

# Prom Week: Social Physics as Gameplay

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## ABSTRACT

In this paper, we present *Prom Week*, a social simulation game about the interpersonal lives of a group of high school students in the week leading up to their prom. By starting the design of the game with a theory of social interaction, *Prom Week* is able to present satisfying stories that reflect the player's choices in a wide possibility space – two features that rarely accompany one another. This paper reports the design details of how *Prom Week* utilizes *social physics* to achieve rich character specificity while maintaining a highly dynamic story space.

## Categories and Subject Descriptors

K.8.0 [Personal Computing]: General – Games. I.2.4 [Artificial Intelligence]: Knowledge Representation Formalism and Methods – Representations (procedural and rule-based).

## General Terms

Design

## Keywords

Game design, social simulation

## 1. INTRODUCTION

In this paper, we present *Prom Week*, a social simulation game about the dramatic week leading up to a high school prom. Players of *Prom Week* indirectly sculpt the social landscape by having characters engage in social exchanges with each other. The results of these social exchanges are many and varied—ranging from mild changes in sentiment toward each other to characters professing their eternal love—and are informed by over 3500 sociocultural considerations managed by the artificial intelligence system *Comme il Faut (CiF)* [4]. Through shifting the interpersonal relationships and learning the personal intricacies of the characters, the player can solve a series of "social puzzles"; such as making the class nerd the prom king, or bringing peace between feuding jocks and preppies.

*CiF* has enabled a new genre of videogame experience that the authors have termed the *social physics puzzle*. Just as existing traditional physics puzzles rely on the player's intuitive understandings of gravity, force, etc., the social puzzle leverages the player's inherent knowledge of how people behave in a variety of social situations. In the delicate system of *social physics*, the smallest social change reverberates and impacts the entire system leading to emergent solutions and surprising, yet satisfying,

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FDG'11, June 29–July 1, Bordeaux, France.

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## 2. COMME IL FAUT AND GAMEPLAY

Gameplay in *Prom Week* involves solving level goals—such as making the class nerd, Zack, date a popular girl—within a limited number of turns by directing the characters to engage in social games. Social games are "multi-character social interactions whose function is to modify the social state existing within and across the participant" [3]. Which social games are available and how each changes the social state is managed by the game's AI system, *CiF*. The player chooses among the top social games that the character desires to play with each character. Enabled by the social physics of *CiF*, each level's goal has innumerable solutions that all maintain character believability. For example, the player could have Zack bond with a popular character over a shared interest to build a relationship grounded on friendship, or he could exploit a popular character's trait of "competitive" and have Zack flirt with someone who the popular character is jealous of.

What exchanges each character wants to do with each other character are determined by his or her social context. Additionally, how each character responds to the exchange is also determined in this way. An example is a social exchange where Zack asks Monica on a date and Monica rejects him because he is not popular. As elaborated below, while Zack not being popular was likely a significant consideration in Monica's choice, there



Figure 1. *Prom Week*'s user interface that shows Naomi and Cassie's social state and what social exchanges Naomi wants to do with Cassie

were many additional reasons.

While goals usually pertain to specific characters, players take on the role of an external observer and manipulator who can select which social actions all characters take. The player can try to make Zack popular, by getting him more friends, performing *cool* actions, etc. Or the player can make it so Monica is no longer popular, by having her do *embarrassing* things, break up with friends, etc.

Because the gameplay of *Prom Week* involves manipulating the social space, the focus of most popular narratives, the *gameplay is the story*. And this story is authored in the sense that the designers create the initial situation, define the goals for each scenario, craft the interactions available, and so on. And yet because *CiF* enables emergent solutions to each social puzzle, the resulting story space is highly dynamic and responsive to player actions.

## 2.1 Social Physics

Video games have achieved a high level of playability in physical spaces; combat, movement, and physics-based puzzles are all very playable and well modeled. *Prom Week* set out to make social spaces as playable as physical spaces currently are. The goal was not to recreate the everyday social world, but to create social dynamics specifically crafted for a targeted experience — just as platforming games don't reproduce the physics of the everyday world (but rather tune physics for gameplay) and fiction writers portray behavior and dialogue in stylized fashions that differ markedly from the average conversation.

