AETHRAKHTHON: Structuring Electroacoustic Improvisation and Performance Using a Game Engine
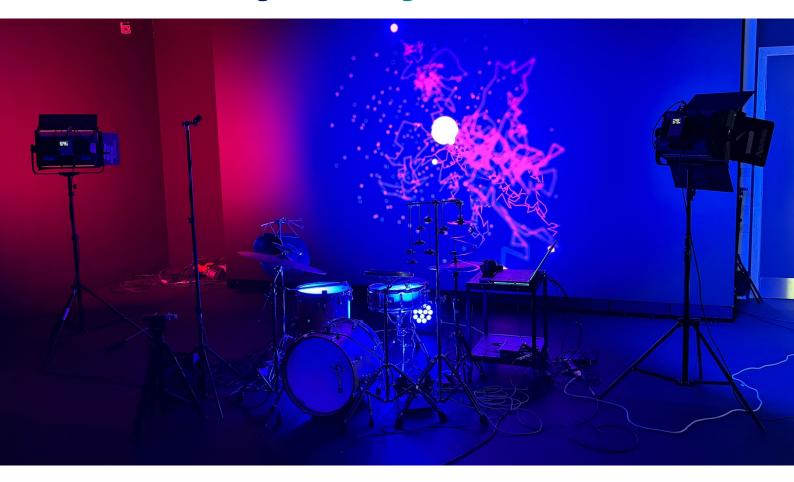
AETHRAKHTHON is a game-piece utilizing an electronically augmented drum-kit as an interface with a physics-driven game environment. The work explores improvised musical structures where the physical dynamics of the game world influence live sound processing and electronics. Through the interplay between the drum-kit and the game engine's physics, the performer navigates a space of sonic possibilities, generating a dialogue of audiovisual interactions. This open-ended structure encourages exploration, allowing for unique interpretations in every performance. The result is a dynamic and evolving experience where the boundaries between sound, motion, and technology blur.

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AETHRAKHTHON

AETHRAKHTHON is a piece for the augmented drum-kit, a hybrid instrument that bridges the acoustic and digital realms. The drum-kit consists of a traditional setup enhanced with sensors, contact microphones, and speakers, all integrated with bespoke software. This configuration transforms the drum-kit into a dynamic control interface for live electronics, game engine, and visuals. Using machine listening techniques and gestural analysis, the performer's physical actions directly shape the sound world and game environment, creating a highly immersive and physical performance. The interaction model minimizes reliance on conventional controller interfaces, with the laptop functioning solely as a mediator for the diverse system components. All controls for electronic sound, lighting, and projection are handled through the acoustic drum-kit, allowing the performer to focus entirely on their instrument. This approach emphasizes a seamless integration of the acoustic and digital, resulting in a performance system that feels both organic and intuitive.

Fig. 1. *AETHRAKHTHON* setup.

The piece makes use Unity's physics engine, utilizing the physical gestures performed on the drum-kit to generate sonic and visual representations. Through sample-based and synthesis techniques, as well as real-time audio processing, these gestures are mapped to actions within the digital game space. This extension of the drum-kit into the virtual environment enables a dynamic interplay between physical and digital worlds, where the performer's actions trigger both auditory and visual actions. The sound palette created by this augmented drum-kit has been documented in several solo releases, including *Frrriction* (2012) and *Long Distance* (2013).

Game Design and Interaction

The performer navigates through different game scenes, each offering unique mappings of physical gestures to sonic and visual outcomes. The environment serves as a space for experimentation, where the performer interacts with and responds to the system in real time, discovering the relationships between physical actions, sound, and visuals. These are projected onto a screen behind the performer, with the audience sharing the same feedback experience. This creates an immersive performance setting, drawing viewers into the dynamic interplay between sound and movement. Interaction within the environment ranges from clear and immediate cause-and-effect relationships — where a drum hit directly influences the visuals or sound processing — to more nuanced and abstract mappings. These variations challenge the performer to continually adapt and respond, creating

a performance that balances control with discovery. Musically, the digital environment acts as a type of graphic score. While it provides a structured framework for the performance, it also leaves room for interpretation and improvisation. The relationship between the performer's gestures and the system's responses generates a unique performance each time.

The piece is designed as a solo performance lasting between 10 and 60 minutes, with duration determined by the performer's artistic intentions and the flow of the game.

Previous Work

This work builds upon previous pieces using game engines as tools for musical performance. Previous works include both solo and ensemble pieces that leverage game mechanics and environments to shape sound and interaction. These projects range from experimental games controlled by conventional game controllers to instrument-specific games designed for acoustic instruments. Notable among these works is *Pathfinder* (2016), a game-piece premiered at ICLI 2016 and subsequently performed at various festivals and conferences such as NIME 2016, DiGRA 2016, Sonorities 2016, and ICMC 2017.

Documentation:
https://www.youtube.com/watch?v=XW4NCk6GXj8

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