Talk To Me About Pong: On Using Conversational Interfaces for Mixed-Initiative Game Design

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Abstract

Mixed-initiative game design tools combine intelligent agents and human input as collaboration to create novel and interesting content. Traditionally, these systems utilize graphical control-based interfaces. These interfaces can be complex and not reflective of designer intent. Given these issues we propose exploring conversational interfaces for mixed-initiative game design tools. We propose a case-study involving a system for co-creating variations of the game Pong as an initial step towards the exploration of the topic. In addition, we present some of the issues involving the design and implementation of conversational interfaces in mixed-initiative game design tools.

Motivation

From the man-machine symbiosis envisioned by Licklider [10] to the sketch-based interactive design capabilities of Negroponte's soft architecture machine [11], researchers have long sought tools that create a design collaboration between people and computers. Such systems today tend to be called either *mixed-initiative*, emphasizing the nature of turn-taking between human designers and computer designers, or *co-creative*, emphasizing the contributions of humans and computers without necessarily implying a turn-taking approach.

Mixed initiative design systems have attracted considerable interest within the procedural content generation (PCG) for games community. Traditionally, procedural content generation within games has focused on creating game content---such as a game level or map---with little to no input from the player. The classic dungeon crawler Rogue exemplifies this approach, with each level of a dungeon being generated by a computer algorithm, with no input from the player [5]. Designer aesthetics are embedded in the genera-tion algorithm. The player either accepts a generated dungeon and plays on, or rejects it by ending their game session. In contrast, a mixed-initiative procedural generation system creates a collaboration between a human designer and a procedural generation algorithm. The Tanagra [4] system by Smith and Whitehead demonstrates this in the arena of level design for 2D platformer games similar to Super Mario Bros [12]. The human designer places one or more platforms, thereby creating a partial level design. Tanagra's generator reacts to these platform placements, and automatically generates a suggested design for the remainder of the level. This suggested design can then be modified by the designer, leading to further design suggestions, and so on. Other recent examples include Liapis' [1] Sentient Sketchbook a strategy map design tool, Compton's [2] Casual Creators, and Nelson et.al's [3,6] mixed-initiative game design tools for mobile devices.

Current generation mixed-initiative design tools for games provide significantly enhanced design support over traditional tools that provide a blank canvas to human designers. However, there are several ways one might ideally like to improve these systems. First, existing tools constrain and channelize design activity via their user interface affordances. For example, in Tanagra the UI only permits the manipulation of platforms and placement of non-player characters, thus limiting design activity to these facets of gameplay. Second, existing tools don't have a rich model of designer intent, and this limits the kinds of design assistance they can provide. Tanagra's model of designer intent is limited to the platforms placed by the designer, and the notion of "pinning" a platform to a fixed location. Whether the human designer is creating a fast-paced hard level, or a slow-paced easy level is beyond Tanagra's understanding. Finally, lacking a model of intent, it's not possible to manipulate designer intent over time. It isn't possible to ask Tanagra to make a level "more frantic" or to interpret suggestive but ambiguous desires like "make it colder".

Another challenge with traditional mixed initiative design tools for games is their interface complexity. Designers working with these tools explore a high dimensional design space. An example of this is *Cillr:* A mixed-initiative game creation system developed by Nelson et.al. [3,6]. This system had an interface with 284 controls, one for each feature of their knowledge representation for games. Nelson et.al. mention the difficulties during user testing relating to difficulty navigating the UI and understanding of the design space that stem from the high dimensionality of the design space, and the complexity of the user interface in the system.

This presents an opportunity to explore different interfaces in the creation of mixed-initiative PCG systems. Conversational interfaces in this case can provide an alternative to GUIs with a large amount of fixed controls presented at once to the human designer. The dialogue based paradigm of mixed-initiative design is well suited to the turn-based interaction of conversational interfaces. Human designers can take advantage of the conversational nature of these interfaces to explore the design space of an artifact by moving one characteristic at a time in an incremental fashion until they reach their objective. This step-by-step design space exploration combined with a real-time visualization of the generated artefact as it changes throughout the design process can provide an alternative to the complex UIs that mixed-initiative systems use

One use scenario of conversational interfaces in mixed-initiative design system is the one of co-creative game design. Games as a finished artifact are generally described by human designers and users in qualitative terms, rather than quantitative. One can think of describing a video game as "frantic", "smooth", or "stressful" but rarely one describes games in numerical quantities and parameters. As such, using mainly quantitative values while exploring the space of generated games in a mixed-initiative tool might frustrate the human designer during the process. On the other hands, iteratively exploring the design space by describing what aspect of the game is being explored at a time might prove more useful to the human designer. One could think of modifying a parameter of a game by saying *"Make the character move faster"* feel more appropriate as a descriptive characteristic of a game in its design process rather than quantitative descriptions like *"character.xSpeed = 32"*. The former type of interactions in the design process of games lends itself as an opportunity to explore the usage of conversational interfaces in mixed-initiative game design.

Pong as a Reference Problem for Mixed-Initiative Game Design

One problem domain for voice driven mixed initiative design is generating interesting variants of an established game, such as Pong, according to human designer intent. The choice of Pong [7] as a game domain for mixed initiative design is the one of having a lower design space dimensionality compared to other video games. The space is small enough that interface design complexity issues are not a cause for trouble, but also one large enough to provide interesting variations of the games to human designers.

The design space of Pong can be expressed at both the mechanical level (paddle speed, number of paddles and balls…) and the sub textual levels (what do the paddles and balls represent). For example, the Atari game Video Olympics [9] is comprised of several mechanical variations of the game such as "Super Pong" as well as sub textual variations of the game like "Soccer" and "Handball". A more modern exploration of the design space of Pong is Pippin Barr's game Pongs [8] which provides both types of variations outside of the hardware limitations of previous Pong variant games.

