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Playable Experiences at the 15th AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE'19)

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Abstract

This paper describes the accepted entries to the seventh Playable Experiences track to be held at the 15th AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE'19). The Playable Experiences track showcases innovative complete works that are informed, inspired, or otherwise enabled by artificial intelligence.

Introduction

The AIIDE Playable Experiences track offers authors an opportunity to showcase work that is informed, inspired, or otherwise enabled by artificial intelligence. Tracks at the conference, including the main track, the demo track, and artifact-evaluation, provide opportunities for creators to supplement their research contributions with interactive demonstrations.

Accepted entries in the Playable Experiences track are complete experiences in and of themselves. The pieces presented here are are vehicles for ground-breaking artificial intelligence research and artistic achievement.

Four entries were accepted to the 2019 AIIDE Playable Experiences track. These pieces demonstrate a range of technological innovations and artificial intelligence techniques, applied towards a variety of genres both existing and novel. The accepted entries are:

- **Rime Royale: A Guildmaster Simulator**
- **Playing with SHRDLU**
- **Human Improvised Theatre Augmented with Artificial Intelligence**
- **TEDRIC: a Talk Exercise Designer for Realising Improvisational Comedy**

This paper consists of each of the authors discussing their works, influences, and approaches towards applying artificial intelligence to create novel playable experiences.

Accepted Submission

Rime Royale: A Guildmaster Simulator

Rime Royale is a digital roleplaying experience for one player. The player has the job of Adventurers' Guildmaster for a small cohort of adventurers with varying abilities of strength, magic, and intelligence. Missions are sent to the Adventurers' Guild that require varying degrees of these abilities to complete successfully; the player must strategically match pairs of adventurers to missions that suit their abilities and how well they work together as a team. Meanwhile, any characters not on a mission will spend time at the guildhall training or bonding with other guild members, depending on their personalities and preferences.

This project is motivated by the conviction that non-player characters in games are interesting more for what they do in spite of the player's whims than because of them. In story-driven games, for virtual characters to seem three-dimensional and believable, they need to be able to pursue

Figure 1: Rime Royale Screenshot

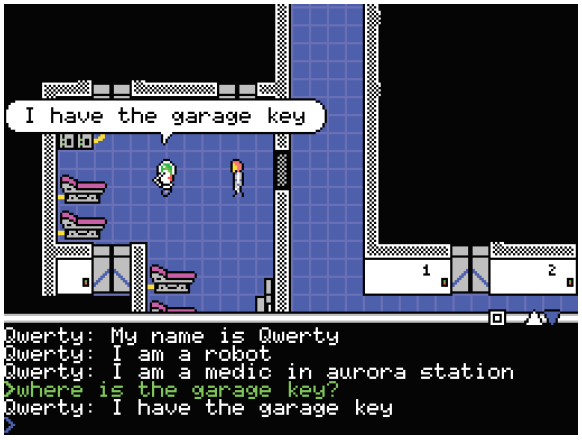

Figure 2: A screenshot of SHRDLU showing the main character talking with an NPC robot named Qwerty.

goals independently of player requests. This experience encourages the player to adopt the stance of a team leader rather than a tyrant, motivates a nurturing rather than destructive mode of engagement.

Informed by these beliefs, we developed the Villanelle framework (Martens et al. 2018) for authoring character behavior and branching storylines using behavior trees. Rime Royale used Villanelle to control the behavior of guild member characters left behind during missions. The implementation integrates the JavaScript version of Villanelle into a web-based environment running HTML5 Canvas to support visual modes of storytelling and user interface. Rime Royale is the first playable experience developed using Villanelle for character AI in the context of a fully-developed story arc and playtested, polished player experience.

Instructions for Play

Access Rime Royale at https://rime-royale.glitch.me/.

You have seven days to send guild characters on missions. Each day is split into two timesteps, morning and afternoon. Assign characters to missions by clicking on the mission you want to do and selecting the chosen adventurers from there. Initiate the next timestep by clicking on the NEXT button. Any un-assigned missions are replaced by new ones at the start of each day.

Each mission has a different stat requirement. Try to choose guild members for missions based on their stats, which you can check by clicking on the profiles of each character. You must assign 2 guild members to each mission you choose to do. Missions have different lengths, and the assigned guild members will come back after the mission is over. The outcome of the mission will pop up in the log in the bottom half of the screen. Characters will gain affinity and stat bonuses as they succeed on missions. Losses are penalized with minor stat loss.

Playing with SHRDLU

SHRDLU is game designed around the question of what would happen if we turned Winograd's original SHRDLU system (Winograd 1972) into a game.

Specifically, "SHRDLU"[1] is an adventure game where the player controls a character in a sci-fi setting world, and can talk to the game NPCs in plain natural language. The name of the game thus comes from the fact that NPCs behave in a similar manner to Winograd's SHRDLU. These NPCs interact in natural language, and have reasoning capabilities beyond what is usual in standard NPCs in this type of games, thanks to a full first-order logic resolution engine.

