**Gossip Mechanism in the Open World Game: Sunset Valley**

Yin-Kai Huang, Fu-Hsin Liao

University of California, Davis

{yikhuang, fhliao}@ucdavis.edu

**Abstract**

*Sunset Valley* is a novel game on the basis of open-world role-playing games and social simulation games with the addition of the gossip mechanism. This paper presents Sunset Valley's implementation and the gossip mechanism's necessity in social simulation games. The main goal of this paper is to solve one common problem that can be found in open-world games — insufficient realism in background characters. We integrate a well-known personality model, Five-Factor Model (FFM), into our game to solidify the gossip mechanism and implement the dialogue system to provide interactions between characters and the player. Dialogues with non-player characters (NPCs) that a player can trigger depend on NPCs’ social relationship statuses. Social relationship statuses could be affected by not only the direct interactions that an NPC had with the player, but also the gossip spread among NPCs.

**Keywords**

Gossip Mechanism, social stimulation, game design

**1. Introduction**

Relationships between the player and characters in open-world games such as *GTA5*, *Skyrim*, and T*he Witcher3* are often built by direct interactions and indirect effects between characters. Direct interactions include

a hug, an insult, a smile, etc. For indirect effects, a specific behavior will affect more than just the involved parties. However, these indirect effects are often generated by the plot or the system by default. A player does not have access to interact with them or witness the indirect effects happening. In this paper, we propose a novel approach, the gossip mechanism, to solve one common problem that can be found in open-world games — insufficient realism in background characters. With the gossip mechanism, characters are able to exchange their thoughts about the player. An NPC whom the player has never met may already have some impression of the player. Based on the hearsay about the player, NPCs may have different responses, dialogues, or behaviors. Players also have chances to witness the scene of NPCs talking about them and try to change the content of the gossip. The gossip mechanism helps to increase indeterminate elements in open-world games, making the game more realistic and spicing up the plot and players’ experiences with more drama.

To achieve the goal listed above, an innovative open-world game, *Sunset Valley*, is designed and implemented. In terms of gameplay, the player is allowed to walk around and explore the whole map freely. Interacting and having conversations with NPCs is the primary way for the player to progress through the storyline. More architecture of *Sunset Valley* will be further introduced in Section 3. In terms of social mechanism, each NPC has a set of social relationship statuses and unique personalities. Social relationship status will grow or shrink depending on the progress of dialogues. NPC’s personalities are built based on the famous personality model, Five-Factor Model (FFM), which is also known as OCEAN [19]. NPCs’ distinctive personalities directly influence their performances in gossip, such as the probability of initiating gossip and the reliability when spreading gossip. More details about the character’s personality and how it affects gossip will be explained in Section 4.

**2. Related Work**

Mentioning open-word games that focus on social interactions, several games come into our minds: The sims, Skyrim, Final Fantasy XV, and the Witcher3. These games allow players to heartily explore their fascinating worlds and are more or less integrated with meaningful player interactions. In comparison, *Sunset Valley* is built in a setting similar to the games above with a gossip system.

Gossip is often considered a form of deviant behavior, as it violates social norms of privacy and confidentiality. However, in some sociology research, gossip is viewed as a non-trivial form of communication that serves important social functions, such as creating and reinforcing social bonds, negotiating social status, and maintaining cultural norms and values [30][31][32]. These studies provide insightful analysis that helps us to justify our motivation and fully understand the concept of gossip.

Among all the studies, one important fact that can not be ignored is that the personality of gossip participants is indispensable to the process of gossip. Our gossip model will not be accomplished without a complete foundation to support the personality system. The Five-Factor Model (FFM) is a well-known taxonomy of personality that is both easily understandable and whose traits can be represented on a discrete numerical scale[3][19][26][27]. It is adopted to be a prototype of personality in projects such as [*Non-Player Character Personality and Social Connection Generation*](https://dl.acm.org/doi/abs/10.1145/3337722.3341859) and *Sunset Valley*. While using FFM as the basis of our personality system, we found papers that establish the connections between FFM and gossip such as *The Effects of Personality Traits on Online Rumor Sharing: The Mediating Role of Fear of COVID-19* [23], *The role of extraversion, neuroticism and positive and negative mood in emotional information processing. Personality and Individual Differences* [22], and *Who falls for rumor? Influence of personality traits on false rumor belief. Personality and Individual Differences* [21].

