

# The Design of *Writing Buddy*: A Mixed-Initiative Approach Towards Computational Story Collaboration

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**Abstract.** The act of writing is often a difficult process; writing partners can be a way to test ideas, provide critiques, and overcome the difficulty of adding words to a blank page. *Writing Buddy* is an in-development prototype of a mixed-initiative playful tool, intended to serve the role of a digital writing partner by combining the authoring affordances of writing software with the natural curiosity inherent in playable media. In it, players create and arrange dramatic beats to achieve certain story goals. Those dramatic beats are then satisfied through assigning character actions to them. Finally, players pen prose and dialogue to bring those actions to life. *Writing Buddy* aims to ease the authoring process by offering suggestions based on character simulation and story structure.

**Keywords:** Usage Scenarios and Applications · Ensemble · Playspecs · Collaborative Writing · Story Recognition · Content Authoring · Mixed-Initiative · Playful Tool

## 1 Introduction

Computational media has proven itself to be a powerful medium for telling stories. However, many of the interactive stories available today achieve that interactivity through devices such as branching narratives. Players engaging in these experiences are often presented choice points, which will alter the course of the narrative. This can be an effective means of allowing the player to tailor a story to their desires, but it is an act of guidance, selection, and uncovering an existing narrative rather than creation.

The act of making a story can be very pleasurable; there is inherent joy in creation, and penning a story can be an excellent way to express one's self. However, it can also be a daunting process; overcoming the oppressiveness of a blank-page is merely the first of many challenges a would-be author must face. Writing partners can help one overcome these challenges, but might be difficult to find. This paper introduces *Writing Buddy*, an in-development prototype of a playful tool that is meant to serve as a digital writing partner. By working and playing with *Writing Buddy*, players create—rather than discover—simple, narratively consistent stories.

## 2 Related Work

Many efforts have been made to produce computer systems capable of generating stories [4, 6, 11, 13, 28]. Though some of those systems allowed for interactivity, they were largely passive experiences for the player, i.e., the player was being told a story rather than creating one themselves. Many of these generators are either author-centric or character-centric; the IPOCL planner [16] recognizes the importance of characters acting believably within a coherent plot. More recently, the NetworkING system [14] generates plan-based stories after users fine-tune character social relationships; the Wide Ruled system [21] enables players to chart similar plans themselves.

Other recent experiments, such as *Creative Help* [17] which builds off of the *Say Anything* [26] system, aids the user in producing full stories with creative control throughout the process. *Creative Help* takes free text written by a user, compares it against a substantial corpus of English-language stories, finds a similar sentence in the corpus, and presents the next sentence from the corpus story as a suggestion for the next sentence in the user’s story. This work allows for deep creative freedom on the part of the player, but the system has no semantic understanding of the story being written. This lack of an internal understanding has been recognized as a problem in mixed-initiative computational storytelling [5], and one which has at least been partially addressed in other domains, such as procedural architectures [7], level design [23], and quest generation [25].

In addition to being a tool to help players create stories, interacting with *Writing Buddy* is meant to be playful. As such, it shares design philosophies with casual creators [2], and is an example of AI-based game design [3] in which novel AI technologies enable new forms of gameplay; this notion is related to the ideation-implementation-simulation cycle of co-creating with story generators outlined in [27]. Other examples of such experiences include *Endless Web* [22], *Storyteller* [1], *Prom Week* [8], and *The Ice-Bound Concordance* [15]. *Storyteller* and *Ice-Bound* are particularly relevant as both involve players constructing stories. *Storyteller* asks players to construct stories that satisfy short narrative puzzles, emphasizing puzzle solving over player self-expression. *Ice-Bound*, on the other hand, gives players more freedom of expression, while learning about a pre-existing backstory. *Writing Buddy* attempts to meld the features of these examples by giving the player creative control to shape the length, content, and characters of the narrative, while still providing specific narrative goals.

