

On the use of Computational Models of Influence for Interactive Virtual Experience Management

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Abstract. We highlight some of the characteristics of existing technical approaches to the management of *interactive experiences* and motivate *computational models of influence*, a technique we are developing to aid drama managers in the persuasion of players to make decisions that are consistent with an author’s goals. Many of the existing approaches to managing interactive experiences have focused on the physical manipulation of the environment, but we argue instead for the use of theories from social psychology and behavioral economics to affect the adoption of specific goals by the player.

1 Introduction

Researchers have investigated *interactive narrative environments* as an approach to meeting ever-increasing user expectations of engaging virtual experiences. A *drama manager* (DM) [1] is a specialized type of experience manager [2] that attempts to balance the competing goals of creating a dramatic experience for the user while affording the user the freedom to act however they wish at any time. Almost all work on drama managers so far focuses on managing the player’s experience by directly manipulating the world or instructing NPCs to interact with the player. In contrast, we propose using influence as the basic tool available to the drama manager. Thus, the physical manipulation of the environment typical of approaches to drama management is replaced with verbal cues frequently used in sales settings—the DM is, in effect, selling the player on the idea of adopting the author’s goals.

We propose *computational models of influence* (CI), a novel technique that goes beyond the current approaches of physical manipulation. CI is based on theories of influence and persuasion from social psychology and behavioral economics. A drama manager built upon CI will be able to convince players to set their own goals to be consistent with the author’s goals without them feeling manipulated or coerced. In doing so, we can move experience management from one of reasoning about physical manipulation of the environment to one of reasoning about *selling* the player on a goal.

We have three main motivations for this work: 1) provide authors with tools to help them sell their goals to the player; 2) simplify the authoring process by providing a principled approach to concretely implementing abstract authorial goals; and 3) maintaining or increasing the player’s sense of self-agency.

Using computational models of influence, authors can create situations where a player is sold on the idea of adopting a long term goal rather than forced to accomplish a short term task. Take, for example, the task of trying to persuade a player to mow her lawn. In the past, this type of goal would be brought about through the physical manipulation of the environment using a type of “lock-and-key” approach: progress in the experience is halted (the lock) until the player performs the desired task (the key). A lawnmower would be placed in view of the player and (metaphorical) walls would be constructed to prevent the player from performing other tasks of significance. If the player does not mow her lawn, eventually she will realize there isn’t much else to do. Once the task is completed, the walls are taken down and the player can proceed.

Now, suppose it is desirable for the player to mow her lawn on a regular basis, not just once. One option is to repeatedly use the same object appearance/boundary construction technique described above. While that may be successful, it is somewhat limiting and may become repetitive or mundane for the player. By constructing a social interaction in the environment based on a model of influence, the drama manager can effectively sell the player on the idea of adopting the goal of mowing her lawn regularly. In doing so, the need to repeatedly manipulate the environment is eliminated but the player continues to comply with the author’s goal.

Further, CI will ease the burden of development on the author. Originally, gameplay progress was motivated by authoring an exhaustive set of local triggers—an enormous burden on the author. More recently, drama managers have brought to bear the power of AI on this problem and, as a result, have allowed for authors to be just as expressive while reducing the effort needed to specify how the gameplay will advance. Using computational models of influence, the ability of authors to stimulate progress will increase further by opening avenues for them to motivate more complicated and lengthy interactions by the player with little effort.

Many interactive narrative environments use a drama manager and so a number of systems have been developed. There is a wealth of work on drama managers and interactive narrative environments in general. However, space precludes a comprehensive discussion. Space precludes a detailed discussion of related work. Instead, see [3] for a survey of early work and [4] for a survey of more recent work. Faade [5] is a notable exception to physical manipulation-based drama management because it is designed to select beats to effect change in the mental or emotional state of the player. Beat selection is based solely on authors annotations and not on any accepted theory of influence or persuasion. In contrast, drama managers using computational models of influence will be able to automatically effect change in the players mental state in service of a physical goal—something the beat-based drama manager does not.

