

Stained Glass Shards

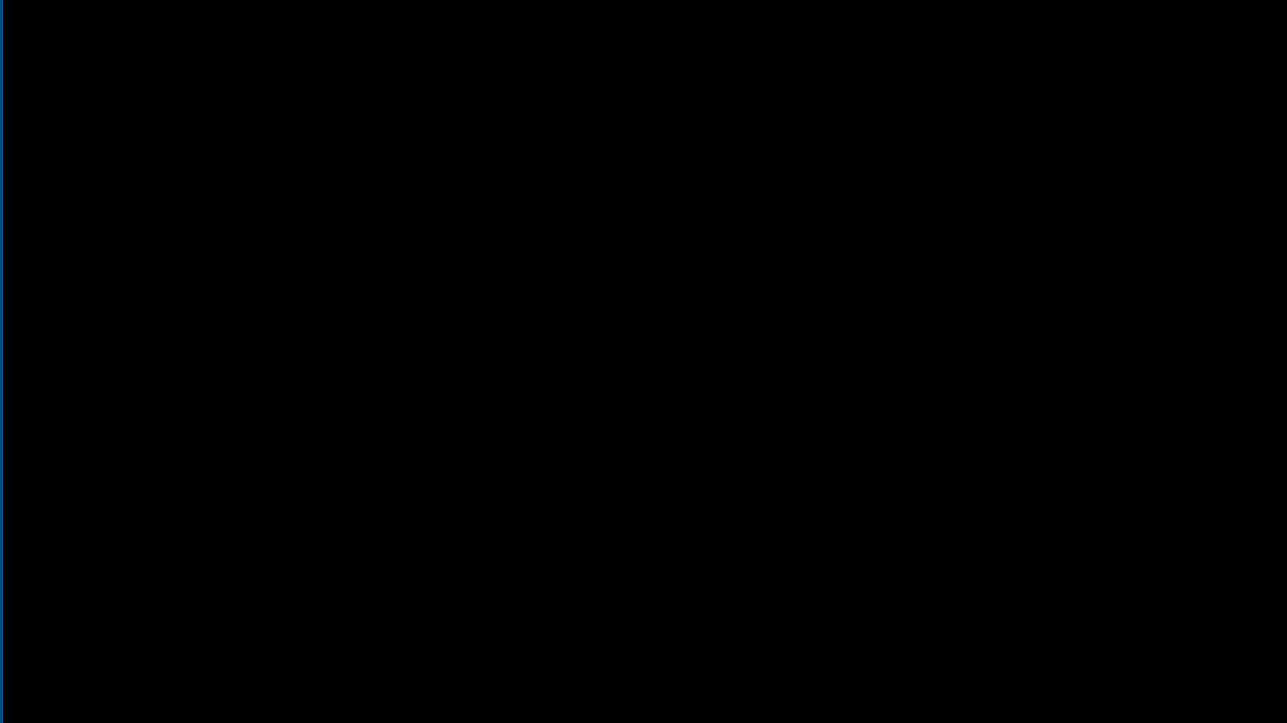
An Exploration of Visual-Reactive
Audio

By Keene Cheung



1. **Demonstration**
2. **Key Ideas and Themes**
3. **Background**
4. **Methodology**
5. **Reflection**