## 3 System Description

The intended audience of *Writing Buddy* are casual authors interested in tinkering with dramatic beats and character actions. Though players are free to play with different characters and actions in a social physics-guided sandbox (see 3.2), *Writing Buddy* provides narrative goals for those seeking a more directed experience. Since myriad stories would satisfy these goals, “solving” them is meant to evoke the puzzle-solving pleasure found in games, while assisting players in creating stories they feel creative ownership over. As the player begins crafting their

stories, *Writing Buddy* provides suggestions for narratively consistent character actions, shows hypothetical possible worlds the player might wish to pursue [18] and helps recognize overarching themes and character arcs. As the player solves more goals, they are presented with increasingly challenging writing prompts meant to provide the player opportunities for creative self expression.

In order for *Writing Buddy* to be a collaborative writing partner, it must be able to reason over character desires and actions, as well as have an understanding of overarching storylines or plots. To achieve this, it uses libraries that, though well suited for this purpose, have prior to this work never been used in just this capacity. Namely, it uses the social simulation system *Ensemble* [20] to calculate and determine character behavior (see 3.2), and it uses the play trace analyzer *Playspecs* [12] to recognize and reason about larger-scale, plot-level moves and moments (see 3.3). Before we discuss the precise uses of these technologies in this system, we will first give a broad overview of how one engages with *Writing Buddy* to create a story. This section will conclude with a brief example of how one might construct a story using the system (see 3.4).

We remind the reader that *Writing Buddy* is still under development. The elements described in 3.1 and 3.2 have been implemented; 3.3 is in development.

### 3.1 The Authoring Process

*Writing Buddy* has three authoring modes: beat, action, and prose authoring.

**Beat Authoring** is intended to capture the broad strokes of the moves of the narrative. The term *beat* is inspired by Robert McKee’s usage of the term [10] (which also informed the seminal interactive narrative *Façade* [24]), though in truth it is closer to his description of a *life value*. A beat, otherwise known as an emotional exchange, is meant to be the smallest unit of dramatic content that can occur between two characters. A life value, then, is a character’s state of being that changes over scenes through a progression of beats. These values often deal with large themes (e.g., life, hope, elation) and their opposites (e.g., death, despair, sorrow). *Writing Buddy* collapses this structure; whereas McKee would argue for a life value to change after multiple beats, *Writing Buddy* associates a life value change (i.e., a character state change) with every beat. Similarly, the state changes currently present in *Writing Buddy* tend to be less grandiose, to make it more believable that such swings are possible given the shortened time

Due to this one-to-one relationship, beats take the form of a specific state and its opposite. For example, one beat might call for a character that is angry at another character to lose this anger. Another might call for a physically weak character to find the strength to overcome this aspect of their nature. The specific beats present in the system are represented by the Ensemble Engine (see 3.2). *Writing Buddy* goals request the creation of a story that contains specific beats. The user can add, remove, and reorder beats to the story with no constraints through a simple graphical user interface. At this level, *Writing Buddy* does not enforce any form of narrative cause and effect or overarching plot structure; the

player is free to add or remove beats to tell a story in terms of changing life values that suits their interests. Beat authoring does not in and of itself change the underlying state of any of the characters of the story, or their relationships towards one another; that occurs when the player assigns actions to beats.

**Action Authoring** has players assigning an *action* to each beat. Whereas a beat is an abstract concept of intended state change with no actual impact on the modeled status of the characters or the narrative, actions have actual effects on characters and their relationships to one another. For an action to be assigned to a beat, three criteria must be true. Firstly, the action must have an effect which satisfies the beat being described; for example, if the beat is detailing a character transitioning from being angry at another character to not being angry, then the action must have the effect of removing that anger. The second criteria is that characters must have the volition to perform the action; to continue our peace-making example, just because actions such as *shake hands*, *tell joke*, or *apologize* might have the impact of making characters form peace with each other, if the characters involved do not have the volition to engage in those activities, they will not be presented as options for consideration. They will, however, be presented as *almost actions* (AAs, see below). For more detail on the volition formation process, see 3.2. Thirdly, actions have preconditions which must be satisfied. To continue our example, a beat calling for two parties to stop being angry at each other only makes sense if the two parties are indeed presently angry; if they are not, then actions which depend on their anger to be true will not be applicable. The system, recognizing that there may have been an authoring error at the beat level, will also include the actions whose preconditions were not satisfied in the list of almost actions.

