

Bad News: An Experiment in Computationally Assisted Performance

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Abstract. Dreams of the prospect of computational narrative suggest a future of deeply interactive and personalized fictional experiences that engage our empathy. But the gulf between our current moment and that future is vast. How do we begin to bridge that divide now, both for learning more specifics of these potentials and to create experiences today that can have some of their impact on audiences? We present *Bad News*, a combination of theatrical performance practices, computational support, and Wizard-of-Oz interaction techniques. These allow for rich, real-time interaction with a procedurally generated world. We believe our approach could enable other research groups to explore similar territory—and the resulting experience is engaging and affecting in ways that help strengthen the case for our envisioned futures and also makes the case for trying to field such experiences today (e.g., in experimental theater or location-based entertainment contexts). *Bad News* is a realized game enjoyed by players with varying degrees of performance experience, and won the Innovative Game Design track of the 2016 ACM Conference on Human Factors in Computing Systems (CHI) Student Game Competition.

Keywords: Deep Simulation · Live Performance · Emergent Narrative

1 Introduction

Bad News (BN) is an award-winning experimental game that combines social simulation and live performance. Players are placed in a procedurally generated town with over a century of simulated history, and the bulk of gameplay consists of players engaging in actual conversation with NPCs performed by an improvisational actor. As the player moves about the town, the underlying simulation is updated via live-coding by a wizard, hidden out of the player's sight. Generating a fresh town for every playthrough ensures novelty for the player, actor, and wizard. Players explore these towns with the goal of informing one specific resident of a recent death of a family member.

What results is an experience in which players interact with a deeply simulated virtual world that is capable of adapting to the actions of the player, a

major goal for interactive drama [18, 14], albeit here with ample human processing power. We believe that the combination of a simulation, a live actor, and Wizard-of-Oz interaction techniques employed by *BN* is a useful one for developing and testing technologies that will enable future fictional experiences that are deeply interactive, generative, and personalized [15]. This is a design space that has only been preliminarily explored [4]. Moreover, we believe that work created by this research mode can be effective works of interactive storytelling themselves; *BN* began its life as a means to prototype integrating generative systems into a purely digital experience [23], but we discovered through playtests that players found the experience of *BN* to be engaging in and of itself.

BN has been officially performed at two venues: the 2015 EXAG workshop, and the 2016 ACM Conference on Human Factors in Computing Systems (CHI), where it won the Innovative Game Design track in the Student Game Competition. Our design, particularly the framing and premise, evolved between these performances. Unless otherwise noted, descriptions refer to the game as it was presented at CHI. In this paper we describe the project with a particular focus on the player experience and the considerations of being an actor in this space.

2 Related Work

As an exploration of interactive drama utilizing live performance with directorial intervention, we connect this work to *The Bus Station*, an early Oz Project experiment that placed players among improvisational actors in a tense scenario managed by a hidden director [9]. This piece was intended in part to prototype a computational experience, and *BN* was born from similar motivations [23]. More recently, a gallery installation deployed *Façade* in an *augmented reality* environment, with human operators intervening to guide its reactive-planning ecosystem [4]. *BN* carries its torch in exploring the potential of mixing human and machine control in amateur live performance. More recently, *Coffee: A Misunderstanding* is a computationally assisted interactive play in which participants from the audience act out characters by performing dialogue and choreography selected by other human players [3]. Though *BN* is not performed in front of an audience, we still situate it in the emerging area of computationally assisted experimental theatre [13, 25]. Broadly, the interplay of embodied conversation and deep simulation makes *BN* an example of a mixed-reality game [1], and its melding of computation and improv situates it alongside the work of Magerko [12] and Hayes-Roth [6], though *BN* inverts the puppet-player relationship by having human-performed improv informed by the actions of virtual agents.

At the 2012 Dagstuhl gathering on Artificial and Computational Intelligence in Games, the Computational Narrative working group named “systems that generate tailored story-based support for face-to-face role playing used in corporate training and simulation” as a valuable short-term research direction [10]. We believe that *BN* is a major step along this trajectory. Though the worlds that it generates are player-agnostic, one could imagine *personalizing* towns for the needs of a player [15]. Similarly, *BN* is not intended for corporate training (besides, perhaps, for a very specific profession, see Section 5.2), but the underlying technology could be used as such with a different diegetic framing.