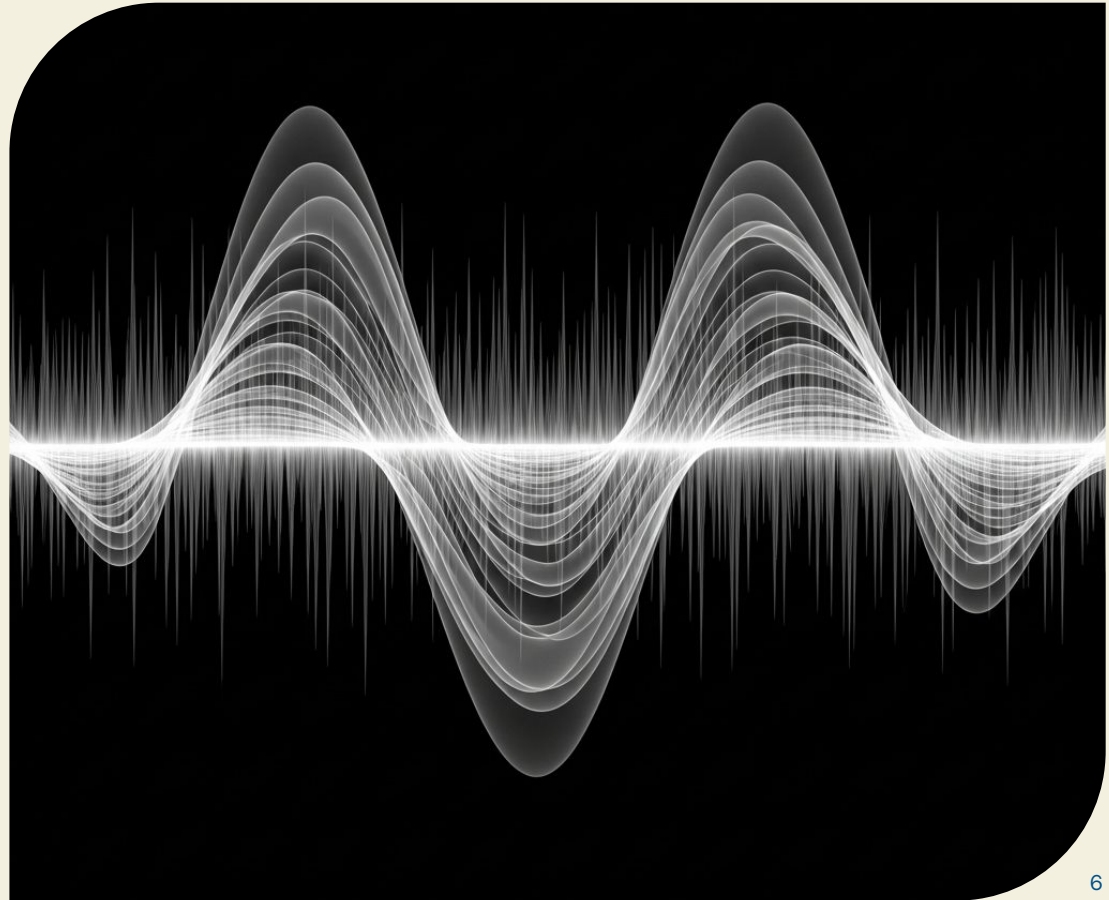
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Audiovisual Composition

- Auditory events are easily correlated to visual stimuli [1]
- Audio-Reactive Visual [3]
 - Sound controls
 - Color
 - Brightness
 - Scale
 - Etc.
- Visual-Reactive Audio
 - Video controls
 - Timbre
 - Dynamics
 - Etc.



