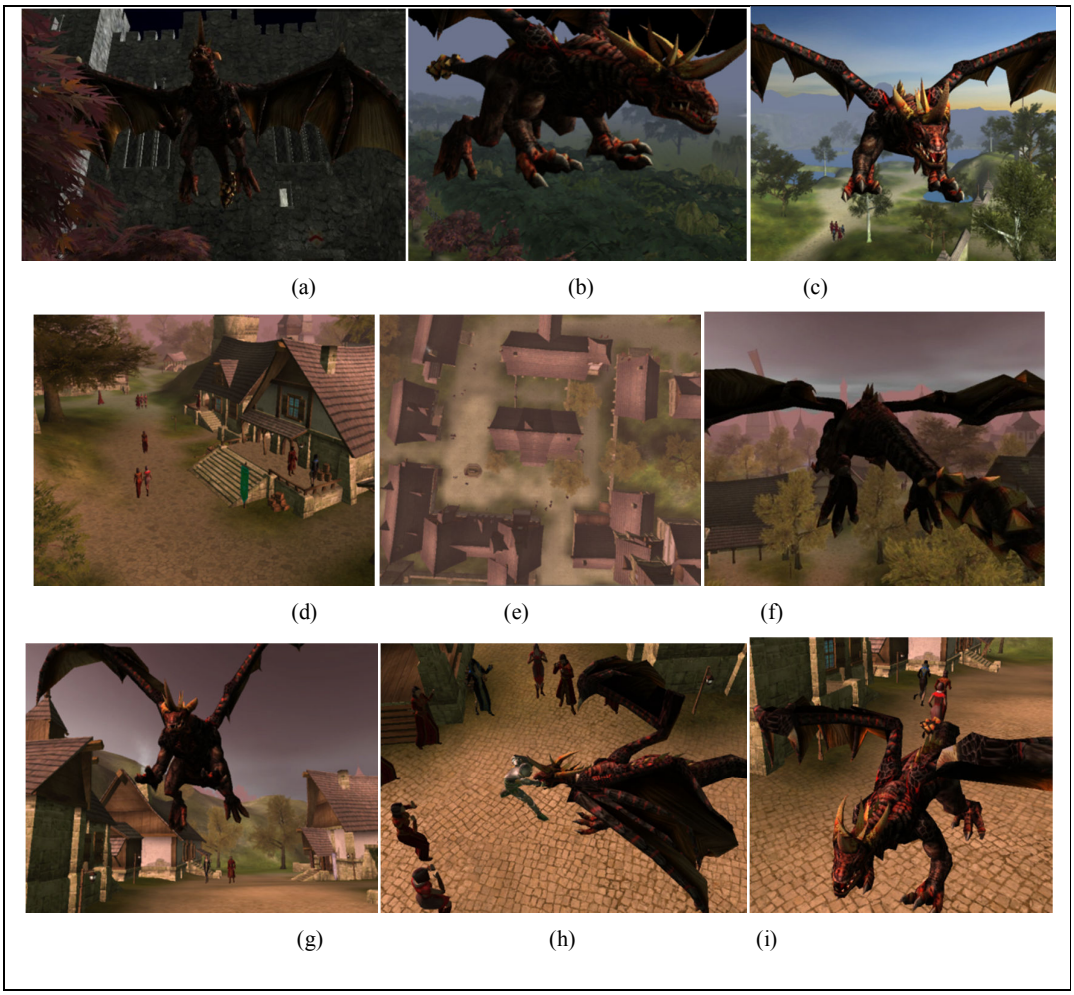

Figure 8: Story example. (a) Draco takes off from Red Castle. (b) Draco flying through the Red Castle. (c) Draco passing by the White Castle. (d) First presentation camera of the destination, the Gray Castle. (e) Second presentation camera of the Gray Castle. (f) Draco moving through the Gray Castle. (g) Draco landing on the Gray Castle. (h) Draco and Brian fighting. (i) Reaction of the supporting characters after Draco kills Brian.