2 Computational Influence

Our goal in developing computational models of influence is to: 1) benefit authors by providing tools designed to influence players to buy into the adoption of goals consistent with the author’s; 2) reduce the burden on authors by enabling them to specify goals abstractly, relying on the principles of CI to bridge the gap to a concrete implementation in the virtual environment; and 3) accomplish (1) and (2) without the player perceiving

any decrease in (and preferably an increase in) self-agency. We turn to the theories of *influence* and *persuasion* from social psychology and the theories of *behavioral economics*. While there are a number of takes on those theories (a complete discussion of which is well beyond the scope of this paper), we have based the work described in this paper on the theories discussed by Cialdini [6].

Click Whirr. All species—including humans—have certain built in mechanical responses to specific stimuli. These responses are called *click*, *whirr* responses to represent the mechanical click of a recorded tape loading and then whirring as it is played. In animals, it is believed that these responses are instinctual and free from social context. In humans it is believed that these responses are developed from psychological principles or social stereotypes learned over time. In fact, they are thought to be coping mechanisms. We use them to reduce our cognitive burden when dealing with the ever-increasing complexity of stimuli we are regularly faced with.

Tools of Influence. In order to use these principles effectively for interactive experiences, we need only to hit upon the trigger features that cause humans to play their recorded tapes. We focus on six principles of influence. These principles have been identified by years of research in the field of social psychology and behavioral economics and are frequently employed as sales tactics by savvy marketers. They are:

- **Reciprocation:** give and take; when someone does something for us we feel obligated to return in kind.
- **Consistency:** we have a near obsessive desire to be (and appear) consistent with what we have already done or said.
- **Social Proof:** we look to others like us to determine the appropriate action to take.
- **Liking:** the more we like someone, the more likely we are to abide by her requests.
- **Authority:** we have a deep-seated sense of duty to authority.
- **Scarcity:** something that, on its own merits, holds little appeal to us will become decidedly more enticing if it will soon become unavailable to us.

The principles provide the foundation for understanding how to create the powerful tools used on a daily basis by sales professionals. We are developing computational implementations of those tools. While these principles can only increase the likelihood of compliance, we believe that it is an important feature of our approach that the player can always decide not to do what the DM is trying to get her to do. Thus, the affordance for self-agency is strictly preserved.

3 Concluding Thoughts

In this paper, we have argued for the use of computational models of influence as a tool to help drama managers exceed some of their current limitations. We have shown that models of computational influence have three important characteristics that contribute to this goal. First, when used appropriately, the models of computational influence upon which our drama manager is built can shape the experiences of players in novel ways. Further, the use of these models will help players to adopt long-term goals. This greatly increases the potential for drama managers to guide players through increasingly complicated experiences.

Second, the models we are developing alleviate the burden on authors of specifying implementation details for their drama managers. Rather than have the author specify how drama manager decisions map to a concrete instructions for reconfiguring the environment or for NPC interaction, the author specifies high level story goals. We anticipate that this will reduce the burden on the author significantly.

Third, to truly provide a player of an interactive experience with a sense of self-agency, it is necessary to endow her with the ability to define and pursue her own goals. A major benefit of our models of influence is they increase (or at the least preserve) the sense of self-agency the player experiences. The plotline moves forward by the player's choosing, not by forced action or physical manipulation. As a result, drama managers built upon the concepts of computational influence enjoy the benefit of increased power, reduced authorial burden, and an improved sense of self-agency for the player.

We expect to continue developing a demo to test ideas in computational influence. We are interested in studying the ability of authors (both with and without previous experience) to create experiences using our paradigm. We also seek to understand the player's perception of self-agency in the environment. Our evaluation will consist of participants using our authoring tools to create their own experience and also asking them to participate in an experience that we have authored.

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