Jikan to Kukan: A Hands-On Musical Experience in AI, Games and Art (Demonstration)

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Abstract

AI is typically applied in video games in the creation of artificial opponents, in order to make them strong, realistic or even fallible (for the game to be "enjoyable" by human players). We offer a different perspective: we present the concept of "Art Games", a view that opens up many possibilities for AI research and applications. Conference participants will play *Jikan to Kukan*, an art game where the player dynamically creates the soundtrack with the AI system, while developing her experience in the unconscious world of a character.

Introduction

The main effort in the game industry has been in the optimization of graphical resources, to ensure realistic images. This strive for a realistic representation also affected the way agents are designed, mostly focused on behaviors that simulate realistic human actions (Scott 2002). Additionally, another important area of focus is developing agents that play with moderate strengths, increasing the "enjoyment" of human players (Lidén 2004). Traditional AI research, on the other hand, is mostly focused on the creation of strong artificial players, motivated by a desire to overcome the best human players (Newborn 2011). Meanwhile, a trend is emerging on the application of AI for the generation of music. Instead of creating fully autonomous systems (Eigenfeldt and Pasquier 2013), however, many researchers are finding more valuable to create AI systems where humans and algorithms cooperate in the music generation process (d'Inverno and McCormack 2015). This AI and arts development is happening apart of the main electronic games development efforts.

Games, however, are actually also an artistic expression. Recent titles are breaking common paradigms, and are showing that games can be a way to obtain unique (even provocative) experiences and feelings. Similarly to contemporary paintings and novels, the main focus of games does not have to be just "fun" and "enjoyment". This new view, however, calls for new ways to apply traditional AI techniques, and also the development of new AI approaches that go beyond merely programming strong/realistic/fun agents.

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We present *Jikan to Kukan*, an artistic game that we are currently developing to explore these ideas. Instead of the traditional view of interacting in a world while some pre-defined music plays in the background, the player dynamically generates the music of the game in an online manner, while playing the game. She experiences this while exploring the unconscious world of a character, hence differing from systems where the objective of the user is to generate music; as in our case the generation is a "side-effect". In this demonstration, we allow the conference participants to play "Jikan to Kukan", and have their own unique musical experience.

Art Games

The focus of Art Games is on the innovation, on breaking paradigms and on creating unique experiences, motivated by artistic movements. Often their visual is aesthetically beautiful, and not necessarily realistic. The way the player interacts with the game (i.e., the game mechanics) is generally complex, or at least different than the usual forms. Moreover, instead of a fixed script, they borrow characteristics from contemporary literature, and present stories that are non-linear and often open to a variety of interpretations. Hence, well accepted notions such as the necessity of a well-defined set of rules, continuous challenge proposals and conditions for victory/defeat are transformed into non-essential features. The main objective of Art Games turns exclusively into producing extraordinary and surreal experiences.

In particular, instead of the traditional view of AI as being a tool for the development of non-player characters (NPCs), Art Games open the possibilities for AI to be applied, instead, to enrich the expressiveness of the games. Hence, AI can take control, for example, on how the music is performed, how the levels are generated, which visual effects are used, and how the story unfolds in an open an non-traditional way. Moreover, since games are interactive by nature, we do not need AI systems that autonomously generate art. In fact, we envision systems where the art emerges in the continuous interaction between the player and the game; where each player has her own and unique experience as algorithms act in a supportive role for the creative process.

Jikan to Kukan

In order to explore the potential of games as a collaborative AI system, we are developing Jikan to Kukan. In our game,

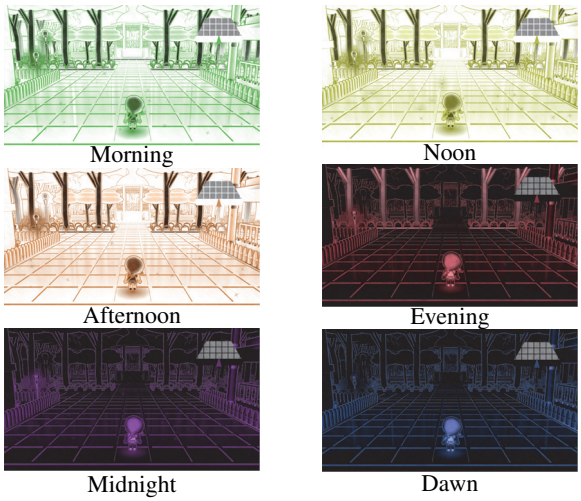

Figure 1: Different color pallets at different states.

the main character suffers amnesia. The player navigates in the unconscious mind of the protagonist, seeking for answers about her life, including her current state. The game progresses with the player looking for and finding "memories" in the scenario; in the process, the player builds her own version of the story. We focus mainly on the musical aspects of the game, emphasizing how it allows the music to emerge by the interaction of the player with the system.

