

A Choice-Based Model of Character Personality in Narrative

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Abstract

The incorporation of interesting and compelling characters is one of the key components of effective narrative. Well-developed characters have features that enable them to significantly enhance the believability and overall quality of a story. In this paper we present preliminary research on the development of a computational model aimed at facilitating the inclusion of compelling characters in narrative that is automatically generated by a planning-based system. The model centers on the use of an intelligent process to express character personality. In this model, personality is operationalized as behavior that results from choices made by a character in the course of a story. This operationalization is based on the Big Five personality structure and results from behavioral psychology studies that link behavior to personality traits. We hypothesize that the relationship between choices and the actions they lead to can be used in narrative to produce the perception of specific personality traits in an audience.

1. Introduction

The automatic generation of character behavior in Interactive Narrative (IN) is an area where much work is still possible. Characters are an essential part of narrative; their features and nuances can add to the complexity of a story and its discourse. The presence of compelling characters that have distinct and well-defined features is a principal contributor to the effectiveness of narrative. Effective characters enable the audience to form a clear mental model of their beliefs, desires, intentions, and morality. This understanding of the characters can lead to a better understanding of the entire story and thus to a more compelling delivery of its content or message.

Characters with a well-defined behavior are a powerful asset in narrative composition; however, the incorporation of character behavior can greatly increase the burden placed on the IN author. As narrative delivery mechanisms such as digital games and virtual environments become more complex and detailed, the effort necessary to create characters that have distinct features increases in its difficulty. Additionally, providing users with higher degrees of agency also results in the need for characters that better adapt to user choices and to changing conditions in the story world.

This paper presents an approach for the incorporation of compelling characters in automatically generated narrative. The approach is based on the development of a computational model that enables characters to have distinct and well-defined personalities. In this model, character personality is founded on the hypothesis that character choices that lead to character actions in a story can significantly influence a character's perceived personality.

The goal of this research is not to create a model that fully recreates all known personality types but rather one that enables the representation of a general subset with enough detail to elicit a predictable cognitive response by the audience. The model could enable authors to achieve specific goals such as ensuring that audiences can clearly differentiate evil characters from non-evil ones based on how they behave, i.e. characters are defined by their choice of actions.

Results from this work most directly apply to systems used to create IN due to the reduction of authorial burden and increased creative freedom that may be provided. Additionally, focusing on the effect that choices have on personality perception in the context of narrative can help us advance models of story comprehension and more significantly develop methods to automatically generate stories that purposely affect such comprehension.

2. Background and Related Work

Planning-based narrative generation focuses on the use of AI planners to automatically generate stories that are interesting and coherent (Young, 1999). One of the principal motivations for work in this area is the importance of storytelling in human culture. Humans use stories to describe, understand, and relate events (Mateas and Sengers, 1998). Additionally, computer-generated narrative can be applied to various domains where it can assist in knowledge transfer (e.g. training simulations, activity visualizations, instructional videos).

Considerable effort has been dedicated by AI researchers to the development and improvement of techniques, algorithms, and architectures to enable the application of the problem solving capabilities of AI planners to the automatic generation of narrative that is both interesting and coherent (Riedl and Young, 2010; Riedl and Young, 2003).

In the area of IN, the ability to generate character behavior that adjusts in response to user actions or changing story conditions has not been fully addressed by researchers. Although models have been developed to direct character interactions (Riedl and Stern, 2006) and compose stories based on predefined character models (Lebowitz, 1984), none of these focus specifically on controlling character behavior within the context of a story. Furthermore, these models do not directly address the goal of eliciting in the audience the perception of specific personality types. Finally, the character models that are addressed by existing research efforts have focused on a specific subset of character actions: utterances in dialog (Mairesse and Walker, 2007; Reed et al., 2011). Our research focuses on another

class of actions –physical actions– and the role that this class plays in the construction of the mental model that the reader forms when experiencing a story.

The solution introduced in this paper relies on the operationalization of creative writing principles for the automatic generation of stories. While there are a number of principles that are relevant to the automatic support of the writing process, our work focuses on the importance of character personality for the development of fictional characters.