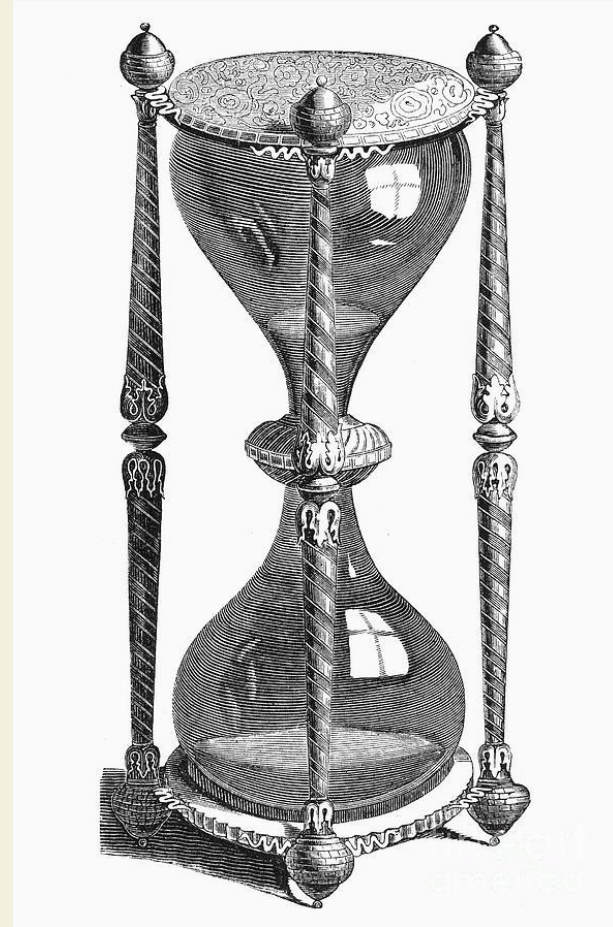
Human-Computer Interaction

- Human-Computer Interaction
 - Physical Interaction Design
 - Gesture-based control
 - Interactive Machine Learning [7]
 - Wekinator
 - Non-rigid Interfaces [8]
 - Instrument Design
 - Utilizing visuals as an instrument



Themes

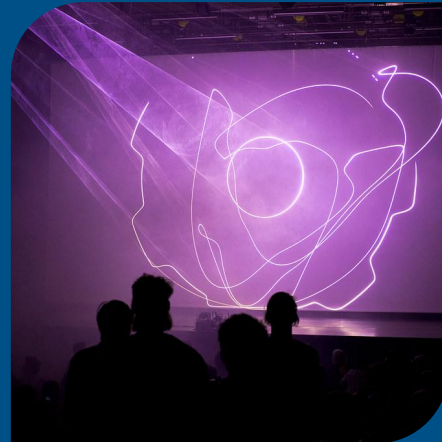
- Sands of Time
- Stained Glass



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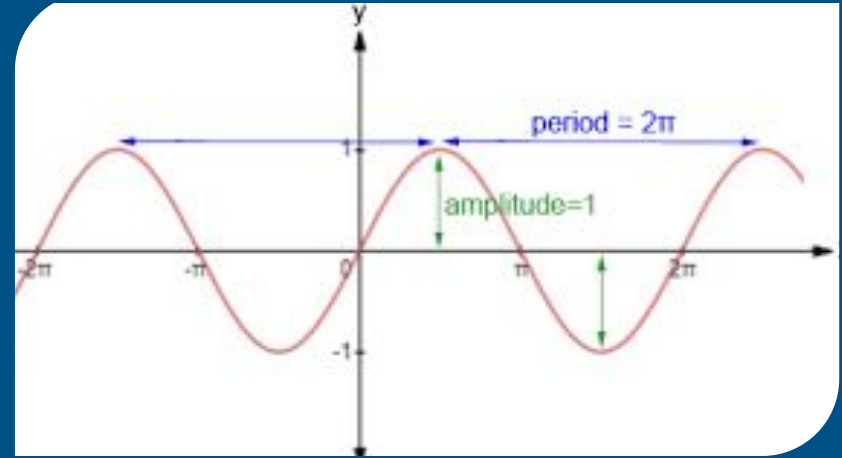
Audiovisual Art

- Film
- Virtual Reality
- Video Games
- Live Performance
- Etc.