The game is controlled by a *finite state machine*, with six different states: morning, noon, afternoon, evening, midnight, dawn. The state transitions follow the natural cycle of a day, and they also happen in a circle (i.e., after "dawn" the state changes back to "morning"). These states control many aspects of the game, but we focus on how they affect the mood, and, consequently, also the music. "Day" states (morning, noon, afternoon) are associated with happy emotions, while "Night" states (evening, midnight, dawn) with sad emotions. Normally happy "memories" are found in day states, and sad "memories" in night states. To visually set a mood, we use different color pallets for different states when displaying the graphics. We use hot colors in day states (to associate with happy feelings), and cold color for night states (to associate with sad feelings), as shown in Figure 1.

We also use music to set the mood of the game. We use here two concepts from music theory: *harmony*, the background accompaniment of a song; and *melody*, the foreground progression of a song. The game continuously play the (predefined) harmony, and to set the mood at different states we use different music scales, as shown in Figure 2. The melody, on the other hand, is not pre-defined. It is directly created by the user interaction. In order to do so we first divide the environment of the game in a grid, where each cell corresponds to a piano key. When the player steps in a cell, the corresponding key is played. We use a basic building block (Table 1), where each cell in the table shows the key assigned to a cell in the scenario. This block is repeatedly concatenated in all directions, and it was designed to allow a smooth connection between the borders, as we show visually in Figure 3. Hence, we can continuously apply a musical pattern across the floor of scenarios of any size, and the user does not perceive when moving from one block to the next one. The keys on the floor always follow the same scale as the harmony (for a coherent musical experience), which is set by the current state. Therefore, the system plays a harmony in a certain scale, which defines a mood; and the player creates the melody dynamically (in the same scale) while exploring the scenario looking for "memories", creating her own unique experience (as shown in https://youtu.be/sjKY_pfyNTc).

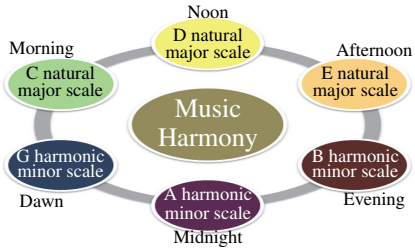

Figure 2: Different scales in the harmony at different states.

C	D	E	F	G	A	B	A	G	F	E	D
D	E	F	G	A	B	C	B	A	G	F	E
E	F	G	A	B	C	D	C	B	A	G	F
F	G	A	B	C	D	E	D	C	B	A	G
G	A	B	C	D	E	F	E	F	C	B	A
A	B	C	D	E	F	G	F	E	D	C	B
B	C	D	E	F	G	A	G	F	E	D	C
A	B	C	D	E	F	G	F	E	D	C	B
G	A	B	C	D	E	F	E	D	C	B	A
F	G	A	B	C	D	E	D	C	B	A	G
E	F	G	A	B	C	D	C	B	A	G	F
D	E	F	G	A	B	C	B	A	G	F	E

Table 1: Building block for placing notes in the scenario.

References

d'Inverno, M., and McCormack, J. 2015. Heroic versus Collaborative AI for the arts. In *IJCAI*.

Eigenfeldt, A., and Pasquier, P. 2013. Considering vertical and horizontal context in corpus-based generative electronic dance music. In *ICCC*.

Lidén, L. 2004. Artificial stupidity: The art of intentional mistakes. In *AI Game Programming Wisdom*, volume 2.

Newborn, M. 2011. *Kasparov versus Deep Blue: Computer Chess Comes of Age*. Springer.

Scott, B. 2002. The illusion of intelligence. In *AI Game Programming Wisdom*, volume 1.

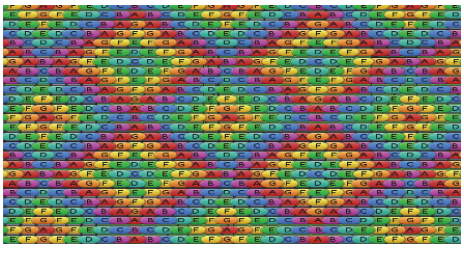

Figure 3: Building block in a loop over a scenario.