
***Postcards* (2017): Creative AI mixed-media compositional system for live performance with a human musician**

Craig Vear

Creative AI Research Group
Institute of Creative Technologies
De Montfort University
Leicester, UK
cvear@dmu.ac.uk

Fabrizio Poltronieri

Creative AI Research Group
Institute of Creative Technologies
De Montfort University
Leicester, UK
fabrizio.poltronieri@dmu.ac.uk

Abstract

The aim of this research project was to develop a Creative AI compositional system for live performance with a human musician. The resulting composition *Postcards* centred around a central computer system controlling and generating multiple streams of media into a cohesive experience. The software environment at the centre of this score is embedded with autonomous or generative behaviour that actively composes the work in real-time and evokes the presence of the composer(s) in the flow of musicking. Additionally, the Creative AI was driving a central dramaturgy (flow of narrative) with the system articulating/ exploring/ exposing or revealing this through time.

Introduction to the project and the research team

This case study was a collaboration between Anne La Bergeⁱ - composition and programming, flute and voice performance; Fabrizio Poltronieriⁱⁱ - visual concept and programming, and Craig Vear as consultant composer. A top-level objective was to understand the complexity of working as a team in the gesamtkomposition of a mixed-media digital score. The study centred on a large-scale work of circa 35 minutes which is titled '*Postcards*' (see Figure 1), and was conceived as a sister piece for La Berge's large-scale mixed-media work *Utter*.

Conceptual approach to Creative AI

The concept behind the Creative AI was to fuse word, sound, image, network connectivity, real-time audio processing and live performance into a cohesive whole that had a thought-provoking dramaturgy. The collaborators worked for 12 months building a prototype that was premiered at the Kyma International Sound Symposium in Oslo, September 2017, and spent a further 12 months refining the score into the final work.



Figure 1. Extract from La Berge's performance of *Postcards* (2017-18) at Kyma International Sound Symposium, Oslo, 2017 © A La Berge

Aesthetic approach

On a poetic level *Postcards* explores augmented conversations across time, place, technology and people. The source material draws from a collection of two long-distance conversations between people immutably bound together through close friendship and creativity. These were the letters between George Sands and Gustave Flaubert (1866 – 1876), and another set of letters between Elizabeth Bishop and Robert Lowell (1947-1977). Thirty-two quotes from each of the four correspondents were selected (128 in total), which became the source material for *Postcards*. Through the performance of the piece these quotes were conceptualized as mixed-media postcards, and abstracted in real-time to create a conversation between the here-and-now of the live performance, the live processing of the flute, and the embedded stories that are held in the media materials.

System design

'Postcards' was conceived to have four interrelated systems:

- a) **Raspberry Pi.** This used algorithmic processes to re-imagine the correspondence between the four authors, and as the master technological conductor for the digital score. The Pi contained three independent internal processes: the first was a rapid exchange of texts between two virtual correspondents (held as cache in the memory of the Pi). In this internal exchange, extracts from the original texts were transferred between the virtual correspondents as fast as the processor could assemble. These texts were analysed and then manipulated using small A.I. scripts that mutated the original text using similes or ASCII code and returned them back into the library.

The second process generated an image from this augmented library and projected it into the performance space. Each image was assigned a straight or curved condition, a colour, lifespan and zoom factor. This purposely slowed the overall processing of the internal text exchange, whilst also offering La Berge a visual stimulus in her performance. The third process was nick-named the *Postman*, and sent controlling data to the other interrelated systems from which they determined their performance parameters.