Fig. 1. A player and the actor during gameplay.

3 The Game

BN is a game about death, death notification, and everyday life, combining deep social simulation and live performance.

3.1 The Premise

The player is cast in the role of a county mortician's assistant, brought to a small American town in 1979 to investigate and identify an unidentified dead body, hereafter referred to as 'the deceased'. The player's character has never been to this town before; the only person they know is their mentor, the county mortician himself. However, before the investigation can begin, the mortician reveals that a crisis the next town over requires his attention, and that the player will need to handle this job on her own. Namely, the player will need to identify the deceased, ascertain the name and location of the deceased's next of kin, and then deliver the eponymous bad news. Before leaving, the mortician assists the player in brainstorming a cover story for herself, one that will enable her to easily gather information from townsfolk without raising suspicions.

The game ends as soon as the player divulges the death: victory if the notified is the next of kin or loss if not. This encourages the player to seriously investigate the town; revealing the death indiscriminately lessens the dramatic build up to the final reveal, which we want to be a meaningful experience. In descending order of legal familial closeness, a character's next of kin in this town is their spouse, parent, child, sibling, and then any member of their extended family.

3.2 The Physical Setup

We now discuss the physical setup as it pertains to the live performance. The player and actor sit at opposite ends of a table, though a *model theatre* with closed curtains obstructs their view of each other. When the player interacts with an NPC portrayed by the actor, the actor draws the curtain to reveal himself; when the conversation concludes, the actor closes the curtain to reinforce that either the actor's or player's characters left the scene.

The player is given a notebook and pen, as well as an electronic tablet that displays game state information, such as her current location and the physical descriptions of people nearby, as well as custom messages written by the wizard.

The actor has a laptop that has an interface (see Section 6.2) providing insight into the characters that he will be portraying. The design of the model theatre prevents the player from seeing the actor’s laptop.

This physical arrangement has a few advantages over a stage. Both actor and player require easy access to their devices; having them rest on a table frees hands for gesticulation. The piece is meant to be personal; the lack of audience seating precludes spectators. It also enhances the accessibility and mobility of the piece: one might not always have a theatre at hand; one nearly always has a table. One limitation of this arrangement is that the player may only speak with one character at a time. Three party conversations are rare, only occurring when the actor engages in a one-way conversation with “offstage” characters.

Ideally, *BN* is played in a quiet, darkened room, in which the player’s attention is focused solely on playing. The tone of any given run of *BN* can vary greatly, and the atmosphere in which it is played seems to greatly influence this variance; well-lit spaces tend to yield less emotional weight behind the actions of the player, antithetical to our goals.

4 The Simulation

Before gameplay begins, a town is generated using the *Talk of the Town* AI framework. Due to space limitations, we will only outline the system here, but the reader may consult existing publications on it for more information [24, 21].

Each *BN* setting is created by simulating the development of a fictional small American town from its founding in 1839 to 1979, which takes roughly five minutes. This amount of simulated history was selected because it produces towns with around fifty businesses and several hundred residents, which we found to provide a rich player experience without being overwhelming. Character appearances and personalities (using the famous five-factor model [2]) are modeled. At each time step, characters make decisions about where to go based on their personalities, their social and family networks, and their daily routines (which may take them to work, on errands, or to places of leisure). If multiple characters are in the same location, there is a chance that they will talk.

This communication between characters facilitates the passing of knowledge from one character to another. Characters discuss about themselves and others in their lives by sharing specific details. These details might pertain to occupations, addresses, physical descriptions, or familial connections. However, as time advances in the simulation, characters’ confidence in their knowledge begins to wane if it isn’t continually reinforced; thus, e.g., friends who have had a falling out will slowly begin to forget the details of the other’s life. As this happens, characters may unknowingly spread false information. Moreover, characters may lie to one another by intentionally spreading information that they believe to be incorrect. After nearly a century and a half of this simulation, characters build up a comprehensive—though occasionally factually inaccurate—view of the town that they live in and the people that populate it.