Difficulties

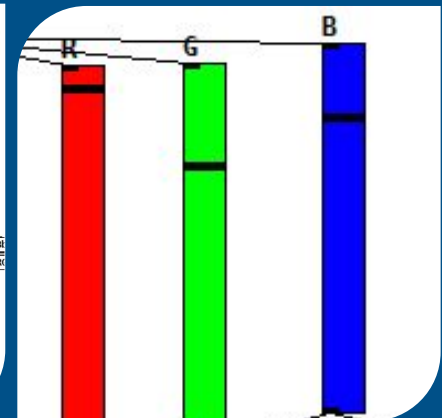
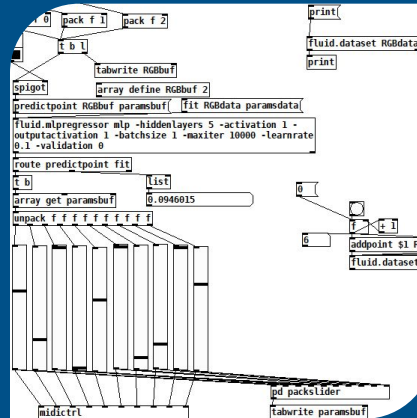
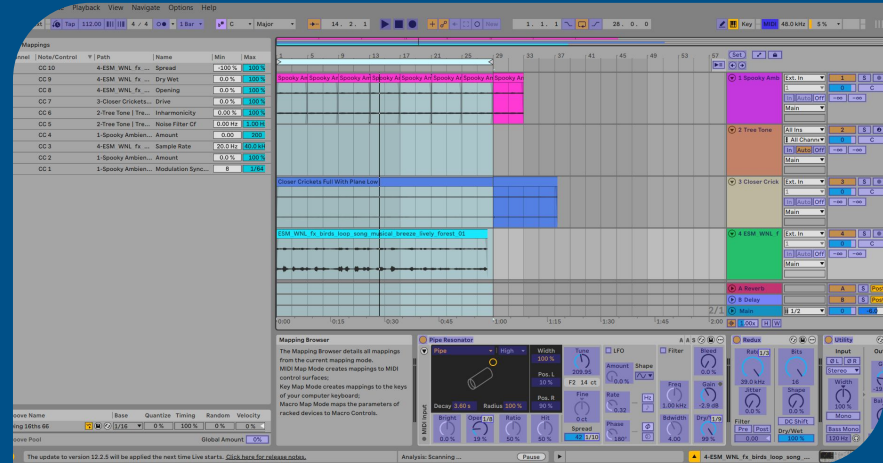
- Feature Extraction
 - Audio
 - Discrete, and One-dimensional
 - Frequency, Amplitude, Timbre
 - Music Information Retrieval [2]
 - Video
 - Multi-dimensional
 - Color, Brightness, Shape, Movement, etc.
- Subjectivity
 - Correlation of sounds based on visual stimuli vary person to person



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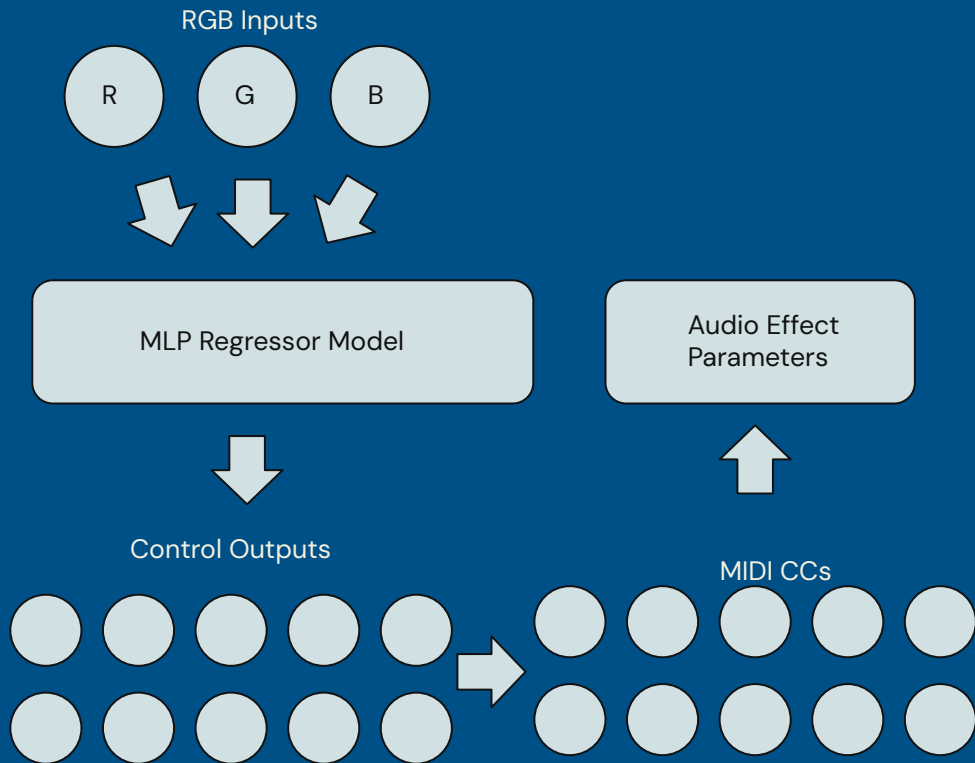
Software

