Electromagnets and the Acoustic Piano:

A Brief Overview of Current Research and Music for the Genre

Introduction

Motivation: Fascination with the sound world of the acoustic piano.

Electromagnet/Piano systems reviewed:

- EBow
- Electromagnetically-Prepared Piano
- Magnetic Resonator Piano
- BioComputer Music

EBow

Designed solely to vibrate a string and produce a continuous sound. Works include:

- Alvin Lucier's (b. 1931)
  - *Music for Piano With Magnetic Strings* (1995) https://www.youtube.com/watch?v=EP-Re02yrIs

- Stephen Scott (b. 1944)
  - *Resonant Resources* (date not found) https://www.youtube.com/watch?v=3xUgEo-cuyM

Electromagnetically-Prepared Piano

Created by:

- Per Bloland
- Edgar Berdahl
- Steven Backer
- Julius O. Smith III

Description:

- A musical signal is generated by a computer using Max/MSP, transferred via DAC to a power amplifier and then on to the strings by way of the electromagnets. Strings function as filters and "loudspeakers."

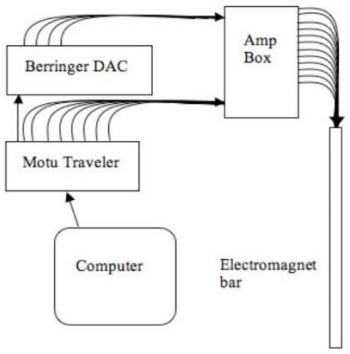

Image 1 – Signal Flow[1]

Further listening available at: http://magneticpiano.com/?page_id=39

Magnetic Resonator Piano

Created by: Andrew McPherson

Description:

- A Piezo pickup attached to the soundboard of the piano captures the combined frequencies produced by the strings during the setup time before a concert. Frequencies are passed through an Analog to Digital Converter, run through a filter to isolate the individual frequencies of each string, passed through a DAC, then transmitted to the electromagnets, which stimulate the strings at their natural frequency.

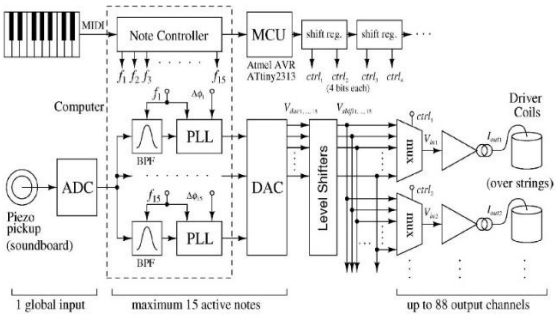

Figure 2 – Diagram of Magnetic Resonator Piano[2]

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Further listening at:

- https://www.youtube.com/watch?v=v1hjXSuPynw&feature=youtu.be
- http://www.eecs.qmul.ac.uk/~andrewm/mrp.html#repertoire

BioComputerm Music

Created by:

- Eduardo Reck Miranda

Description:

- The performer plays a sound which is recorded by a microphone and transferred to the computer, which in turn transforms the information into an electrical impulse. This impulse is run through the containers containing *Physarum Polycephalum* (electricity-conducing slime mold connected to two electrodes) and transferred back to the computer for processing. The computer then determines which of the strings to activate via electromagnets. A duet thus occurs between the system and the performer. [3]

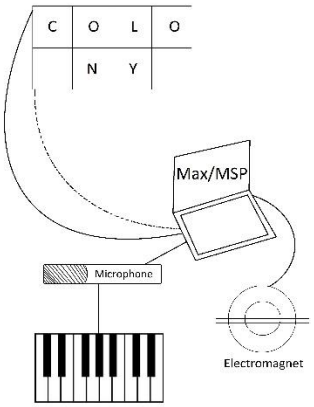

Figure 3 – Diagram of BioComputer Music

Bibliography

Berdahl, Edgar; et. Al. "If I Had a Hammer: Design and Theory of an Electromagnetically-Prepared Piano." *International Computer Music Association* Volume 2005, 2005. 29 Apr. 2018, https://quod.lib.umich.edu/i/icmc/bbp2372.2005.209?rgn=main;view=fulltext

Bloland, Per. "The electromagnetically-prepared piano and its compositional implications." Paper presented at the International Computer Music Conference, Copenhagen, Denmark, (2007).

Bloland, Per. *Biography*. 30 Apr. 2018, www.perbloland.com/?p=Biography.

Braund E., Miranda E.R. "BioComputer Music*:* Generating Musical Responses with *Physarum polycephalum*-Based Memristors." *Kronland-Martinet R., Aramaki M., Ystad S. (eds) Music, Mind, and Embodiment. CMMR 2015*. Lecture Notes in Computer Science, vol 9617. 2016.

EBow. 30 Apr. 2018, http://www.omega.be/guitares/effets-guitares/accessoires-effets/ebow-bow-plus-electronique-pour-guitare.html

_____. 30 Apr. 2018, https://tonereport.com/blogs/tone-tips/drop-the-pick-on-purpose-5-alternatives-to-try.

McPhersen, Andrew. *Biography*. 29 Apr. 2018, http://andrewmcpherson.org/index.html

Miranda, Eduardo, R. *Biography*. 30 Apr. 2018, http://www.composers21.com/compdocs/mirandae.htm

Moog Piano Bar. 29 Apr. 2018, https://www.sweetwater.com/store/detail/PianoBar--moog-pianobar

McPherson, Andrew. "The Magnetic Resonator Piano: Electronic Augmentation of an Acoustic Grand Piano." *Journal of New Music Research*, Vol. 39, No. 3, 2010.

Miranda, Eduardo, R. *Biography*. 30 Apr. 2018, http://www.composers21.com/compdocs/mirandae.htm

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