Additionally, characters get married, have kids, leave jobs or start new ones, found businesses, move out of town, and pass away. Birth, death, and marriage



Fig. 2. The wizard sits behind the scenes, live-coding modifications to the simulation and sending information to the actor.

rates, as well as baby names and the types of businesses that are founded and folded, come from historical U.S. census data; actual historical events such as world wars and natural disasters are not modeled beyond their reflections in this data. A child’s personality is informed by those of their parents. Each business type has a set of occupations to be filled (e.g., retail establishments have cashiers, managers, janitors, etc.), and hire for these positions based on the applicant’s personality, age, work history, and familial and social connections; family businesses in the *Talk of the Town* framework are a frequent occurrence.

Though the town may be fictional, an important design goal of *BN* was to make it *a game about real life*. The player interacts with run-of-the-mill people living in a small American town. They have jobs, families, and friends. They run errands. They have leisure time at neighbors’ houses, or they unwind at the bar. There is no explicit model of narrative in the simulation, but, as others have articulated [26, 15], narrative-like meaning can still emerge bottom-up through empathic social interaction with rich characters. By simulating over a century of history, *BN* characters embed in rich social contexts that are brought to light through player interaction (see Section 5) and actor performance (see Section 6). This does mean that it is the responsibility of the actor and wizard to discover “interesting” elements of the simulation, and for the actor to gently steer conversations to points where these elements can be brought up naturally—this requires a combination of *story recognition* [22], *experience management* [20], and improvisation, skills that less experienced actors and wizards may need to develop. When done well, much of the joy of playing *BN*—for player, actor, and wizard alike—lies in discovering the inherent wonder in the seemingly mundane lives of these simulated characters.

4.1 The Wizard

Though the bulk of simulation occurs before play begins, there is one important figure of the town whose actions must be executed in the live simulation throughout gameplay: the player. To this end, the game employs a wizard sitting out of the sight of the player who listens to the vocal commands of the player and updates the simulation accordingly. Thus, every time the user travels to a new lo-

cation, the wizard relocates the player’s avatar from one part of town to another via live-coding. Similarly, other actions afforded to the player (see Section 5.1) are enabled by the wizard making live updates. Additionally, the wizard queries the simulation to search for narrative intrigue and potential dramatic nuggets that may be nestled in all its accumulated data. These nuggets can then be delivered to the actor over a direct line of communication (an instant-messaging service). This relationship is explored in more detail in Section 6.3.

5 The Player

The ideal player of *BN* is open to improvisational roleplay. It has been well recognized that not everyone views themselves as, or wants to be, an improvisational actor [5]. However, the trappings of performance and narrative reside in the very fabric of our being [8, 16]. Roleplaying has the ability to be profoundly transformational [19], but accessing personal memories around the sensitive subject of death can place players in a vulnerable, uncomfortable state of being [27]. Our goal in creating *BN* is to give players the capacity to tailor the emotional depths to their own comfort levels; the actor will read the cues established by the player—including their use of language and tone of voice, their body posture, and the backstory they fabricate for the character they choose to assume—and attempt to match that energy. See Section 5.2 for more on establishing this contract of care; see Section 6 for more information on the actor’s process.

5.1 The Priming Process: The Guide

BN begins with an extra-diegetic guide who leads the player to their seat. The guide eases the player into the world of the game, explains the premise and their role as a mortician’s assistant, hands them a journal and pen to take notes, and describes what actions the player can take. These actions include beginning a conversation with an NPC in the same room as the player, looking at the city residential directory (which displays each residential address and the last name of the family that lives there), looking at the city business directory (which displays the address and name of every place of business, including restaurants, schools, hospitals, etc.), traveling to a specific address or business name directly, or, in traditional IF fashion, moving in the cardinal directions relative to their current position. Players can also knock on doors, buzz apartments through an intercom system, and enter and exit buildings. Finally, players can advance the game’s simple day-night cycle. These actions are taken by voicing them aloud (e.g., “I go to the quarry.”), allowing the wizard to hear and then update the simulation—and thus the content on the player’s tablet—accordingly.

