Netz: Two Pieces for a Novel Mixed Reality Musical Instrument

At the centre of this submission stands Netz, a new MRMI born from a six-month long collaboration with a pianist and music producer, with the goal of co-designing and developing a novel MRMI for performers with experience in keyboard instruments. During the design process, we investigated the use of artificial neural networks (ANNs) to facilitate nuanced control of MRMIs.

Figure 1 shows a rendering of the instrument from within the MR application. We were inspired by Leonhard Euler's Tonnetz, a conceptual tool representing a tonal space that can be used for the structural analysis of musical harmony, as explored by musicologist Hugo Riemann. Netz is built upon the key concepts of the Tonnetz - organisation of pitches as nodes on a lattice, with certain pitch relationships between nodes - and extends them to enable expressive musical performance in MR. Nodes in the Netz instrument are connected to a digital synthesizer that runs on the MR device, enabling musical performance without the need of a separate machine for sound production. Nodes in Netz are conferred expressive features. Through finger gestures, performers can control dynamics, pitch, and additional timbral variations (e.g. digital filters). The links between nodes are also made interactive. Sliding from one node towards another yields the corresponding glissando or portamento, allowing for multi-finger pitch bending between several nodes.

Figure 2 shows a photo of a performer playing the instrument. Originally, Netz was designed to be placed on a flat surface, such as a table top, however, it can also be played in mid-air. Hand pose recognition is a key feature of the instrument. Through playing with different hand poses, performers can produce different musical results with the elements in the Netz. We incorporated an ANN for hand-pose classification with the instrument. Using certain hand poses, performers can trigger chords of different qualities by interacting with the triangles formed by three neighbour nodes in the lattice.

Accompanying this submission are two pieces composed for and performed on the Netz instrument. The first video offers a brief description of the instrument, followed by a performance of the piece Walk to the Fountain. The aim of this piece is to demonstrate some of the music performance possibilities offered by Netz. The piece is slow, characterised by subtle filter control of notes and chords through variations in vertical hand positions, and uses between-node glissandos abundantly. In the performance, the instrument is floating in the air, which enables a greater range for the filter controls. The second piece, Leon Says Hello, is performed with the instrument positioned slightly above a table. This allows the performer to leverage tactile feedback from the table surface, which makes it easier to play melodies at a fast pace.

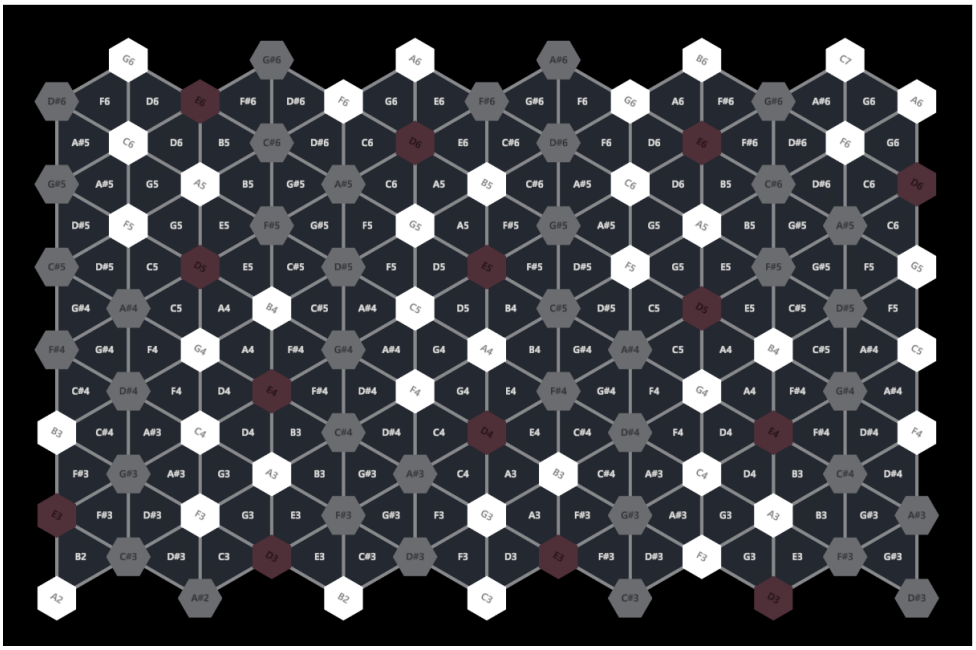

Figure 1: Rendering of Netz in Unity.

Figure 2: Netz instrument performance.