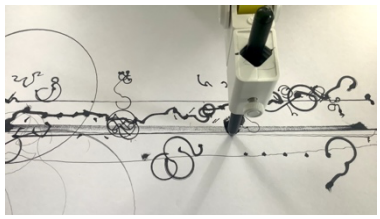
https://digiscore.dmu.ac.uk/

The Digital Score case study – Robotic AI and Arm

> ***Definition****: a digital score is a communications interface of musical ideas between musicians utilising the creative potential of digital technology.*



Artistic Vision

This digital score case study will use a robot arm and AI to draw notation through real-time responses to a live musician. The arm is powered by an AI agent that interprets the live sound of the live musician in a creative way. It responds by drawing musical notation that is perceived to be meaningful to the engaged musician(s) who interpret it there-and-then into sound. Through this process, the ideas embedded in the digital score are realised and music is produced.

As it stands a proof-of-concept (PoC) of the robot arm score has been completed (see video https://www.youtube.com/watch?v=oi1AdjK-mck). In this PoC the language of the notation was borrowed from Cornelius Cardew's *Treatise*, but it can be programmed to draw anything. We can also use digital paper, projection, or touch screen and enhance the notational language with animation, colours, shapes and images, and Western (or any form) notation.

The point with this PoC is that the inked notation is only part of the score: how the arm moves, when it moves, its velocity and acceleration; how each of the marks relate to the ongoing flow, and legacy of thinking inspired by its previous marks on this paper; how the presence of the AI is continuously reading the human musicians are all elements that communicate the idea and nature of the digital score as a whole. The robot arm in this sense should not be considered an assistive tool, but a co-creative agent, as the musicians and the AI work together in a synergetic relationship to create the music.

The next stage (and your involvement) takes this synergetic relationship one step further, by "plugging in" a musician into the AI. In this way, the AI goes beyond sensing the music (as sound) and starts to sense the plugged-in musician using brain-waves, muscle twitches, midi control data (from CMPSR), and/or galvanic skin responses (arousal). In this way the AI and the musician work as an extended system with each feeding the other: the AI reads the realtime brainwaves and arousal data of the human (A), and the human feels the embodied behaviour of the robot arm. The feedback loop is closed as the live musician (B) makes sound, which in turn is heard by the both the AI and humans (A+B).

The Research Process

- Mid-January (w/c 16th) – initial project meeting to include a hands-on demonstration with the current PoC robot arm. Aim: to get a feel for the interactivity, and start the discussion about the aesthetic design and composition of the digital score, understand creative AI behaviour, concept and design … what do YOU want it to do, draw, create?
- Feb week 2 (w/c 6th Feb) – first iteration of bespoke score/ robot design. Aim: ideas for further design, and refine behaviour of creative AI, compositional details
- Mid-March (w/c 13th March) – next stage iteration. Aim: further ideas, starting to finalise the composition
- March week 4 (w/c 27th March) – final play through. Aim: debug and final tweaks/ refinement
- April week 1 (w/c 3rd April) – sharing of prototype with partners *Orchestras Live* and *Sinfonia Viva*; plenary.

NOTE – The composition of this piece will be created by the musicians involved, and ALL intellectual property will be retained by the individuals. This is part of the democratising potential of this digital score.
We are aiming for a prototype, so should be open and free to explore, rather than aim to complete a shiny product.
It is also assumed that each musician will have a transformational encounter with this new way of making music. From a "scientific" perspective, I wish to capture these encounters and experiences. As such, I would require the musicians to openly engage with the qualitative research process, this will involve keeping a session log, agreeing to interviews, and completed the odd online questionnaire after the project. Further details should be read in the "Participants Info Sheet".

Contact email (until 31st Dec 2022): Professor Craig Vear cvear@dmu.ac.uk