Trois Machins de la Grâce Aimante (Coretet no. 1)

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Fig. 1. Performers wearing Oculus Rift head-mounted displays perform *Trois Machins de la Grâce Aimante*.

1. PROJECT DESCRIPTION

Trois Machins de la Grâce Aimante is a composition intended to explore Twenty-First century technological and musical paradigms. At its heart *Trois Machins* is a string quartet fundamentally descended from a tradition that spans back to the 18th century. As such, the work primarily explores timbral material based around the sound of a bowed string, in this case realized using a set of physically modeled bowed strings controlled by Coretet [1], a virtual reality string instrument and networked performance environment. The composition - for four performers, preferably from an existing string quartet ensemble - takes the form of three distinct movements, each exploring different capabilities of the instrument itself and requiring different forms of communication and collaboration between the four performers.

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Fig. 2. Coretet preset configurations from left to right: orb, violin, viola, cello and the Coretet bow [left]. Coretet server view of performer playing the cello [right].

Movement I serves as an introduction to the performance, with performers first engaging Coretet using its Orb configuration. The structure of Movement I is improvisational and rhythmic with a metronomic pulse being established by the ensemble. Notes on the Orb are triggered by the collision of the avatar's skeletal mesh and the surface of the Orb generating pitched percussive sounds. Performers move from performing rhythmic hand strikes to bowing the Orb, creating a single pitch similar to that of a bowed steel plate or saw. The movement concludes as each performer bows the Orb, resolving to a static four-note chord across the ensemble.

Movement II explores a function of Coretet that allows finger positions activated along each instrument's neck to be quantized to a variety of modes and scales. To denote each selected mode or scale fret markings similar to those found on a viola da gamba or guitar are made visible along the instrument's neck. These modes and scales include:

- *Octave*: the neck is divided into two regions
- *Triad*: major triad built on a string's root pitch
- *Pentatonic*: a five note scale
- *Whole-tone*: a six note whole tone scale
- *Chromatic*: a single octave chromatic scale
- *Quantized*: the full range of the instrument with pitches quantized to the nearest note in a chromatic diatonic scale
- *Free*: the full continuous range of the instrument without quantization

A composed improvisation within each selected mode is performed by the ensemble for movement II and focuses on different rhythmic, harmonic and melodic ensemble performance practices. A traditional graphic score (see Figure 3) was prepared for Movement II and used by the composer and ensemble outside of the virtual environment for the preparation of concert performances.