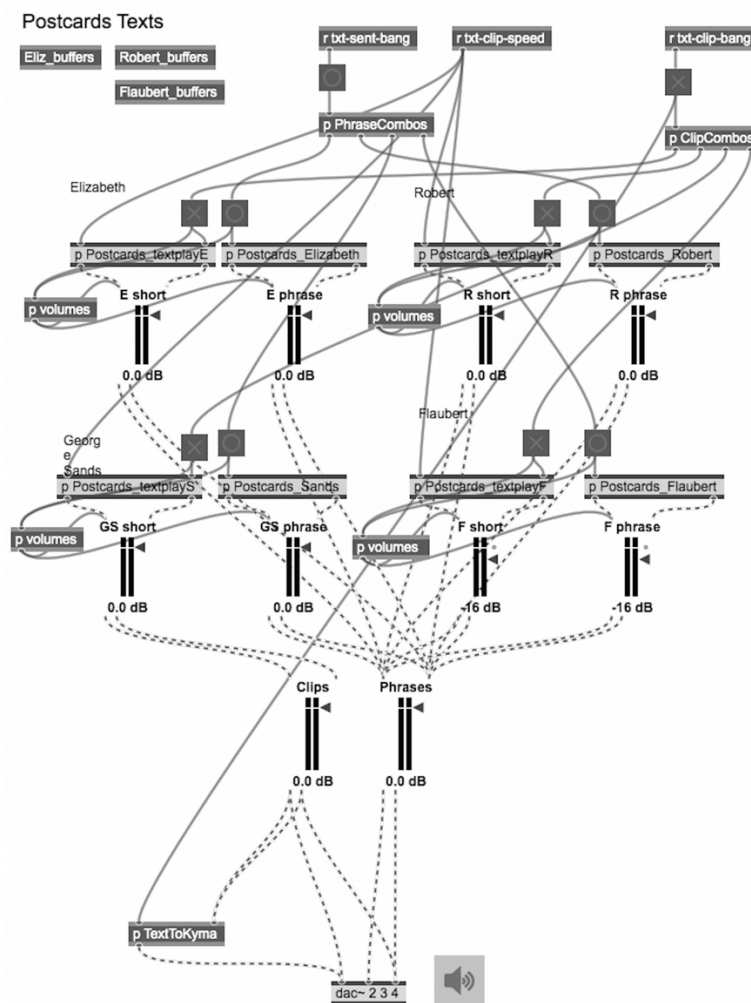


Figure 2. Image of the generative audio processing system from *Postcards* (2017-18) © A. La Berge/ C. Vear

- b) **Generative audio.** Each of the pre-selected text extracts from the four authors were spoken and recorded by La Berge and others with each voice assigned to an individual author. These recordings of the 128 lines of original text brought an additional layer of poetry into the piece as La Berge had experienced prolonged periods of correspondence when they were living or working in locations far apart. These audio extracts were used as generative material in the performance as either short rhythmical samples no longer than 20ms, or in their full length (see Figure 2). The specific combinations were determined by the performance parameters initiated by the *Postman* from the Pi.

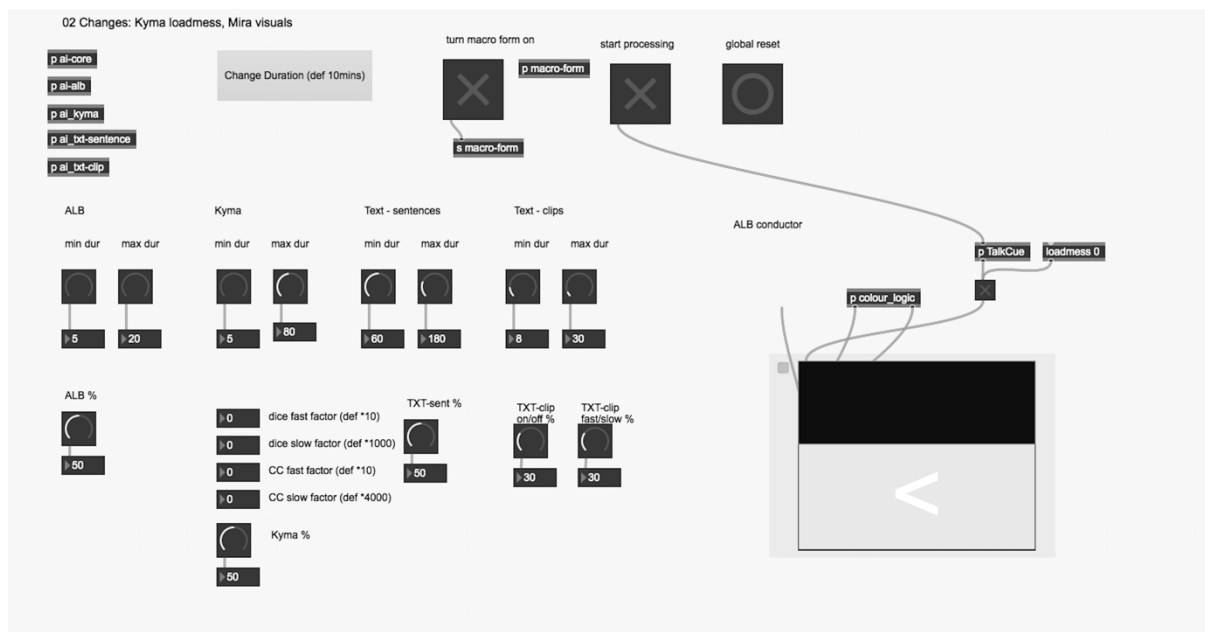


Figure 3, Image detailing the audio processing control system prototyping environment from *Postcards* (2017-18) © A. La Berge/ C. Vear

- c) **Live audio processing.** A Kyma sound engine processed the live signal from La Berge's flute microphone. This system consisted of several predefined states, and these were controlled by parameter signals from the *Postman* on the Pi. This processing was also controlled locally by a Creative AI behaviour engine that siphoned a stream of data from the rapid exchange of texts in the Pi. The audio processing system would call for a number from this siphoned stream and use that to determine a decision (see Figure 3). This added a sense that the processing was being determined from within the flow of real-time communication, rather than as a subservient process external to the central poetics of the work.

- d) **The human performer.** Although La Berge is an exemplary musician and improviser, it was important that the digital score conducted her so that she was incorporated into the whole *gesamtkomposition* of the work. To this end the *Postman* would signal to her whether to be inside the music through performing with her flute or voice, or outside the music as a commentator speaking directly to the audience.

