Translating consciousness into music

The creators of The Fragmented Orchestra, artist Jane Grant, musician, composer and physicist John Matthias and composer Nick Ryan, write about the project which won the 2008 PRS Foundation New Music Award and which will have its first public outing from December to February at FACT gallery in Liverpool and 24 sites across the UK.

The Fragmented Orchestra is a huge distributed musical instrument, modelled on the firing of the human brain’s neurons. This collaborative work, spanning music, art and science, has evolved from a fascination by its creators of the inherent rhythms and adaptive learning of spiking neurons.

One of the best descriptions of our project has actually been written not by us, but by Arden Evans, the author of Sound Ideas: Music, Machines and Experience:

‘The Fragmented Orchestra combines conceptually simple but technically precise elements (microphone, speaker, communicator, and “neuron”) into an elegant, geographically-distributed network structure. The result, a vast musical brain, promises to generate pieces that touch upon extraordinarily disparate aspects of music and culture, including audience participation, sampling as instrument, endogenous composition, aesthetics of technology, and more.’

The origins of the project

In 2004, John Matthias and Eduardo Miranda at the University of Plymouth developed the Neurogranular Sampler, an instrument which triggers grains of sound from sound files in a computer when artificial spiking neurons fire within a computer programme. These initial experiments formed a large part of the piece Cortical Songs written by John Matthias and Nick Ryan, which was released on Nonclassical Records this year with John Matthias playing solo violin. In this piece, spiking neurons control a set of lights, which flash when the neurons fire. The score is a combination of instructions to performers following flashing events and conventional notation.

At the same time, Jane Grant also at the University of Plymouth, developed the Neurogranular Sampler and, working with computer scientist Tim Hodgson, stretched the grains, increased the density of firing and developed a working interface for the instrument. The resulting work by Jane Grant merged the voice and breath with internal neuronal firing patterns, forming the sound and video installation Threshold which was exhibited at the AntSway Gallery in Summer 2003.

A network of sonic sites

In May 2008, the composers, the PRS Foundation and FACT emailed thousands of people and institutions, inviting them to propose a location to be considered as one of the 24 sites. They were asked to describe in 100 words why their site was sonically interesting. The response was fantastic, with proposals coming in from all over the UK, with written descriptions of sounds and locations. The final 24 sites were chosen for their inherent sonic rhythms, their geographical location and the significance and use of the site. The final 24 sites are listed in this box to the right.

Each of these sites will have a soundbox installed, streaming the sound from the site to a computer at FACT in Liverpool which will stimulate a artificial neuron, modelled in the computer, to “fire”. The neurons form a tiny cortex of 24 artificial neurons adapted from a theory of spiking neurons, or nerve cells developed by the US computational neuroscientist, Eugene Izhikevich. When the neuron fires, it will send a tiny fragment (typically 30-500 milli seconds) of the sound from the site to one of 24 speakers installed in Gallery 1 at FACT.

The 24 suspended speakers will play the sounds from each individual site. The audience, weaving their way through the space will be able to hear the composition as a whole and to listen intensely to each of the sites individually. The streamed sound from all of the 24 locations, combined at the gallery will also be sent back through the internet to each of the sites and to the project website, where it can be heard as one live stream of sound.

Hourly, daily, weekly and monthly timetables at the sites will be re-composed in real time by the neuronal instrument. Many timetables, the vast and the minuscule, will merge in the gallery – and the context will change and adapt its behaviour according to the stimulation it receives. The neurons will trigger each other to fire, occasionally resulting in a collective
THE 24 SITES:
- Gloucester Cathedral
- Landscape C of E Primary School, Devon
- Music55-7@Verbal Arts Centre, Derry
- The Hidden Gardens, Tramway, Glasgow
- Watershed, Bristol
- Sonic Arts Research Centre, Queen's University Belfast
- National Portrait Gallery, London
- The Thainstone Centre, Inverurie, Aberdeenshire
- University of Plymouth, Roland Levinsky Building
- St. Andrews Church, Fulham Fields, London
- Roundhouse, London
- Rochelle School, London
- The Stephen Lawrence Centre, London
- Centre for Alternative Technology, Machynlleth, Wales
- Millennium Stadium, Cardiff, Wales
- Blueprint Studios, Manchester
- Bronte Parsonage Museum, Yorkshire
- Kielder Observatory, Black Fell, Northumberland
- Newlyn Art Gallery, Cornwall
- Everton Football Club, Goodison Park, Liverpool
- Institute Of Psychiatry, Kings College London
- Kiosk, West Pier Decking, Brighton Seafront
- University of Birmingham, Aston Webb Building
- FACT, Liverpool

pulsing from all 24 locations.

Whilst the brain does not make sound, these patterns and clusters of firing neurons are a rhythm, a pulse. This rhythm, a biological one, is the pattern of the very beginning of thought, the beginning of process of consciousness.

The collective sound sent to the sites from FACT are amplified in the soundbox and sent to a Fabcom F1 Drive which, when attached to a resonant surface, will transmit the sound allowing a large part of the site's architecture to 'play.' The public at the 24 sites are invited to play the instrument and will be able to hear the effect their playing has on the overall composition of the piece.

Roundhouse and crowds singing or cheering at Goodison Park and Millennium Stadium will merge with human noise whether incidental or performed. The public invited to play the instrument at the sites will be able to hear the effect their playing has on the overall composition of the piece. The composition lies in the layering and triggering of all of the 24 channels of sound. The 24 channels will overlap causing harmonies, ripples, clashes and crescendos.

So what will the results of the project be?

The honest answer is that we don't know. Indeterminacy plays a very important role in the composition—the firing times of the neurons are not predictable in advance, nor are actions on performances or events that might take place whether made or elemental. We cannot predict the kind of relationships that will form between communities of people at the sites by playing and listening to the instrument. Relationships between firing neurons will mirror relationships between sites.

The Fragmented Orchestra runs from 12 December 2008 to 22 February 2009. www.thefragmentedorchestra.com

In the same way the fragments of sound from the sites will adapt and change the digital mechanism of this brain, allowing relationships to be formed between the sites. These relationships may be disturbed in an instant by changing activity at any particular site. The composition will change as the instrument slowly re-organises itself and allows audio from different combinations of sites to be heard as music. As a result, the artificial brain or cortex forms a cogent learning system of stimulus and response. In effect, the instrument will collect and compose according to where it is in its learning, and how it responds to the stimuli, whether made or elemental.