The richness of variations of the game's design space lends itself as an interesting use case for voice driven mixed initiative design. A human designer could try to execute their vision for different kinds of games based on the assumptions provided by the base game. One could imagine a designer collaborating with the system to create a version of Pong that could be described in qualitative terms such as "angry" or "bucolic" by means of a conversational interface to the system. Since mixed-initiative systems employ a dialogue-like use metaphor, the user can explore the design space of the game in a manner that results more "natural" to their design process. Given that the number of agent types, player actions, and physics parameters in Pong is well defined, we can apply a set of descriptive adjectives to the actions that can reflect a human designer's intent during the process. Phrases such as *"I would like to control 5 fast paddles at once"* or *Make the ball move in a more aggressive manner"* can be mapped to a series of parameter modifications of the game itself in the system. This can lead into a collaborative process between the system and the designer that might result in a more efficient exploration of the design space of the game.

Issues for the Creation of Conversation-Driven Mixed-Initiative Systems

While the usage of conversation based interfaces might be able to address some of the UI design issues of mixed-

initiative game design systems, there are issues to be considered when implementing such a system.

One of the issues of conversational interfaces in mixed-initiative systems is the one of how much can interact with a conversational interface continuously before finding the experience frustrating. This is an analogue to the problem of interface complexity in control based UIs. While the large amount of controls presented to the user might prove frustrating and hard to navigate to the human designer, an extended interaction with a conversational interface might frustrate the user. This could be interpreted by the designers as the system "not listening" to their input if the results of their conversations about a design do not result in their expected vision of the artifact.

A second issue is the one of finding a starting point between the system and a human designer such that the exploration of the design space of our system leads to a successful co-creation process. This "blank-canvas" process carries several design considerations such as whether either a random solution or a fixed initial point of entry affect the exploration of the design space of our artifacts. In addition, given the conversational nature of the interface the proposition of who initiates the co-creation process arises. Should the designer initiate the exploration of the design space by selecting the parameter they feel is the most appropriate to modify to realize their vision? Or should the system act as a guide by pointing at parameters that might be able to achieve the designers vision in an efficient manner? This is an interesting consideration, since a designer initiated process might lead to an efficient pruning of the design space of the system, since the user is expected to direct its vision towards the system. On the other hand, a system initiated co-creation process might lead the designer to consider parts of the design space of the system that otherwise would be ignored by letting the system lead the process.

This leads us to the issue of design workflows while using conversational interfaces. One feature that is present in graphical UIs in mixed-initiative systems is the freestyle workflow that having all options presented at once affords the designer. In this sense, a more linear workflow is present in a conversational metaphor. By iterating one aspect of the design at a time in an ordered manner, the human designer might become frustrated by the system. For example, the designer might perceive that they have to methodically go through a phone-tree style menu to reach the aspects they desire to modify. This can become a cumbersome task in the designer's mind as they feel they cannot apply their workflow to a turn-based interaction model. In this sense the system's conversational interface needs to present the affordance of being "freestyle" by letting the designer move around the design space freely in any order.

These above are some of the issues that can arise in the design of conversational interfaces for mixed-initiative co-creative systems. As such, the designer needs to consider these possibilities in order to embrace the advantages that this metaphor affords.

Conclusions and Future Work

We have discussed a proposition for using conversational interfaces in mixed-initiative game design systems. This proposal stems from some of the issues present in traditional graphical UIs used in the design of mixed-initiative systems for PCG. The usage of conversational interfaces that let the user interact with the design space of artifacts, such as games, in an iterative dialogue using qualitative terms presents an alternative to quantitative valued control-based UIs that can address the issues of interface complexity and lack of qualitative manipulation of artifacts present in current mixed-initiative game design systems. In addition, we have presented some of the issues to consider when designing conversational-based interfaces for mixed-initiative design tools such as interaction attrition, starting points, and design workflow issues.

We have started developing a conversational interfaced system that co-creates variants of Pong as an initial exploration of our proposal. We look forward to analyzing the results of user testing of our system with hopes of gaining insights about game design for future systems based on how human designers interact with the system.

References

[1] A. Liapis, G. N. Yannakakis, J. Togelius -, "Sentient Sketchbook: Computer-aided game level authoring," in Proceedings of the Foundations of Digital Games Conference, USA,2013.

[2] K. Compton, M. Mateas -, "Casual Creators," presented at the International Conference on Computational Creativity 2015.

[3] M. Nelson et al., "Mixed-Initiative Approaches to On-Device Mobile Game Design," presented in the proceedings of the Mixed Initiative Creative Interfaces workshop at CHI, USA, 2016.

[4] G. Smith, J. Whitehead, and M. Mateas, "Tanagra: A Mixed-initiative Level Design Tool," in *Proceedings of the Fifth International Conference on the Foundations of Digital Games,* USA, 2010.

[5] M. Toy, G. Wichman, K. Arnold, J. Lane - Comput. Sci. Res. Group UC Berkeley, USA, 1980.

[6] M. Nelson et al., "Fluidic Games in Cultural Contexts," presented at the International Conference on Computational Creativity 2017, USA, 2017.

[7] A. Alcorn, "Pong", *Atari,* 1972.

[8] P. Barr, "Pongs", *pippinbarr.com*, 2012

[9] J. Decuir, "Video Olympics", *Atari,* 1977.

[10] J. C. R. Licklider, "Man-Computer Symbiosis," *IRE Transactions on Human Factors in Electronics*, USA, 1960.

[11] N. Negroponte, "Soft architecture machines,", MIT Press, 1975.

[12] S. Miyamoto, H. Yamauchi, and T. Tezuka, "Super Mario Bros," *Nintendo Entertainment System. Nintendo*, 1985.

Biographies

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