Discreción

I composed this piece for members of TAK ensemble during the Fall semester 2021. From the start I knew I wanted to work on a piece that involved setting up a series of constraints but that left room enough for the performers to explore the space thus created. I wanted to explore the “space” metaphor not as a 3-dimensional cartesian plane (which may have involved overly determining performance parameters) but as a space whose meaning is given by a process of shared embodying. I was interested in allowing an process to develop that would allow a fixed set of sound textures and actions to interact with unpredictable events.

This piece is scored for Voice, Flute and Snare Drum, each one of them with both a vocal and a contact microphone and with live digital signal processing. Both microphones are located differently depending on the instrument: for voice, the first one in front of the mouth and the second attached to the throat; for flute, the first switching between the footjoint and mouthpiece and the second attached to the headjoint; and for the Snare Drum, the first generally at mouth height and the second at the middle of the batter head. Both signals are convolved by taking different sized FFTs[[1]](#footnote-1) and multiplying the resulting spectra.

This is done by al algorithm that slices 2n (where n is an integer, n > 7 and n < 12) samples at a time from both signals and multiplies them by a sine window function and by a complex sinusoid2. This turns both signals from a time-domain representation to a series of discrete frequency-domain ones. Then some transformations can be applied to the resulting spectrum (like shifting peaks in the case of the piece) before multiplying them and with an inverse process turn the multiplied spectrum back into a time-domain signal. The result is that the spectral peaks they share in common are strengthened, while also providing a sonic result that is unpredictable at times, with nonlinear responses and unexpected digital artifacts.

I decided to expand this idea, however I limited the ensemble to instruments I had access to and could easily test the processing on. I developed material for the piece by testing different parameters of the whole system, including FFT window and hop size, as well as instrumental techniques and microphone placement. That made me discover that the convolution process was tuned very defined series of fundamentals (whose lowest pitch is determined by dividing the sample rate by the FFT window size) and that singing or playing adjacent pitches generated very clear acoustical beats. Beats are also created by the percussionist and Flute player singing or playing pitches close to the Snare Drum tuning. Also, resonance in higher harmonics is achieved when peaks in both signals are multiplied, while also allowing the rumble of the throat for the voice and creating a texture reminiscent of overtone throat singing. Thus, the piece was structured around performers creating and interacting with beats, and sounds employing upper partials, such as harmonic singing and whistle tones.

1. Fast Fourier Transform: an implementation of the Discrete Fourier Transform, turns signals from time-domain representation to spectrum-domain.

   2  Complex waveform with real cosine and imaginary sine components. [↑](#footnote-ref-1)