To provide a more delicate structure of social relationships, we refer to social networks in *Prom Week* [28] and social relationships in *The Sims 4* [29].

**3. Sunset Valley**

*Sunset Valley* is an open-world game where the player can explore Sunset Valley village freely by having dialogues with seven distinct NPCs. In *Sunset Valley*, the player plays the main character, who has long left the village he grew up in and finally came back. The player will find that the sun never sinks in the village, and the player needs to solve the mystery by discovering clues in dialogues with villagers. The mechanism of *Sunset Valley* is illustrated in Figure 1. We utilized four

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Figure 1. Sunset Valley's Software Architecture

unique singletons, gossip manager, personality manager, dialogue manager, and selection manager to

manage all behaviors in the game. The gossip manager manages the social system of each NPC and calls the personality manager when NPCs are about to gossip. The personality manager decides if characters will eventually gossip, calculate the result of gossip, and process the result of non-gossip social actions. The dialogue manager initiates dialogues (stories) written with Ink while the player clicks on an interactable NPC. The selection manager keeps track of the object that the mouse is pointing at.

In each NPC, there are three main components, social system, movement AI, and interactable object. The social system stores three types of one-way relationship status that each NPC holds toward the player – Affinity, Trust, and Admiration. These statuses can be built in both direct and indirect ways. Direct ways include having a dialogue with NPCs and finishing quests for NPCs. Indirect ways are such as gossiping. Different levels of status can lead to a different response in the same dialogue with the same NPC. In some quests, the player will even need a certain level of status with NPCs to complete those quests. Under such a mechanism, building positive relationships with each NPC seems to be the only reasonable way to play *Sunset Valley*. To prevent players from having this kind of monotonous experience, some NPCs in *Sunset Valley* were designed to have opposite positions from other NPCs. One NPC might ask you to insult the other one in order to bond with him/her. Certainly there is a part of stories that the player can never discover and complete. As a result, whom the player chooses to bond with is extremely crucial to the player’s experience.

**3.1 Gossip mechanism**

While playing well-known open-world games such as *The Sims*, *GTA5*, or *Skyrim*, we often found a lack of immersion even if those games have been made as vivid as possible. We realize the reason behind this is they all ignore the existence of gossip. Gossip empowers the influence of players’ decisions and hence makes players act carefully as we do in the real life. With the gossip mechanism, a player might pay a heavier price if he/she chooses to be mean to NPCs. We believe the gossip mechanism is the missing puzzle for open-world games to be fully immersive. To make *Sunset Valley* more realistic than other open-world games, we implemented the gossip mechanism.

Gossip can be defined as “ a general interest in the doings, the virtues, and vices of others” or “small talk” [15]. Based on the definition, the gossip mechanism in *Sunset Valley* is composed of many sub-systems and is designed to spread information about social actions that the player recently executed on NPCs. In our gossip mechanism, there will be only one spreader and one receiver. The mechanism doesn’t support group gossip at this time. To start gossiping, spreader and receiver will need to be at a suitable distance. While the spreader and the receiver are in the gossip distance, the personality manager will take both the spreader’s personality and spreader’s relationship with the player to decide if the gossip proceeds. If it does, the personality manager will then calculate how much should the receiver accept.

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Figure 2. A dialogue between the player and Eric

**3.2 Dialogues**

The dialogue system in *Sunset Valley* is made with *Ink*. By clicking on an NPC, the player can have dialogues with the NPC and chooses a response that best describes the player’s mind among the options. Different responses contribute to different levels of changes in relationship statuses. The more dramatic the response is, the bigger the change will be. In Figure 2, NPC Eric told the player that the beloved and well-respected person, Gramma’s dementia got worse. Choosing “Show some sympathy” might result in a plus in the relationship between Eric and the player. On the other hand, choosing “Tell the cold truth” might be too straightforward and result in a deduction in their relationship.

**4. Relationship Status and Gossip Formula**

In this section, we will elaborate on the method we used to design our characters' social behavior. The well-known personality model in the psychological area, Five-Factor Model (FFM), is adopted in our game to define NPC's personality, and the system goes forward to take personality into account forming the gossip decisions and social relationship status of each NPC.