3. The Concept of Character in Narrative

Characters are an essential component of narrative (LaPlante, 2007; Chatman, 1978). The importance of characters becomes more apparent when we consider the critical role they play in the composition of a story. Characters are vital for the realization of crucial story elements such as events and dialog (Morrison, 2010; LaPlante, 2007; Chatman, 1978).

In order for characters to contribute to the effectiveness of a story they should be well-defined. Among the factors that contribute to the effective definition of a character we include: physical attributes, talents, emotions, beliefs, and personality. Characters that portray these factors in an interesting and believable manner are considered round; characters that fall short of this expectation are considered flat.

3.1. Personality and Its Importance to Character Development

Personality is a key component of what makes a narrative character round. A character's personality can make it more believable and compelling, consistent yet capable of surprising the audience. A character's lack of personality can create the perception of being flat, thus detracting from the story and reducing its effectiveness.

3.2. The Relevance of Actions

Characters play an essential narrative role as agents of change in a story. According to narrative theory, characters can be the recipients or originators of change (Chatman, 1978; Morrison, 2010). Change can result both from a character's actions and its reaction to the actions of others or story events, i.e., characters can act and be acted upon. It follows from this principle that actions are one of the main techniques used by creative writers to define and describe fictional characters (LaPlante, 2007; Bulman, 2007; Morrison, 2010).

The research described here focuses on actions as one of the key elements that define personality in the audience's mental model of the story. The central problem we address is the selection of character actions taking into account their properties such as goals, beliefs, and moral traits. Additionally, we consider that characters can be shaped by their reaction to story events, in particular the effect that such events can have on the choices they make.

3.3. Choice and the Expression of Personality

Considering the structure of a story, specifically plot points where branching occurs (Barthes and Duisit, 1975), we intuitively expect instances when actions follow a choice. For example, in *The Iliad*, Aquilles must choose whether to

help the Greeks in the Trojan War. We deduce that choices made by characters can have a direct impact in determining the actions they perform. Furthermore, we argue that choices may be linked to specific personality traits. This idea is supported by research in behavioral psychology that has found correlation between people's actions and their personality (Mehl et al., 2006; Funder and Sneed, 1993).

We posit that the link between choice and personality can be used in narrative to enable the perception of specific personality traits. An audience that is made aware of the existence of multiple choices that are available to a character will form an opinion of such character's personality based on (1) the choices made and (2) the causal chain of events or circumstances that precede the choices.

We have identified two specific story aspects where choice and character personality intersect:

1. Stories can be constructed to include choices that express a character's personality, i.e. characters make choices that are consistent with their assigned personality traits. For instance, an *agreeable* character only makes choices that result in honest behavior.
2. Stories can be constructed to include events that justify or explain a choice that does not agree with the character's personality. This type of structure may be used to show more complex or surprising characters. For instance, an *agreeable* character makes a choice that results in dishonest behavior after multiple attempts to engage in honest alternatives.

For this research we initially focus on aspect (1), under the assumption that once it is computationally modeled, aspect (2) will be an extension that can be derived from it. Our approach addresses choice as a character-centric event that can be directly linked to a character's personality traits. We use choice as the means to express a character's personality.

3.3.1. A Narrative Example

Consider the following story with two alternate endings.

Amos is a farmer whose son has fallen gravely ill. His son may die unless he undergoes a very expensive surgery. Amos must obtain a large amount of money soon if he expects to save his son. Amos considers his options for obtaining the money, such as asking his friends for help, getting a loan from the credit union, selling his only tractor on eBay, or even robbing the local bank.

Alternate Ending 1:

After careful consideration, he decides to sell his only tractor, even though that means that his work at the farm will be much harder from now on. Selling the tractor provides enough money to pay for the operation and save his son.

Alternate Ending 2:

After careful consideration, he decides to grab his shotgun and goes to local the bank. He robs the bank and obtains enough money to pay for the operation and save his son.

Both story endings have the same set of choices available to the character, Amos. However, the choice made in ending 1 shows a clear attempt to resolve the crisis through what could be characterized as honest behavior. In contrast, in alternate ending 2 the character engages in behavior that could be characterized as dishonest. We contend that it is the specific choice made by the character, when considering the available alternatives, that characterizes his behavior as honest or dishonest. This distinct choice is what enables the expression of a specific personality trait.