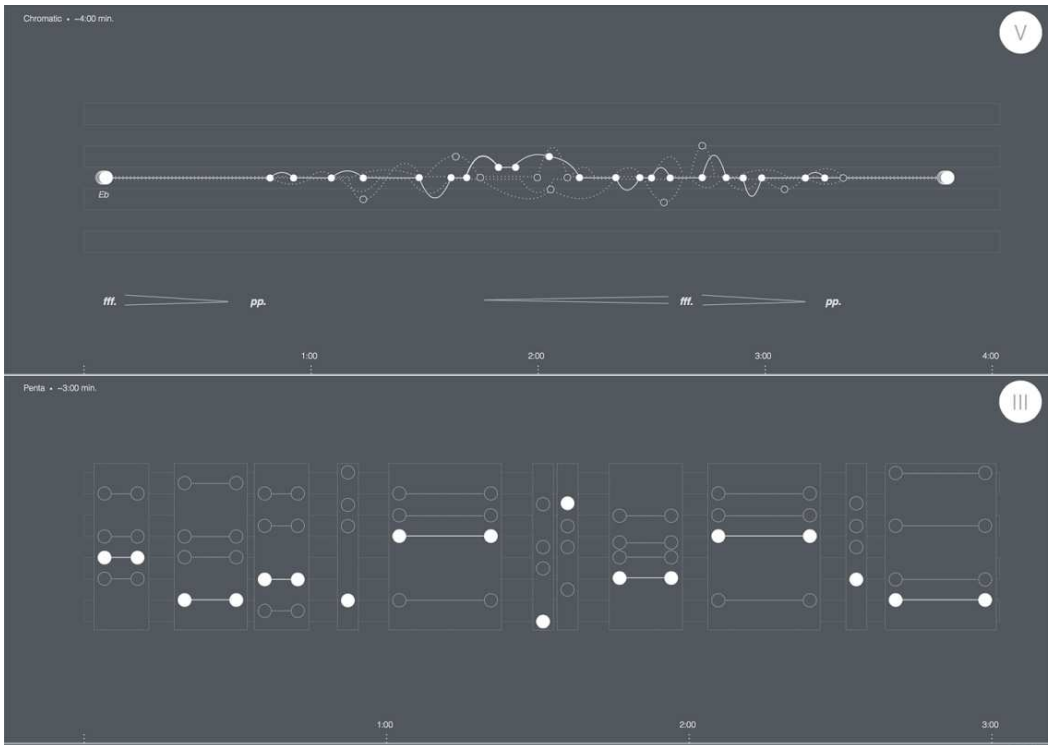

Fig. 3. Two sections from the graphic reference score for Trois Machins de la Grâce Aimante, Mvt. II

Whereas the first two movements of *Trois Machins de la Grâce Aimante* are largely improvisatory in nature, **Movement III** was composed using traditional notation practices and focuses on vertical harmonic structure and rhythmic synchronicity. Within a virtual reality environment where performers wearing head-mounted displays are unable to view notated scores in a traditional manner, Coretet instead displays notes from a musical score in real-time as glowing blue pitch location indicators along the instrument's neck. Scores are synchronized across each of the clients and read individual MIDI tracks exported from a parent score using music notation software such as Finale.

2. TECHNICAL NOTES

Trois Machins de la Grâce Aimante is performed entirely using Coretet, a virtual instrument which can be shaped and scaled by performers wearing Oculus Rift head-mounted displays into different configurations (see Figure 2). Parameters such as neck length, body size, and number of strings are manipulated to recreate traditional stringed instruments such as violin, viola or cello or to create new and physically impossible instruments. Performers use a virtual bow which activates the bowed string physical model when it comes into contact with a specific bowing bar on the instrument. By pressing buttons on the Oculus Touch's left hand controller, performers choose which string will be activated. By moving their left hand along the instrument's neck and pressing each string's associated button, performers change the pitch of the current sounding note.

Coretet leverages the Unreal Engine's native network layer to create a networked virtual performance environment capable of supporting and presenting a traditional four-member string quartet to performers through head-mounted displays and to audiences through an auxiliary screen or projector. In a concert performance such as is utilised for *Trois Machins de la Grâce Aimante* this game server hosts each Coretet client instance (representing each performer) connecting across a local ethernet network. Performers in Coretet see each others' head, bow and instrument in real-time within the virtual concert space, allowing for the use of communicative visual gesture both of the head and of the instrument and bow. In live concert situations, a view into the networked virtual space is presented to audiences from the game server. In a manner similar to e-Sports broadcasts of networked games, a series of virtual cameras on the server are projected in 2D for viewing by audiences seated in traditional concert halls.

3. PROGRAM NOTES

While *Trois Machins de la Grâce Aimante* is a composition intended to explore Twenty-First century technological and musical paradigms, it is at its heart a string quartet fundamentally descended from a tradition that spans back to the 18th century. As such, the work primarily explores timbral material based around the sound of a bowed string, in this case realized using a physically modeled bowed string. The composition takes the form of three distinct movements, each exploring different capabilities of the Coretet instrument itself and requiring different forms of communication and collaboration between the four performers. Coretet is a virtual reality instrument that explores the translation of performance gesture and mechanic from traditional bowed string instruments into an inherently non-physical implementation. Built using the Unreal Engine 4 and Pure Data, Coretet offers musicians a flexible and articulate musical instrument to play as well as a networked performance environment capable of supporting and presenting a traditional four-member string quartet.

4. MEDIA LINK(S)

- Video: https://www.youtube.com/watch?v=cgODPY90pAU
- More Information: http://www.coretet.io

ACKNOWLEDGMENTS

Support for the composition of *Trois Machins de la Grâce Aimante* and the development of Coretet was generously provided by a GAPPP residency and commission from the Institut für Elektronische Musik und Akustik (IEM) in Graz, Austria, under the direction of Marko Ciciliani, Barbara Lüneburg and Andreas Pirchner. Hardware support was provided by an Nvidia hardware grant and additional funding and support was provided by Rensselaer Polytechnic Institute.

REFERENCES

[1] R. Hamilton, *Coretet: a 21st Century Virtual Interface for Musical Expression.* In Proceedings of the 2019 New Interfaces for Musical Expression Conference (NIME 2019), Porto Allegre, Brazil, 2019.