The gameplay of SHRDLU borrows ideas from the *Sierra* graphic adventure games of the late 80s such as "Space Quest" (Crowe and Murphy 1986). The player finds itself in a space station in an unknown planet without remembering how did she get there. By interacting with three robot characters (Etaoin, Qwerty and Shrdlu), the player will unravel the mystery about her identity and about Aurora Station.

As shown in Figure 2 the key difference between SHRDLU and Sierra adventure games is that, while in Sierra adventures the player had to type commands to make the main character perform actions (like in earlier Zork-style text-based adventures), in SHRDLU typing is used to talk to other NPCs in a similar way as in Façade (Mateas and Stern 2003), or MKULTRA (Horswill 2014). The key differentiating factor of SHRDLU is that it features three robot NPCs, each controlled by a separate Winograd's SHRDLU-style AI system, which handles natural language parsing, generation and reasoning. The two main AI techniques powering this AI system are: a grammar-based "situated" natural language parser (that uses the perceptual buffers of the NPCs to translate text into speech acts represented as first-order logical formulas), and a first-order resolution engine to perform inference. Also, all of the text produced by the game NPCs is automatically generated from their internal logical representations, and thus, they do have a logical representation of what they are saying which they can reason about.

An early prototype of this game was presented at AIIDE 2018 (Ontañón 2018), featuring only the introductory parts

[1]SHRDLU can be found here https://github.com/santiontanon/SHRDLU

Figure 3: Left: performers receiving lines from an AI chatbot via a headset. Right: Example of an improv performance(downstage) with one improviser receiving lines from an AI chatbot (upstage). A computer operator (upstage) curates the suggestions generated by the AI chatbot before sending them to the PA system of the theatre or to the headset of the improviser.

of the story. The version that will be displayed at AIIDE 2019 will include two full acts of the game (out of a total of three planned for the final game).

A playable demo of the version described in this paper, with a guide is available in the following url: https://www.cs.drexel.edu/~santi/games/SHRDLU-AIIDE2019/shrdlu-aiide2019.html

Human Improvised Theatre Augmented with Artificial Intelligence

Motivation

Improvisational Theatre Improvisation (*impro* or *improv*) is a complex theatrical art form modelled on natural human interaction and demanding constant adaptation to an evolving context; it has been qualified as "real-time dynamical problem solving" (Magerko et al. 2009; Johnson-Laird 2002) in the settings of both jazz music and theatre. Improv requires performers to exhibit acute listening to both verbal and non-verbal suggestions coming from the other improvisors, split-second reaction, rapid empathy towards the other performers and the audience, short- and long-term memory of narrative elements, and practiced storytelling skills (Johnstone 1979). From an audience point of view, improvisors must express convincing raw emotions and act physically to reproduce the experience of a scripted play.

The Three Minds of an Improvisor Individual improvisors, or improv troupes, typically combine several behavioural channels (or "minds") over the course of a performance. Upright Citizens Brigade teacher Billy Merritt introduced three concepts of *pirate*, *robot* and *ninja* (Merritt and Carrie 2012) to qualify players who fearlessly initiate new scenes with "no idea of what will happen next" (*pirates*), players who use their sense of logic and acting skills to ground the scene into reality (*robots*), and players who support the improvised storytelling by introducing characters and situations necessary to move the story forward or by reincorporating narrative elements to bring the story towards a conclusion (*ninjas*). An alternative subdivision into "realms of the body" (Shawn 1963) could be seen in the practice of French actor, dancer and trainer Francois Delsarte (1811-1871), namely into *head*, *heart* and *gut*. In the context of improv, the *head* focuses on storytelling, narrative elements, interest, humor, analogy, metaphor, and reincorporation; the *heart* concerns itself with reacting truthfully in the moment (Meisner and Longwell 2012); and the *gut* is the wild-card channel through which spontaneity emerges (Benedetti 1999). Good improvisers or improv troupes can balance these three channels, effortlessly switching as the performance progresses.

Using AI as an Actor Training Tool? AI models have been used for generating narrative structures by playing a role similar to the *head* (Eger and Mathewson 2018): an AI storyteller can be used in improv exercises where the actors focus on being in the scene (i.e. similar to a director calling edits). AI models have also been used for putting performers with challenging and novel situations (*gut*) (Mathewson and Mirowski 2017; 2018). The latter study (Mathewson and Mirowski 2018) collected feedback of a large number of human performers who qualified the AI conversational partner as an "X factor". The *pirate*-like conversational AI forced them to take care of the narrative, and enabled them to focus on the emotional aspects of the performance. These AI models can therefore serve challenging educational and inspirational tools for performance development.

Engaging in Human-Machine Conversations

To learn how to perform alongside AI-based improvisors, we have developed several exercises which channel the golden rule of improvisational theatre, saying: "Yes, and…" The first exercises focus on conversational dialogue. We use several conversational AI-based chatbot systems:

- rule-based systems (e.g., ELIZA (Weizenbaum 1966));
- retrieval based models such as Jann (Just Approximate Nearest Neighbour) [2], combining the Universal Sentence Encoder (Cer et al. 2018) embeddings of Cornell Movie-Dialogs Corpus (Danescu-Niculescu-Mizil and Lee 2011) with approximate nearest neighbor search;
- generative language such as A.L.Ex (Artificial Language Experiment) (Mathewson and Mirowski 2017), based on sequence-to-sequence recurrent neural networks (Sutskever, Vinyals, and Le 2014; Vinyals and Le 2015) trained on the OpenSubtitles corpus (Tiedemann 2009).