AAs refer to actions whose effects would satisfy the beat in question, but that are not applicable for any of the aforementioned reasons (the characters do not have the volition to engage in this action, or the preconditions for the action do not hold). Players are presented with the list of AAs for each beat, along with a description of why the action was disqualified from actually being assigned to the beat. Presenting this list is meant to have a twofold effect for the player. One is strictly informative, and explain why certain actions the player might have thought were applicable are not in this context. The other is to provide insight into the underlying state of the system, and spark creativity towards adding story beats that could make the action viable. It is a form of emergent narrative through hypothetical consideration; by seeing the possible worlds which could be true under different circumstances, the player might take inspiration in attempting to make those circumstances come to pass [19]. Once the player has added enough beats to satisfy the goal set out by *Writing Buddy*, and each of those beats has been assigned an action, the player can move on to the final authoring process.

**Prose Authoring** allows the player to write plain-text prose to accompany each beat. Beyond the underlying state changes encoded in the actions themselves,

this stage of authoring represents the performance realization of the actions. The system has no means of reasoning over this text, and thus the player may free write whatever they wish. We acknowledge that the final prose of the piece are incredibly important to the discourse of the narrative, and at present *Writing Buddy* places the responsibility of its creation entirely on its users.

### 3.2 Ensemble

Beats, character volitions, and actions are represented using the Ensemble Engine, a social simulation system that represents characters' individual personalities, their relationships to one another, and the social norms which drive their behavior. A more thorough description of this social physics system and its progenitor may be found here [20] and here [9]. In *Writing Buddy*, Ensemble is responsible for keeping track of characters, their current state, and the actions that they may take towards one another. In addition to maintaining the current state, Ensemble keeps a history of every discrete state the characters of the story have been in. Each of these discrete states is called a *timestep*. Each beat is considered to be a separate timestep.

To determine the actions available for assignation to a beat, Ensemble calculates the volitions of the story's characters. This is done through the evaluation of Ensemble "influence rules." Each rule consists of a precondition and corresponding effects that affect character behavior. For example, characters that are rivals will be more likely to try to one-up each other. Actions, then, are tied to these effects; arm-wrestling, spit-contesting, and drink-quaffing might all be considered actions that characters trying to one-up each other might engage in.

Because each beat represents a separate timestep, and because actions can be assigned to beats in any order, *Writing Buddy* marks the first experience using a social physics engine in which players may edit the past. This is an important feature, as sometimes in the authoring process writers may wish to start in the middle or end of the story and fill in the beginning afterwards. In the spirit of AI-based game design [3], this requirement from the game inspired improvements to the AI, as prior to this point, Ensemble only allowed operation in the present, adding each new action to the end of history. Enabling the functionality to add actions prior to "future" ones has involved validating that changes made to a beat in the past do not obviate the actions already assigned to beats which come after it. For example, if a later beat is currently assigned an action with the precondition of two characters being enemies with each other, that action will no longer make sense if the player resolves the conflict between the two characters prior to that action taking place. When a previously assigned action becomes problematic for reasons such as this, the system highlights the issues for the player to resolve.

### 3.3 Playspecs

Playspecs were designed as a means of analyzing a game via play trace analysis, allowing for regular expression operations to be applied to both player inputs

and game states. A more thorough description of Playspecs can be found in [12]. In short, an individual Playspec details a sequence of player inputs or game state that the game designer is interested in, and a play trace is one such sequence generated via gameplay. A trace is said to match the Playspec if the trace contains the specific sequence outlined in the Playspec.