Challenges and Solutions

The main challenges with this Creative AI composition were a) balance of intermedial cohesion, and b) the progression of narrative flow across time. With a) we implemented several layers of parameter control in the GUI of the software environment (see Figure 2), so that the internal computational choices across the systems were scalable through the development process. This enabled the team to tailor the behaviour of the system whilst we were working within it. Over the course of several weeks La Berge worked with the score, and adjusted some of the parameters until it felt right. This notion of it feeling right was a very subjective process for La Berge who was the only musician inside the music, and it was important that it was directed to fit her affectual and embodied perspective. The priority was that the processing didn't disrupt her flow in the musicking, and co-operated with her in the generation of creative opportunities. Whilst she couldn't define precisely what felt right they were aware that it equated to a positive collaborative state between human and machine, media and code, in which there was a generosity in the co-authorship of the music.

For a solution to the second challenge of narrative flow across time they expressly wished to avoid sub-dividing the whole time frame into smaller movements, or episodes, and challenge ourselves to find a solution for a cohesive narrative (in the broadest sense) through the whole piece. To this end they returned to the nature of the source material (the correspondence) and devised a simple sequencing based on the journey-states of a postcard: *receive* - a moment, *read* – duration, *write* – duration, *send* - a moment, *wait* – duration. Each of these were considered as a state-condition, and a duration assigned to *read*, *write*, *wait* of between 3-5 minutes. The *Postman* delivered independent state-conditions to each of the systems, which had autonomy to define its own characteristic for that state.

Performer's Response

La Berge completed the online questionnaire following premiere performance of a 10-minute version of *Postcards* at the Kyma International Sound Symposium in Oslo. Her response was very personal, and given the nature of its creation process and embedded narratives and meanings, this is not surprisingⁱⁱⁱ. In building the sound processing environment and collaborating with the design and build of the inter-related systems, La Berge embedded a

sense of herself into the nature and logic of the code which led to an acute sense of familiarity in its behaviour. This supported her musicality and story-telling techniques, ensuring that the feeling of *Postcards* worked with her abilities and techniques rather than pulling against them. To La Berge its interactivity felt 'similar to a Laurie Anderson song, sometimes personal, sometimes global, sometimes political and always minimal.'

The Creative AI approach resulted in an immersive and musically rich play-world for La Berge to explore and enjoy. She described her immersion in the visual and sonic realms of the flow as being 'exciting and motivating artistically; specifically because I loved both the sounds and the visuals'. She attributed this to the mediated events (sound and image) being controlled by a central software environment that coordinated all the computational systems. On this she said 'All of these components provided a layered environment of media where I could navigate within to tell an abstract story about *Postcards*.' But, because of the embedded random/ generative processes, it also offered an 'extra element of spontaneity' that 'gave the music a layer similar to improvising with another musician.' This approach also served to steer her as an improvising performer in a structural way. On this she said 'giving the piece a composed element where the audience and performer could trust that over time the piece would have interesting and engaging structural characteristics rather than being a fully improvised work.'

Within the flow of musicking La Berge considered the behaviour of the digital elements (sound, image, algorithms, and the network of interconnections) 'as if they were other living beings making aesthetic and structural decisions throughout the performance.' She said that throughout the performance she stayed 'hyper-alert to their activities and actions' as they helped to determine her decisions to 'function as either support or as steering member of the ensemble'. This changed the nature of her role, and her perception of the role of the digital elements. At times she felt that she functioned as a 'side-person' and at others the 'front-person in an improvising band.' Overall she perceived her role as 'co-architect, co-composer, co-designer, co-poet' with which her 'brain and body were active as were the digital others.' To facilitate this La Berge imagined that 'we are all in it together, the digits and me.'

The interplay generated through the Creative AI in the flow of musicking felt like she was 'performing with an improvisation ensemble' but also that it clearly defined 'strict aesthetic boundaries.' The presence of the generative functions made her feel like she was 'playing a score with rules' and that the evocation of its 'moment-to-moment decisions' called upon her to 'interact, steer and follow all the media.' Within the flow she felt that each 'medium had the opportunity to be playful, dominant and fluid' depending on the here-and-now combinations of 'presets, juxtapositions of sound and image and what the data flow was doing'. Although she choose a minimal approach in her realisation of the work it did entail 'jumping between

somewhat athletic changes and pauses to give the audience a maze-like path to follow while still enjoying my own performance. I had a good time.’

Developmental work

The overall impression of this Creative AI approach was a feeling of cohesion and unity for both audience and performer. This included a sense that the system, and the human musician were co-operating and co-creating together within the flow of the live music-making. The next stages for the development of this approach is to incorporate machine learning processes into this system to investigate if, and how, this can augment the co-operative nature of Creative AI within an embodied system such as the flow of music-making.

Code release

The code for this project is released with a GNU licence on GitHub at XXXXXX

ⁱ See <https://annelaberge.com> (accessed 25 July 2018)

ⁱⁱ See <http://www.fabriziopoltronieri.com/about> (accessed 25 July 2018)

ⁱⁱⁱ A. La Berge, October 2017. Online questionnaire to C. Vear. All quotes in this section.