5.2 The Priming Process: The Mortician

Once the player sits down, the guide instructs her to say that she will now speak to the mortician. Next, the actor opens the curtain as the mortician, greets the player as his assistant, quickly explains that he will have to leave soon, and directs the player to notify the deceased’s next of kin on her own. Before he leaves, the mortician asks the player to only reveal the death to the next of kin, so as not to cause undue shock to the town and to respectfully allow the family to

choose how to share the news of their loss. The player and mortician collaborate to weave a convincing cover story to justify the player approaching strangers and asking them questions. This is the approach *BN* takes to establish a contract of care, or simply contract, with the player. In an immersive theatre context [11], these contracts are design strategies that work to make the unraveling experience safe and delivered with care for the audience members. By diegetically framing the player as a mortician’s assistant, but giving her the opportunity to develop an additional role on top of this, we found that players had enough narrative scaffolding to feel comfortable exploring the town, while still retaining enough creative freedom that their characters truly belonged to them.

5.3 The Moment of Truth

Once the player has discerned the identity and location of the next of kin, she must let that character know of the deceased’s passing. Our hope is that by exploring the town and meeting its residents, players will have a mental picture of the deceased’s life, and will develop empathy for those the deceased left behind. Consequently, we aim for the reveal of this passing to be the emotional peak of the experience; though there has been a range in how players treat this significant moment, all have been respectful and civil. One observed behavior is the inclination to make the next of kin as comfortable as possible before the reveal. This can be as simple as asking the next of kin to take a seat; sometimes it involves asking them to go somewhere private. Some players have had noticeable hitches in their voices as they deliver the news, stumbling over the words as they struggle with how to break the news of the death of a loved one.

6 The Actor

As previously mentioned, all of the non-player characters in the town are played by a single actor. All performances of *BN* to date have used the same actor—an author of this paper who has a professional performance background, including more than ten years of improvisation experience. As discussed in Section 3.2, the actor remains out of sight until the player engages an NPC. Also hidden is a laptop that displays an actor interface (see Section 6.2). Since the actor does not know the qualities of the characters he will be playing until moments before assuming that character, the actor must learn to parse the interface quickly.

6.1 An Actor Prepares

Though the characteristics of the characters performed are determined by the simulation, the performance of the actor in *BN* is improvised. Thus, improvisational theory for quickly determining and ascertaining character relationships is incredibly useful for the actor to know and employ, such as status dynamics [8], or recognizing the “heat and weight” of a relationship [7]. It is also important for the actor to familiarize themselves with the Big Five personality traits (extroversion, agreeableness, neuroticism, conscientiousness, and openness to experience) [2]. These serve as a convenient brush to broadly paint the shape of a character and provide a useful hook for an “outside-in” approach to informing a character [17]. Although real values $[-1, 1]$, these are split into five partitions for ease of

access for the actor. Other key characteristics, e.g., age, gender, occupation, and beliefs, also contribute heavily to the actor’s physical and vocal choices.

Though the actor remains seated the entire time, characters still express themselves through physicality. A low-extroversion or high-neuroticism character might hunch over in their chair, cross their arms, or otherwise posture themselves as small and guarded as possible. Highly agreeable characters might stick out their chest or lean in toward the player to demonstrate that they are a friend. A low-neuroticism, low-agreeableness character might comfortably lean back in the chair, conveying disinterest in the player and their search.

Similarly, strong vocal choices convey character. Volume is an easy vocal quality to modulate based on personality—for example, low-extroversion characters tend to be more soft-spoken. Openness to experience can impact the nature of words used; characters with low openness employ a simpler vocabulary. The location of the conversation impacts the character’s demeanor as well. A highly conscientious character at work is likely to be professional and guide the conversation, assuming the player is a patron needing to be assisted, even if the character happens to have unsocial traits such as low extroversion or low agreeableness; elsewhere that same character might act differently.

Though these personality traits assist the actor in quickly assuming a character, the actor must still fill in the details that lead to a memorable, believable, distinct character during performance. These details are determined through character-specific decisions made during conversation, through observed attitudes toward others characters in the town, and through insights provided via chat with the wizard. These details make the character feel more alive; the actor is allowed to invent these details as they see fit, so long as they build upon facts established by the simulation and do not contradict it in any way. For instance, during one playthrough, the player encountered a painter at a construction company eating lunch at a diner. During this conversation, the character revealed his aspirations for moving to New York and striking up a career as an independent artist, dreams not present in the simulation.