This progression illustrates the limitations and benefits of the different models. It invites participants to explore how each AI-based system might contribute to performance theatre in different ways. In these interactions, we focus on the dynamics necessary for successful improvisation alongside AI. We discuss timing, status, physical dynamics, and the undesirable—albeit quite common—dismissal of nonsensical lines from conversational AI models. Teachings from our AI-centered workshop are transferable, for instance for developing performance and public speaking skills (Winters and Mathewson 2019a).

[2] https://github.com/korymath/jann

Exploring AI Stage Partner Embodiment

Over the course of the workshop, we explore how the embodiment of the conversational dialogue system can affect theatricality and communicative dynamics. We illustrate and demonstrate the differences by comparing a robotic platform (Inc. 2019) to a video projection-based system. We also explore how the lines generated from the conversational models can be supplied (via headphones) to the humans in the performance (Fig. 3). In this way, a subset of the human performers can deliver nonsensical AI-generated lines using uniquely human emotion, instinct, and timing, while the other human performers *justify* and ground the scene. By modifying the embodiment we are able to compensate for timing limitations of computational systems through nonverbal acting and emotional subtext.

Show and Workshop

Our installation is an interactive improv workshop for a group of interested participants, culminating in a live public performance. Attendees are invited to observe and interact with AI-based improvisational theatre technology. The workshop is facilitated by two improv theatre professionals; the performance features various AI tools for augmented creativity. We aim to augment and enhance human performance by building and deploying challenging AI-based improv systems. We particularly look forward to participants' discussions on giving up control to AI-based collaborators (Meisner and Longwell 2012). A recording of a typical AI improv show can be seen at https://www.youtube.com/watch?v=bMSigawTuJs.

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TEDRIC: a Talk Exercise Designer for Realising Improvisational Comedy

We present TEDRIC, a slide deck generation system capable of generating TED-talk-inspired PowerPoint slide decks based on a single audience suggestion (Winters and Mathewson 2019b). This system enables improvisational comedy actors to more easily play the improvisational theatre game called *"Improvised TED Talk"* or *"PowerPoint Karaoke"*, in which an improviser improvises a monologue using a previously unseen slide deck (Mathewson 2018). Usually when this game is played, a second improviser prepares a slide deck for the presenting improviser. Preparing these slides is not easy, as it is a time-consuming task that involves knowing what types of slides work well, in what order, and with what content. Best practices prescribe that the created slides should contain "curated crazy" content, that is generic enough to support any type of audience suggestion, or at least any type of suggestion within a more specific domain (e.g. *nature* or *inventor*) (Mathewson 2018). The task of the slide deck is to offer a narrative and some suggestions for the presenter to either incorporate or justify in his explanation in a humorous way.

Figure 4: A presenter presented an improvised presentation using generated slides.

Our system uses a several different AI systems to automatically create a slide deck about a topic for this improv game. It thus replaces the need for a second improviser to create this slide deck, and for the first time enables the audience of the show to directly influence the content of the slide deck itself. To achieve this, the system randomly walks through knowledge graphs to decide the topic of every slide, returning to the topic given by the audience every couple of slides. It then picks a slide generator type based on the slide position: e.g. introductory slide generators (e.g. *Title slide*, *"About Me"*, *"History"*) have a higher probability to be generated early. Each generator then fills the content of their template using multiple types of generators, such as context free grammars, scraped content (e.g. from Reddit, WikiHow, Giphy). The slide deck generator is easy to extend with new types of narrative generators, slide generators and content generators, and thus a great application for many types of generative AI techniques.

To evaluate the quality of our system, we asked eight volunteers to evaluate three generated and three human created slide decks, without any knowledge about the source. The human created slide decks were extracts from slide decks used in shows performing the *"Improvised TED talk"*. We found that the generated slide decks were perceived to have slightly higher quality than the human created ones (Winters and Mathewson 2019b). This is likely due to the fact that TEDRIC is able to make the slides about the audience suggestion, something that was impossible to do before due to the time it takes to create such a slide deck. Afterwards, we successfully used this generator in several improv shows, spoken in English and in Dutch.

The code to run and play TEDRIC is made available on https://github.com/korymath/talk-generator. The online demo, as well as a large dataset of generated examples, can be found on http://talkgenerator.com.

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Conclusion

The Playable Experiences track at AIIDE presents four unique works that leverage artificial intelligence to create novel, polished experiences. These pieces are technical contributions and are valuable resources for the future of the field. With an emphasis on human-centric playability and audiences, these works have the potential to inspire future game designers and researchers to further chart unexplored design space through innovative artificial intelligence approaches.

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