4. A Computational Model of Personality

Our approach is to create a computational model that enables the representation of distinct character personality traits in the context of a story world. The model is intended to provide authors with the ability to create story characters that have a rich set of behaviors that can be adjusted based on authorial goals and in response to story events or user interaction. The model works under the premise that narrative characters can be distinguished or classified by visible manifestations of their personality, i.e. their choices, actions, and dialog.

We focus on the creation of an intelligent process that enables the automatic generation of behavior that matches personality traits assigned to story characters. In this model, personality is expressed in the form of actions linked to choices. Actions are determined by individual elements such as goals, beliefs, moral traits, and personality. Characters are further shaped by their reaction to external events or the effect that these have on them. For example, let us consider a character's reaction to an aggression; an agreeable character may respond with forgiveness whereas a non-agreeable character may respond with revenge.

4.1. The Big Five Personality Structure

In order to design a planning-based story generator that can create characters with distinct personalities, we are developing a computational model of behavior based on personality traits. Our model uses the Big Five personality structure defined by Goldberg (1990). This structure provides a taxonomy for the classification of personality using the following five factors:

1. Extroversion
2. Agreeableness
3. Dependability
4. Emotional Stability
5. Culture (or Openness).

Within each classification there are distinct bi-polar personality traits, e.g. honesty vs. dishonesty.

Each factor is linked to specific personality traits that can be mapped to a set of behavioral manifestations. According to results obtained by social psychologists Mehl et al. (2006) and Funder and Sneed (1993), there is high correlation between personality traits and specific, observable, behaviors. Study results indicate that witnessing a certain behavior can elicit the perception of a personality trait associated with it.

4.2. Computational Approach

A simplistic approach to the development of a computational model of behavior would be to annotate the actions in the action library of a planning-based story generator (e.g., Riedl and Young (2003)) with specific personality traits. Actions are chosen by the planner during narrative generation using the annotations as part of a filter mechanism. However, this approach would not adequately achieve our purpose for several reasons. First, it requires a labor-intensive process. Every time actions are added to the planning library, it is necessary to update their annotations to indicate the specific personality traits to which they apply. More significantly, actions may need to be further annotated to indicate every situation in which it is appropriate to use them. When we consider that there could be many situations that justify or preclude the validity of an action it is evident that the work for the author would increase exponentially.

The ideal solution would use a declarative approach, in which a character's properties are used to dynamically determine the set of actions that he or she should perform. Such a method would scale to complex domains and generalize to IN applications beyond simple test cases or academic story generators.

4.3. Intelligent Action Selection

Our process aims at enabling the intelligent selection of actions considering the context in which they execute and without requiring extensive hand-annotation of actions in the planning library. In this approach, the execution context determines the appropriateness of actions for specific story characters. For example, the action *Kill(actor, target)* may only be appropriate for an agreeable character if the context indicates either that he or she is behaving in self defense or that the target is an evil enemy who must be defeated. However, the same action may always be valid for a disagreeable character.

The process selects actions after analyzing the current execution context and evaluating the space of possible story plans. The execution context is derived from the current state of the story world, the properties of the characters and other actors in the story, and the set of open goals that are yet to be achieved in the plan. Among the specific story elements analyzed by the action selection process we include:

1. The causal chain of events that precedes the plot point where an action is needed.
2. The character's personality traits.
3. Previous actions that the character has performed.
4. Future actions that the character may perform.
5. The character's relationships, e.g. friends, enemies.
6. The set of choices that the character has already made.
7. An evaluation of the past and possible future consequences of choices made by the character.

Information obtained from the analysis of the execution context is used to advise the planning process on the selection and placement of actions, to produce desired behaviors. To this effect, we are currently working on a mapping between observable behaviors and personality traits using em-

pirical results from social psychology (Funder and Sneed, 1993; Jackson et al., 2010). The objective is to operationalize the mapping as a set of plan structure characteristics that when present result in specific character behavior.

4.4. The Choice Process in a Planning Context

Our initial model of character choice is based on modifying the process used by a least commitment planning algorithm, such as POP (Weld, 1994), to select actions. Choice occurs after an open goal has been selected from the agenda and before a new action is added to the plan.