Up to now, Playspecs have been used in post game analysis; after collecting play traces, one uses Playspecs to discover if certain game states are ever encountered, any outliers indicating subversive play, or otherwise extraordinary behavior. *Writing Buddy* plans to integrate Playspecs into the gameplay itself. The integration will take place on multiple levels. First is a simple level of recognition; any given goal is defined as a Playspec. As beats are added and removed, the current list of beats will be run through the Playspec; if the list of beats matches the Playspec then the goal of the level will be met. Besides recognition, Playspecs could also be used to propose new beats to add, to capture the feel of an active writing partner. Casual users may opt to disable this feature, preferring themselves to be the primary arbiter of narrative content. The capability for players to author Playspecs to share with one another is a long-term goal.

### 3.4 Simple Example Interaction

To clarify the authoring process, we present a simple scenario illustrating use of the system. When the player starts using *Writing Buddy* they are presented with a goal; the goal for this example is to write a story in which a man leaves home and returns. The player begins by authoring beats. They see that they can author a beat in which a man goes from the state of “being at home” to “not being at home” and adds that to the list of beats. Similarly, they then add another beat that changes the state of the man from “not being at home” to “being at home.” The story now has these two beats, and the Playspec representing the goal lets the player know that the beats they have selected satisfy it.

The player then attempts to assign actions to the beats. However, they are stymied, as there are currently no valid actions for the beats as they stand. There are, however, almost actions that appear. One such almost action is labeled “storm out” but the player is informed that the man does not have the volition to perform this action, but would if he had gotten into a fight recently. The player then goes back to the interface for authoring beats, creates a new one called “man goes from not angry to angry”, and adds it to the beginning of the list of beats. This causes the Playspec goal to re-evaluate the list of beats; the man still leaves home and comes back, so it evaluates as a success. The player then attempts to assign an action to their new beat, and finds that there is an action that the man is willing to do: “have an argument.” The player assigns this action to the beat, which updates the underlying state of Ensemble. Now when the player attempts to assign an action to the “leave home” beat, Ensemble recalculates the man’s volitions and determines that, yes, because the man had recently gotten into a fight, it makes sense for him to “storm out.” The player assigns this action to the beat in question. A similar editing process can be followed for the beat pertaining to returning home.

Once all beats have been assigned actions (or before then, if the player so chooses), the player can begin writing prose for each beat. When doing so, they are reminded of the life value they are attempting to change associated with the beat (e.g., have the man go from not angry to angry), and the specific action that they selected to realize it (e.g., “have an argument”). Here they have the means to write whatever they wish.

## 4 Conclusions and Future Work

In this paper we have described *Writing Buddy*, a mixed-initiative based playful tool to assist in story writing. By combining the character based social simulation system *Ensemble* with a real-time application of the playtrace analyzer *Playspecs*, we have created an experience that combines the puzzle-solving pleasure found in games with an authoring environment that guides and assists players in creating narratively consistent stories.

Though this is a promising start, the system is currently just a prototype, and there remains much exciting work to be done. The system’s current structure lends itself best to short, fast stories, since a story is nothing more than a collection of beats, and each beat changes a life value. Future incarnations of this work could incorporate additional structure, introducing the notion that it takes many beats to constitute a single scene, many scenes to compose an act, and multiple acts to tell a story.

Embedding *Writing Buddy* into a fully realized game seems a natural extension of its playful design. One can imagine such an experience framing the player as a struggling writer: the player’s reputation would be determined by the nature of stories they pen; their prestige would grow as they solve more challenging authorial goals, earning new characters, beats, actions, and social rules to make richer stories mark their growing skills as a writer.

There is also much to be learned about the nature of mixed-initiative collaborative authoring tools. Players using this system should feel creative ownership over the stories they created using this system, while at the same time recognizing that these stories were made in collaboration with a digital writing partner. Discovering what relationship players have with the system—and with the stories they produce with it—will help inform the future development of this system and the development of other such tools.

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