6.2 The Actor Interface

Displayed via a hidden laptop, the interface is divided into three parts: information about the character the actor is currently playing, information pertaining to another character that is the topic of conversation, and “match” information (see below). The currently played role fills in once the player initiates conversation. It has information regarding the character’s personality, profession, age, gender, marital status, physical appearance, and their reason for being at the current location (work, errands, leisure, etc.)

The second section, regarding the subject of conversation, is populated with data whenever the conversation veers toward a specific character. It consists of everything the character currently being performed knows about this other character, as well as how they feel about them. Since characters can get facts wrong about each other (see Section 4), next to every belief is a confidence rating. Characters can have accurate information but not be confident about it, and conversely can be supremely confident in information that is wrong. There

can also be gaps; e.g., a character might have no idea where another character works. The actor can choose how upfront they are about their uncertainty.

The final section contains a list of “matches;” after the player asks a broad question (e.g., “do you know anyone who is blond with a scar?”), it is populated with every person the character knows that matches. This section of the actor interface is also maintained as part of the wizard’s responsibilities.

6.3 Peeking Behind the Curtain

When not updating the simulation, the wizard has time to explore the history of the town and the interweaving relationships of its denizens. When he unearths narratively interesting tidbits, he communicates them to the actor via a chat window. This relates to the *story recognition* challenge of emergent narrative [22]. Sometimes even small things, such as a date, can deeply inform character behavior. For example, if the wizard sees that the character has a child whose birthday is coming up, it can inform both the demeanor of the character (happy, harried, etc.), and provide justifications to their simulated behaviors.

Often the information is more complex, involving love triangles and other rich emergent phenomena (enumerated in [21]). In one playthrough the player was visiting the store where the deceased worked. The wizard was able to discover that the deceased had very high mutual attraction for the store’s manager. Moreover, this manager was a man who was significantly older than the deceased and already married, but his spouse was harboring romantic feelings for a coworker of her own. This manifested when the player spoke to a mutual acquaintance of the manager and the deceased: a gossipy teenager who insinuated that the manager, unhappy in his home life, had been flirting with the deceased. This scandalous behavior provided a bit of drama in these characters’ lives, but also cued the player that she might discover information by speaking to the manager.

Just as the actor can “invent” justifications and motivations as long as they build off of information established by the simulation, the wizard may do so as well, and communicate that to the actor. Thus, though the actor has the unique responsibility of determining how information about the world is revealed to the player via performance, the information itself is unearthed and developed by the actor and the wizard working in tandem as both story recognizers [22] and experience managers [20].

7 Sample Playthrough Summary

To give the reader a sense of the general progression of a game of *BN*, we include a summary of a thirty-minute playthrough. The player was a male in his mid-20s with two years of improvisation experience. To elucidate creative sources, we’ll append parenthetical attributions specifying the sources (player, actor, or simulation) of details and actions. Though these attributions detail the diegetic decisions and actions of the actor, player, and simulation, the wizard is secretly communicating with the actor (through an interface and chat) about the simulation and updating the player’s tablet with information about their physical location, nearby residents, and directory information, thus influencing the behavior of both player and actor. We remind the reader that every run involves

a uniquely generated world; the characters, relationships, and histories in this playthrough were never seen before, nor will they ever be seen again.

After speaking with the mortician in the game’s introduction, the player left the deceased’s apartment and checked the residential directory to quickly ascertain the last name of the deceased (*player, simulation*). From there, he found a janitor in the apartment complex, and asked the janitor if he knew the deceased by name or anyone matching the deceased’s description (*player*). The janitor confessed that he did not know any of the tenants (*simulation*), but suggested that the player go to a nearby delicatessen, which was a popular hot spot in town (*simulation, actor*).