Since there are two types of effects, direct effects and indirect effects, while humans receive new information, our system also separates them by defining different rules but retaining some common parts. The details of direct effects and indirect effects are presented in Section 5.3 and Section 5.4 respectively.

**4.1 Five-Factor Model (FFM)**

Five-Factor Model, also known as OCEAN, is a prominent taxonomy of personality in the psychological field. FFM helps not only psychologists and researchers but also game designers to easily understand one's trait based on a discrete numerical scale. In the gaming industry, FFM is a strong foothold for game developers to construct a game containing social activity between characters since personality plays an important role while humans are involved in the social activity in real life. The five factors of OCEAN are Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. In our Sunset Valley, each character has its own OCEAN scaling from 0 to 1 for each factor. Below is the summary of each element which could be a reference when you are willing to include a new character in the game.

**Openness** - The characters with high openness scores are inclined to accept unconventional ideas and facts more. NPCs with low openness scores usually have a second doubt about the facts they get.

**Conscientiousness** - People with higher conscientiousness will be more aware of their own behaviors and the consequences which might happen because of their actions. On the contrary, lower conscientiousness leads to being irresponsible to their actions. Conscientiousness is one of the pivot factors and also an exceptionally unique one when it comes to gossip decision. We will elaborate on this in Section 4.5.

**Extraversion** - In a nutshell, extraversion is a measurement of being an extrovert or an introvert.

**Agreeableness** - An agreeable person tends to avoid arguments and conflicts as much as possible. An disagreeable individual, on the other hand, is less a people pleaser and always suspicious of others' kindness.

**Neuroticism** - Characters in high neuroticism scale are more likely to overthink and act self-conscious. They enlarge the negative effects coming toward them. If one has low neuroticism, it acts calmer in any situation.

Next, we introduce our method of generating emotional status and the gossiping probability of NPCs based on characters' personality.

**4.3 Direct Effects**

Direct effects are influences that NPC accepts directly from a player not through other NPCs. While a player is having a dialogue with an NPC, each choice that a player makes would trigger an emotional status change. In the phase of emotional status changing, since each action has corresponding values of emotional scales, for example, praising causes the increase of affinity, trust, and admiration, we then combine these shifting values with the personality of that specific NPC to generate the final shifting values.

Four factors of FFM, Openness, Agreeableness, Extraversion, and Neuroticism, are taken into account in this operation. The reason for choosing these four factors is based on previous research that extraversion and neuroticism is capable of influencing one's emotional information processing [22]. However, as the paper shows, Openness and Agreeableness are not taking part in the emotional information processing, but from the describing of these two factors [19], and also we try to make the difference between direct effects and indirect effects, we still include Openness and Agreeableness. Instead of having the same significance of Extraversion and Neuroticism, Openness and Agreeableness only have a small amount of effects in this operation.

By looking at the details of FFM we listed in section 4.1 and [22], a table that describes the effects of these four factors reflecting the direct actions from a player can be summarized, Table 1. The emotional shifting values that an NPC receives from a player are simply classified into positive or negative ramifications. After Openness, Agreeableness, Extraversion, and Neuroticism generate their own final values based on the rules in different situations, we then sum up these four values and divide it by four to get the ultimate emotional shifting value.

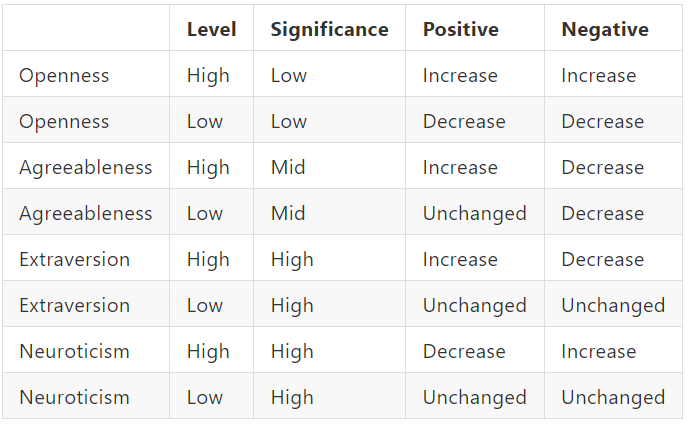


Table 1. Rules of Defining Emotional Shifting Values by Direct Effects

Level: Scale of the factors, Significance: If factors are important or not, Positive: Positive emotional shifting value, Negative: Negative emotional shifting value.