Without a system like *CiF*, representing social interactions, cultural context, and the consequential interactions between the two in their entirety is impractical, or perhaps impossible. This task of representation would be similar to that of representing the possible combinations of player interactions and their impacts in the virtual world. The space of contexts (states of the virtual world) and social interactions (player interactions) is prohibitively large — and not necessarily the ideal one for authorial expression. *CiF* provides knowledge representation and processes that model the social interactions that make this ambitious goal tractable to implement.

*Prom Week's* social physics is comprised of over 3,500 sociocultural considerations. The considerations are the rules that influence the character's desires and have either a positive or negative numerical weight to each social game. The player chooses among the top desires of the characters. For example, a character with the trait of vengeful will be more likely to do something mean to someone who has just done something mean to them. These rules encode a notion of "social common sense" which is what the player will reason over while striving to satisfy each level's goal. In this way, we refer to each level as a "social puzzle."

## 2.2 Social State

The following will provide a high level description of the components of *Prom Week's* social state which were arrived at after several design iterations:

**Relationships:** binary, reciprocal and public connections between characters. The three relationships in *Prom Week* are: friends, dating and enemies.

**Social Networks:** scalar, non-reciprocal and private feelings from one character toward another. The three networks are: Buddy, Romance and Cool.

**Statuses:** binary, temporary feelings that often result from multiple interactions. Some statuses, such as embarrassed, are internal private feelings. Other statuses are public and represent social standing, for example, being popular.

**Traits:** permanent attributes of a character's personality. Most traits are private, such as being "competitive," while others are public knowledge, such as being a "sex magnet."

**Social Fact Database:** the social history of interactions between characters. All entries in the social fact database are public knowledge and thus comprise the characters' collective social history.

**Cultural Knowledge Base:** the objects of the social world, each character's relationship and the "zeitgeist" or popular opinion about that object. For example, Zack may "like" the object "scientific calculator" which is commonly understood to be a "lame" object.

The following example illustrates the structures described above, and will be used again to demonstrate the processes.

Simon is a character with the traits of being a weakling and witty. Naomi is a character with the trait of attractive. Simon has the status of having a crush on Naomi, and Naomi has the status of popular. Naomi and Simon have the relationship of being friends. Simon has high romance network values toward Naomi and she has very low romance scores towards him. Naomi also has low cool network values toward Simon. All other network values are neutral. The cultural knowledge base states that Simon likes objects labeled as "lame," such as scientific calculators, and Naomi likes things that are "cool," such as footballs. In the social fact database is an entry marked as something embarrassing that Simon had done towards Naomi in the past. It is described as "Simon misunderstood Naomi asking for help on homework as a romantic advance."

This is just a single example of how the components of *CiF* detailed above work together to create recognizable social situations which, as will soon be shown, are rich with the potential for drama.

## 2.3 CiF's Processes

In the initial work toward creating a playable social model, we leveraged Goffman's dramaturgical analysis [1] to encode patterns of normal social behavior in the previously-mentioned social games. Growing from their definition coined during the development of *Façade* [2], social games have been defined as multi-character social interactions whose function is to modify the social state existing within and across the participants. Social games are designed to encode normal patterns of social behavior while providing space for personality-specific character behavior in a format that an AI system can make use of. Essentially, *CiF* is a system that determines what social games characters desire to play and how they respond when others play games with them.

All of the character's desires and responses to interactions are determined by influence rules comprised of aspects of the state encoded into *CiF*. As a simple example, if a character is friends with someone, he will be more likely to want to do something nice to that person. As a more complex example, imagine that a character (x) is friends with someone (y) who is friends with someone else (z) that x isn't friends with, and y has been interacting with z recently and not with x. Fearful of losing their friend to a stranger, x would be a little more likely to want to do something to get y's attention.

*CiF* operates by looping through a set of processes. The first process is desire formation. This process determines a character's volition (or will) to play a social game with other characters. Every time desire formation is executed, every character determines their volition to play every social game with every other character. Volition is scored by counting the weight of the true influence rules. After this process, all characters in the cast have a volition value for every social game with regards to every other character.