Two factors are considered to select the set of actions considered by the choice process: (1) the action must be relevant, i.e. one of its effects establishes a result that accomplishes the goal and (2) the action can be performed by the character, i.e. the value that represents the character who executes the action can be bound to the parameter in the action used to designate the principal actor. We assume that the planner's data structures and knowledge representation will be modified to enable reasoning about who or what performs an action.

CHOICE process pseudo code:

- 1: Given a character that performs the action (C), the effects that the action must produce (F), the library of domain actions (L), and the current plan (P)
- 2: $A =$ the set of actions in L that establish F as an effect
- 3: $A_T =$ trim A by removing the actions for which C is not a principal performer of the action
- 4: $A_R =$ invoke the *RankActions* function (see below)
- 5: **while** $A_R \neq \text{empty}$ **do**
- 6: $A_e =$ select the top action from A_R
- 7: Remove A_e from A_R and add it to the plan
- 8: Update the agenda and causal links
- 9: Recursively invoke the planning process.
- 10: **if** a plan P is found **then return** P
- 11: **else**
- 12: **if** $A_R = \text{empty}$ **then return** failure
- 13: **end if**
- 14: **end if**
- 15: **end while**

The *RankActions* function analyzes the effects of an action to measure their compliance with the personality traits of a character. It returns a list of actions in descending order of compliance.

- 1: Given a set of actions (A), a character who performs the action (C), a character repository (R), and the current plan (P)
- 2: **for** each action A_i in A **do**
- 3: $Rank_i = 0$
- 4: **for** each effect E_j produced by A_i **do**
- 5: **for** each personality trait P_k assigned to C **do**
- 6: **if** *Complies*(C, E_j, P_k, R, P) **then**
- 7: $Rank_i = Rank_i + 1$
- 8: **end if**
- 9: **end for**
- 10: **end for**
- 11: **end for**

The *Complies* function evaluates whether an effect is consistent with behavior associated with a personality trait. For

this purpose we will develop a declarative representation that enables the use of an extensible library of mappings between behavior and personality traits. For example, if C_l is an agreeable character the effect (*dead* C_m) is consistent only if C_m is not a friend of C_l and C_l has motive to eliminate C_m . On the other hand, if C_l is highly disagreeable the effect is consistent regardless of the relationship between the two characters or C_l 's motives. The *Complies* function uses information from the character repository and the current plan to inform the evaluation process.

5. Discussion and Future Work

5.1. Planning Algorithm Modifications

The next step in this effort is the development of an algorithm for the evaluation and placement of story actions. The algorithm must avoid the computationally intensive option of generating all the possible plans and then selecting those that exhibit the required character personality traits. The process must also guarantee that the story is coherent, i.e. added actions are part of a valid causal chain of events.

An analysis of the plan structure characteristics needed for the model indicates that a solution solely based on new constraints and heuristics may not be sufficient. Instead it is necessary to consider changes to the process used to construct the plan structure. The modified algorithm should enable operations such as: changing the ordering of actions currently in the plan, increasing or reducing action decomposition, changing or introducing a causal chain of events, and dynamically introducing behavior-related constraints. These modifications would facilitate the construction of plans that treat choice as a first-class object, i.e. the plan is built to include choices that result in the desired character behaviors.

5.2. Proposed Evaluation

Essential to this research will be validating the claim that narrative generated using our model includes characters that have distinguishable personalities. The validity of the claim will be tested through user studies designed to measure whether the generated character behavior elicits in the audience the perception of the corresponding personality traits.

In order to have an environment conducive to experimentation, we also propose to incorporate our narrative model into a Mixed-Initiative Story Editor (Horvitz, 1999). The editor will enable non-expert users to create stories with the assistance of an intelligent user interface.

6. Conclusion

We have presented preliminary research aimed at the development of an intelligent mechanism that enables the automatic generation of narrative that elicits the perception of distinct character personalities without the need of a labor-intensive process. We use a solution based on a declarative approach, in which a character's properties and the story context are used to model the choices that determine the set of actions that he or she performs in the course of the story.

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