- Protocols
 - MIDI (Musical Instrument Digital Interface) vs OSC (Open Sound Control) [4]
- Ableton Live
 - Electronic Music Production
 - Control Audio with MIDI CCs (Control Change)
- PureData
 - Music Programming
 - GEM (Graphics Environment for Multimedia) Library
 - Program visuals
 - FluCoMa (FluidCorpusManipulation) [5][6]
 - MLP Regressor
 - Allows interpolation of inputs
 - Sends MIDI CCs to Ableton



Workflow

1. RGB input using sliders
2. User trains model based on desired sounds to convert 3 input parameters to 10+ control parameters
3. FluCoMa regressor interpolates the parameters
4. Play the composition and have fun!



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Drawing a Conclusion

- Potential Improvements
 - Creatively explore other parameters
 - Add physical interactions
 - Motion sensors
 - Gesture Tracking
- Future Use
 - Exploration of new methods of instrument design
 - Integration with other creative coding software



- 1) Lavan N, Collins MRN, Miah JFM. Audiovisual identity perception from naturally-varying stimuli is driven by visual information. *Br J Psychol.* 2022 Feb;113(1):248–263. doi: 10.1111/bjop.12531. Epub 2021 Sep 6. PMID: 34490897.
- 2) Markus Schedl; Emilia Gómez; Julián Urbano, *Music Information Retrieval: Recent Developments and Applications*, now, 2014, doi: 10.1561/15000000042.
- 3) Fu, Quanwei. (2021). Research on the Use of Computer Music in Modern Musical Composition. *Journal of Physics: Conference Series.* 1820. 012153. 10.1088/1742-6596/1820/1/012153.
- 4) Wright, Matthew and Freed, Adrian and Momeni, Ali. (2003). OpenSound Control: State of the Art 2003. *Proceedings of the 2003 Conference on New Interfaces for Musical Expression (NIME-03).*
- 5) Tremblay, P.A., Green, O., Roma, G., Bradbury, J., Moore, T., Hart, J., and Harker, A. (2022) *The Fluid Corpus Manipulation Toolbox (v.1).* Zenodo. doi: /10.5281/zenodo.6834643
- 6) Tremblay, P.A., Roma, G., and Green, O. (2022) Enabling Programmatic Data Mining as Musicking: The Fluid Corpus Manipulation Toolkit. *Computer Music Journal* 2022; 45 (2): 9–23. doi: /10.1162/com_a_00600
- 7) Boem, Alberto. (2020). Non-Rigid Musical Interfaces: Exploring Practices, Takes, and Future Perspective. (NIME 2020).
- 8) Fiebrink, Rebecca and Cook, Perry. (2010). The Wekinator: A System for Real-time, Interactive Machine Learning in Music. *Proceedings of The Eleventh International Society for Music Information Retrieval Conference (ISMIR 2010).*

Thank you!