**4.4. Indirect Effects**

In Sunset Valley, NPCs are capable of walking around and gossiping about a player meaning that each character is exposed under indirect effects anytime anywhere. People with different personalities have disparate responses to hearsay. Furthermore, the situation of hearing gossip is not the same as obtaining first-hand information directly from a player.

People with higher Extraversion and Neuroticism scales are more easily to fall for rumors [21]. When an NPC is gossiping, it is actually passing down the values of the player's action which it got directly from the player. The operation of handing these emotional shifting values is the same as we describe in Section 4.3, except the influences of the personality on each value and the rules are different. Table 2., constructed based on [21] and [22], shows the influences of different levels of Extraversion and Neuroticism factors on gossips.

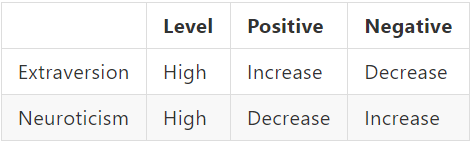


Table 2. Rules of Defining Emotional Shifting Values by Indirect Effects

Level: Scale of the factors, Positive: Positive emotional shifting value, Negative: Negative emotional shifting value.

**4.5. Gossip Probability**

Our system in Sunset Valley supports gossiping functions. When two NPCs crush into each other's domain, the gossip mechanism would have a chance to be triggered. To achieve more realistic rumor spreading, character's personality and emotional status are being considered while deciding the probability of gossiping behaviors since our urge of gossiping is usually swayed by both of these two elements in real-life [25].

People high in Conscientiousness, Extraversion, Neuroticism are more likely to share rumors while they are under fear [23]. We consider fear an intense emotion, and in our case is the moment that Affinity, Trust, or Admiration is extremely high or low. However, you might wonder that the result of this research doesn't match the description of Conscientiousness in Section 4.1 since individuals with higher conscientiousness should be more responsible for their own actions and aware of the repercussions that they might cause. Here we come up with a rational explanation. When high conscientious people are under an intense emotion, they believe that the information they have is accurate, and they deem that spreading or gossiping these facts as a correct movement.

For producing probability of gossiping, we first gather the level of Conscientiousness, Extraversion, and Neuroticism in the personality scale from the spreader. We then apply pre-defined rules based on the three factors and the spreader's emotional status, shown as Table 4.3. After running through the rules, three respective values of Conscientiousness, Extraversion, and Neuroticism are being generated. Summing up these three values and dividing it by three helps the spreader obtain the concluding probability of gossiping.

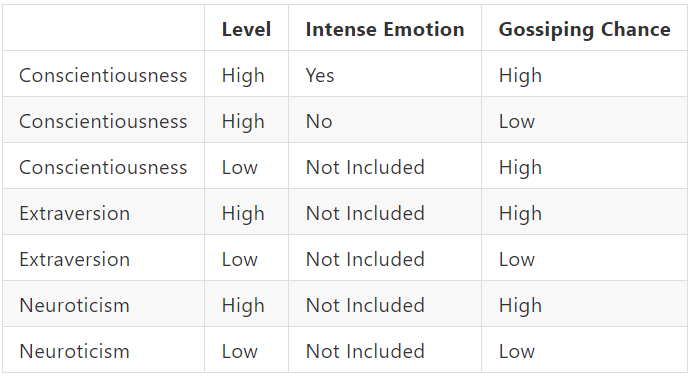


Table 3.Rules of Defining Gossip Probability

**6. Conclusion**

**7. Future Work**

As hard as we try to refine *Sunset Valley* in the last few weeks, there are always innovative ideas that we can take advantage of. Currently *Sunset Valley* relies a lot on the operational logic of quest flags to further the plot. The major disadvantage of this kind of storytelling game is the creation of a tremendous authoring burden. An intuitive solution to this is integrating AI technology into our dialogue systems such as CiF[16] or ABL. To motivate players to explore the game and enrich their playing experiences, we look forward to integrating an inventory system and a currency system into *Sunset Valley.* Finally, in order to make the gossip mechanism smarter, merely tracking the social relationship that NPC holds toward the player is not enough. The social relationship between NPCs is an indispensable element too. We are expecting to include NPCs’ relationships in the gossip formulation in the future.

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