The player went and found it to be crowded (*simulation*). Observing the characters in the deli, he sought out someone with similar features to the deceased (*player, simulation*). Doing so, he managed to find the deceased’s aunt—the sister of the deceased’s father—who in fact had inherited the same physical features of the deceased by virtue of their common ancestry (*simulation*). The aunt was open-minded enough to not mind sharing her table with a stranger (*simulation, actor*), and after the two exchanged introductions and the player learned the aunt’s surname (which was the same as the deceased’s; *simulation*), he knew he was on the right track. He explained he was a historian chronicling the history of the town (*player*), hoping she would tell him more about her family, and ultimately the next of kin. The aunt obliged, telling familial history that reinforced the game’s theme of loss: her father had been a town blacksmith for forty years of life, but as the march of progress advanced and demand for blacksmiths all but disappeared, her father lost his smithy and—after decades of being a skilled artisan—had to find work as a stocker at a grocery store, until he passed away (*simulation, actor*).¹ The player sympathized with the aunt, and asked if there were other members of her family he could speak to (*player*).

Feeling connected with the player after sharing her family history (*actor*), the aunt told the player that her brother is a janitor at a nearby department store, whose shift was ending soon (*simulation, actor*). The player thanked the aunt for her time, and rushed to the department store (*player*). The player entered the store after hours (*player, simulation*), and a manager irately approached him (*actor*). Before being ushered out, the player spotted the janitor (on the tablet’s listing of nearby characters; *player*), who was best friends with the manager (*simulation*). The player struck up a conversation with him (*player*), which the manager begrudgingly allowed (*actor*). It became clear that the janitor was the deceased’s father (*actor*), and therefore his next of kin (*simulation*). Out of respect for the father’s privacy, the player did not want to reveal the death with the boss glaring at him (*player*). The player offered to meet the father at a bar when he was done with his shift (*player*), which he agreed to (*actor*).

At the bar, the player quickly got into an altercation with the bartender (*player*), who viewed the player as childish (*actor*). The player managed to calm

¹ This was an artifact of the underlying simulation’s modeling of industrial progress, which makes smithies likely to shut down in the period after World War II. The daughter’s emotional opinion on these affairs was a choice of the actor.

the bartender down without a fight breaking out by asking him to mix a drink (*player, actor*), just as the father arrived (*actor*). The player then asked him to take a seat, somberly revealed his true profession as a mortician’s assistant, and respectfully informed the father of his son’s passing (*player*).

8 Preliminary Results and Critical Reception

Our results are derived from brief 5-10 minute postmortems (immediately after playing) with the approximately thirty players we’ve had, and through our own observations of players during play. The postmortems involved describing the underlying system to the players (e.g., the simulation process, the actor’s interface, etc.), and asking players how they felt about the town they explored (e.g., whether it felt “hand-crafted” or generic, whether the characters were believable) and the decisions they made (e.g., did the player feel like they were the driving force of the narrative).

The most striking observation is how quickly players eased themselves into the roleplaying aspect of the experience. Many players expressed discomfort, most often about lacking training in improvisation, before playing—and sometimes during play at the beginning. However, as play progressed, players stopped verbalizing these discomforts, and began showing investment in the role (thinking aloud about the town and who to talk to next).

Perhaps the most assuring piece of feedback from the postmortems was that many players expressed that the experience felt very unique—both by virtue of the fact that this is a gameplay experience unlike most others, but also because the player has free reign to explore a town with hundreds of characters in any way that they choose. Thus players report feeling high senses of agency over the shape of their gameplay session. Players have said that they felt *transported* to the world, and were able to readily visualize the people that they spoke with and the places that they visited. Many players found their towns so vibrant that they were shocked to learn during the postmortem that the towns were not designed by hand. This suggests a promising use of this framework—and the technology that powers it—in future applications of games and stories to enable high senses of player ownership over their narratives.

In summary, *BN*’s unique combination of live performance and simulation appears to have the potential to be a powerful new form of storytelling. The ability to generate towns with hundreds of NPCs with interconnected histories and relationships in a matter of minutes is fertile ground for rich emergent narrative. The open-ended framing of the game enables players to carve their own path, determining which locations and characters in the town become narratively significant—this meets the call for future directions in interactive storytelling articulated in [10, 22, 15, 26]. The casting of the player as a specific character that must develop a cover story simultaneously provides the player with firm scaffolding to build on with the flexibility to diegetically shift their identity lessening some of the vulnerability inherent in roleplaying. We sincerely hope that *BN* is the first of many pieces of its kind.

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