

Ghost Doctor Duplicate

“Ghost Doctor Duplicate” is an improvised performance and also the name for an evolving digital music instrument system. Both the performance and the instrument system is part of an ongoing artistic research project at the Norwegian Academy of Music driven by Bernt Isak Wærstad named “Instrument design with AI and Machine Learning”. The goal of this project is to explore and develop new and idiomatic modes of response and resistance for digital musical instruments, which are often lacking the immediate haptic response and resistance we find in acoustic instruments. By using both generative and adaptive techniques from machine learning and AI, this project aims to produce a fauna of adaptive and somewhat autonomous digital musical instruments. An artistic presentation of the project will be given with this solo performance for electric guitar and electronics, where the “Ghost Doctor Duplicate” system serve as both an extension of the electric guitar and as a somewhat defiant artistic entity in itself.

Since this performance will be an artistic presentation of a work in progress, it is likely to have evolved from the time of writing this proposal to the time of the actual performance, but I will give a description and some examples based on the state it is now.

As a participant in the “Cross adaptive processing as musical intervention” [1], I explored several MIR techniques and ended up focusing mostly on spectral crest, flux and flatness. Based on my experiences from that I have been exploring similar features for self-adaptive processing purposes. Instead of mapping the feature values directly to processing parameters, I wanted to explore the effect of having the values instead pass through a neural network. The goal is to have a more open-ended system which had more room to explore though probably with a downside of being less comprehensible. I was not too worried about this downside, as my experience from the cross adaptive project where that understanding the cause and effect relationship was mostly important during design and testing, but quickly became less important when we started playing as we reverted from analysing what was going on to intuitively responding to the sounds produced and applied processing.

I’m including links to some excerpts from my latest studio session with this system. In this version a small library of recordings of some of my “signature” electric guitar sounds were analysed and the output feature set (consisting of spectral centroid, flux and flatness) was combined with a setting of aesthetically pleasing parameter values for some of my basic audio processing effects (see list under) and fed into a neural network.

One of the potential issues of a responsive instrument is that it is constantly responding (i.e. changing). As a mean of counter this, a simple switch to toggle the feature extractor and neural network on and off was eventually implemented. This made it easier for me to take back control when needed and quickly became an interesting musical effect in it self as a way of working with repetition. Another interesting musical effect that came up during this session, was combining looped material with live input in to the same analyser. Somewhat similar to the cross adaptive project where the sound from one musician would affect processing of the other musician(s), only here my previous sounds would affect my current sound and vice versa. For the future, I also plan to explore this sort of temporal interplay in parallel having two sets of analysers and audio processors.

Studio excerpt #1: <https://bit.ly/2KdIHtc>

Studio excerpt #2: <https://bit.ly/2O5f52v>

Studio excerpt #3: <https://bit.ly/2CzxPSP>

Studio excerpt #4: <https://bit.ly/2Xa24su>

List of audio effects and parameters mapped:

- **Lowpass filter:** cutoff frequency and resonance
- **Highpass filter:** cutoff frequency and resonance
- **Reverb:** send amount and decay time
- **Ring modulator/frequency shifter** (both used, but not at the same time): dry/wet mix and frequency
- **Delay:** send amount, feedback, delay time (left and right independently) and feedback filter
- **Compression with distortion:** dry/wet mix, output volume and drive amount

Technical requirements

- 2 guitar amps (Fender Twin/Deluxe/Princeton, Vox AC30 or similar)
- 4 DI boxes
- 1 mic stand (low)
- 3 power sockets
- 1 keyboard stand (or small table)

I will need a quad setup for the PA system with 2 speakers placed behind the audience. Depending on the venue, 2 monitors on separate sends might also be necessary.