Next, a social game is selected to play (by the player). Social games have an initiator intent (the initiating character's desired social change) and three roles: an initiator, a responder, and a possible third party or other. With a game chosen, the social game play process commences and has two main responsibilities. The first is to determine how the responder reacts to the game. This process is very similar to scoring volition in the intent formation process: the sum of true rules that pertain to responding to the social game. If the sum is zero or greater, the game responder accepts the intent of the game. Otherwise it is rejected.

Each social game has several ways it can play out that depend on the social state and whether the game was accepted or rejected. These are called social game *effects*. For example, if a character plays a game called "Share Interest" with another character, and the game is accepted, there could be an effect specific to situations in which the two characters both like a "cool" object in the cultural knowledge base and another in which they bond over a "lame" object, celebrating their deviation from the will of the zeitgeist.

*CiF*'s processing loop ends with performance realization along with the side effects of social game play. Each effect is associated with a performance realization instantiation. An instantiation is a set of template-based dialogue acts and associated animations. After the instantiation is realized, the social state change associated with the chosen effect is applied. This includes placing an entry into the social facts database to account for the played game, to be referenced and considered in all future social exchanges.

The last step is running a set of "trigger rules" over the new social state. Trigger rules account for social changes that result from multiple social games and other elements of the social state. For example, a character will receive the status of "cheating" after starting a relationship with one character when they are already dating someone else.

## 2.4 Levels, Story Progression and Endings

Designing *Prom Week* around *CiF* has resulted in unique opportunities for innovation in story and difficulty progression design. The game's puzzle-based nature could easily have conflicted with our desire to tell coherent and satisfying stories. The structure of the levels and goals were designed to address these potential conflicts.

A player of *Prom Week* begins by selecting a *Story* to play. A *Story* is a collection of levels, with each level's goal corresponding to a plot point in the overall story arch. In addition to a goal, each level consists of a set of characters that are present and a distinct setting, such as the park or the school quad. For example, the *Story* titled *Prom King* is a series of levels whose goals, if successful, portray the rags to riches tale of Zack, the class nerd, becoming the prom king. The first level tasks the player with ending Zack's war against two popular bullies in the hallway. A later level involves pulling strings until Zack is dating

someone "cool" at the park. Note how the earlier goal of eliminating Zack's popular bullies will likely help the player with this new goal as the popular crowd will not be as disdainful toward Zack. The completed goals from earlier levels help the player complete later levels. As mentioned above, objectives can be met in a variety of ways; the player can forge a friendship between Zack and the bullies, or perhaps make the bullies lose their social standing, and in so doing lose the sway their antagonism for Zack would otherwise have.

Each level can potentially be failed by not completing its goal within a given number of turns. However, we didn't want to invalidate the story that the player had been building by making him or her have to replay the failed level from the beginning with its initial starting state. Because of this, we allow each player to choose whether he or she wants to erase the social state changes and replay a level from the beginning, or retain the current state and continue to the *Story*'s next level. Though the levels were designed to build upon each other, because of the many emergent solutions to goals, not meeting an earlier objective does not necessarily mean that a player has no chance of completing a later level's objective.

Every *Story*'s last level takes place at the prom. A *Story* concludes when the player selects one of the many endings that are unlocked according to the social state he or she has built throughout all of the *Story*'s levels. For example, *Prom King* might end happily with Zack successfully becoming *Prom King* if all of the level objectives were satisfied. Conversely, if the player had Zack abandon his geeky best friend in an attempt to become popular, that former friend may attempt to humiliate Zack during *Prom King*'s climax. Zack may not even become *Prom King* at all, but will finally muster the courage to express his feelings to the girl of his dreams (assuming, of course, that the social state contains a girl that fits the criteria). Special endings are also created to address where the player has failed to meet earlier level goals. In this way, *Prom Week* tries to make all *Stories* have cohesion with the player's actions. Furthermore, as players become better at the game, they can strive to unlock all endings, create particularly awkward or humorous situations, recreate events from their own lives, attempt to solve each level's social puzzles in as few moves as possible, and otherwise explore the social world through play.

## 3. CONCLUSION

In this paper we described how *Prom Week* achieves rich character specificity while maintaining a highly dynamic story space through its social artificial intelligence system (*CiF*). *Prom Week* is an example of how playable models of social interaction (social physics) can enable new types of games.

## 4. REFERENCES

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