Three Is a Magic Number: Virtual Cameras for Dynamic Triadic Game Dialogue

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Abstract. Interactive storytelling games can benefit from a century of film cinematography and established cinematic conventions. Conversation scenes in games are highly dynamic and pre-authored camera parameters impractical. We propose a combined theoretical and empirical approach towards an automatic Visual Director System focused on dynamic conversation scenes involving three characters and encoded as AI game component that selects suitable shots.

1   Introduction

Interactive storytelling (IS) games provide the players with opportunities to participate in stories in real time and, compared to other types of games, they are more like films, in that the major focus is on narrative. Further, 3D IS games often have an open environment allowing players to navigate the game's scenes. Such games present "excellent opportunities for integrating and combining new possibilities with traditional film viewpoints" [7]. Virtual cameras play a vital role in 3D IS games because they directly affect player experience and game enjoyment [6]. The current work considers in particular games that do not employ a first or third-person camera but that rather use other means of automatic and dynamic camera positioning, framing and editing, sometimes only in conversation scenes, to achieve cinematic aesthetics.

This paper reports on work towards an intelligent camera system, the Visual Director System, focusing on triadic conversations, i.e. scenes that involve three characters, accounting for mood and directorial style, and easy integration into a game engine. We provide an overview of our two-pronged theoretical and empirical approach towards system design that combines research on cinematic idioms and the analysis of cinematographic and directorial choice in conversation scenes selected from successful movies. See also [8] for a previous report on preliminary results with a basic set of film idioms and more details on related work.

2   Towards VDS' Intelligent Camera Algorithm

Our approach towards an automatic camera system, the Visual Director System (VDS) aims to find out how cinematic conventions and styles are used in three-people conversations in film, rather than positing suitable AI methods, in order to iteratively encode identified conventions as game AI components useful for dynamic scenes in

IS games. Many of the cinematography techniques in film can fruitfully be applied to virtual cameras in video games leveraging the players' understanding of cinematic language [3, 5]. Ideally, camera parameters should be adjusted dynamically as players experience and affect the virtual scenes.

The VDS is a game AI component for camera logic, with minimal requirements regarding the encoding of the narrative. We chose Unity 3D, a widely used cross-platform game engine, to improve reusability by non-experts. An implementation of classic **principles of cinematography** acts as reasonable baseline for directing game dialogue scenes. Based on reviewing a host of literature on asserted idioms, formulas, grammar conventions, and rules of film, e.g. [1, 2, 4], we have selected a range of basic idioms that are applicable to triadic conversations and reasonably independent of directorial style, noting the important tension between the idea of universal rules and individual styles as well as the potential effect of breaking unwritten rules.

- The *rule of thirds* provides an aesthetic baseline.
- Shot types are based on the *framing ratio* of characters, from wide shot to big close up shot, which determines the distance between camera and characters.
- *Camera angles* can be used to reflect hierarchies or emphasize moods.
- The *line of action rule*, a.k.a. line of interest or 180º rule, helps spatial continuity.
- Dialogue is edited in *action-reaction shot* sequences: speakers then reactions.

By **analyzing conversation scenes** directed by different accomplished directors that involve three characters, we work towards a catalog of how rules are applied in successful films, providing insights into how this can be encoded into dynamic conversation in games using general rules while allowing for capturing the variability of styles. Several triadic conversation scenes were studied, twenty of them analyzed in detail. We present an overview of recreating three with our system in a later section. One scene is taken from the film "The Lady Vanishes", directed by Alfred Hitchcock. The director divides three characters into two groups, and shows the story using a range of framing from a medium long shot (apex shot of three characters) to close-ups showing the facial expression on characters. This scene exemplifies several rules present in most of the analyzed scenes that establish a baseline for camera setups building on the theory-driven starting point.

- Basic rules for framing, camera positioning and orientation are observed, including standard shot types, the rule of thirds, and the over-the-shoulder shot idiom.
- An apex camera showing all characters is used most frequently for establishing and ending a conversation scene.
- The line-of-action is observed and adapted when characters change positions.
- Further, this scene shows the influence of a scene's mood on camera parameters. In this case, higher emotional tension is reflected in an increased use of close-ups.

The aim of the iterative approach of analyzing scenes from successful film is to eventually abstract the practical knowledge embedded in those creations, rather than postulating it from theoretical considerations alone. The current iteration of the VDS works partly as a director that determines what cinematic conventions fit the specific real-time conditions in conversation scenes, and partly as a controllable camera

system for which game designers will input basic instructions to get suitable shot sequences. The following is a high-level summary of the **abstracted principles** of cinematography that employ real-time character information to generate suitable shot sequences. In triadic conversations, the system firstly sets up an apex camera so that most faces can be revealed. Subsequently, cameras to capture each character are positioned on the same side as the apex camera relative to the line-of-action. During the conversation, three kinds of changes automatically affect shot selection:

• Horizontal movements of characters or turning heads change the line-of-action.
• Character changes, e.g. sitting down, affect framing ratios automatically.
• The mood of the scene and individual characters is represented as an "emotion" parameter per character that affects framing factors and angles in real time.
• Cuts between cameras are driven by dialog acts and reactions to player actions.

By design, the system enables the game designer to pre-specify shot sequences based on events such as character actions and utterances or changes in mood and character emotions. This approach allows the combination of system intelligence with authorial control and directorial stylistic choices. This design decision is also instrumental for our empirical approach of iteratively recreating analyzed scenes, based on the layered automatic techniques described above.

We used our system for three **scene recreations** from well-known films. While taken from linear narratives, they serve as approximations of interactive story settings in so far as one character is freely directed by the player, triggering interactions with other characters. These settings thus validate the functionality of our baseline system. At the same time, they serve as a platform for the iterative abstraction of camera automation principles and for the analysis of directorial style and other parameters that are not yet accounted for in the system. One example is the scene from "The Lady Vanishes" mentioned above. The other two are taken from "Chinatown" and "Strangers on a Train", respectively, see Fig. 1.

Fig. 1. Generated Shot Compare To Original Shot

As shown in Fig. 2, the system automatically adapts to variations in the scene resulting from player actions. The commonalities that were pointed out above were integrated into the baseline system for camera setups. The unique aspects of analyzed scenes, such as tendencies for selecting specific angles to reflect mood changes are just as valuable results towards enabling support for directorial styles.

Fig. 2. Automatic Adjustment on Shot Variations

3   Summary

We presented our combined theoretical and empirical approach towards an automatic Visual Director System focused on dynamic conversation scenes involving three characters. The implemented system provides for automatic real-time camera setups partly specified by authorial input and is realized as an AI module for a popular game engine. The empirical study of movie scenes is used to iteratively refine the techniques used for automating cameras without losing the focus on authorial control and the potential for directorial style when using the system in interactive games. The restriction to triadic conversation scenes limits the generality of the system but, at the same time, enables our approach that revisits essential problems of camera automation from the perspective of the desired end result.

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