Visuals Across Media: Designing and Composing Visual Imagery with Sonic Aesthetics

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Today's talk...

- Introducing Visual Music and Key Themes
- Approaches to Creating Visual Music
- Algorithms and Auditory Display
- 'Artist-Led' Visual Music Composition
- Using Musical Metaphor in Visual Development
- Visual Music Instruments and Real-Time Performance
- The *morhplux* Digital Visual Music Instrument
- Summary and Conclusions

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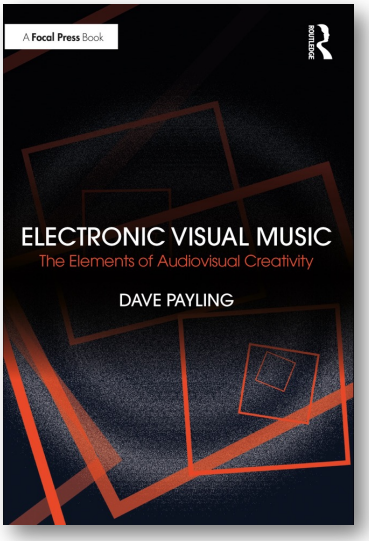

My Background

- Musician from a popular music background
- Moved into academia from an engineering degree and onto experimental music…
- Currently Associate Professor at Staffordshire University UK
- Research Visual Music and Electronic Music
- Teach composition, mastering
- Many topics in today's talk further detailed in publications.
- Electronic Visual Music (2023) Routledge
- Collaboration, Engagement, and Tradition in Contemporary and Electronic Music NoiseFloor Perspectives (November 2024) Routledge

https://www.routledge.com/Electronic-Visual-Music-The-Elements-of-Audiovisual-Creativity/Payling/p/book/9781032326634
https://www.routledge.com/Collaboration-Engagement-and-Tradition-in-Contemporary-and-Electronic-Music-NoiseFloor-Perspectives/Estibeiro-Payling-Cotter/p/book/9781032553740

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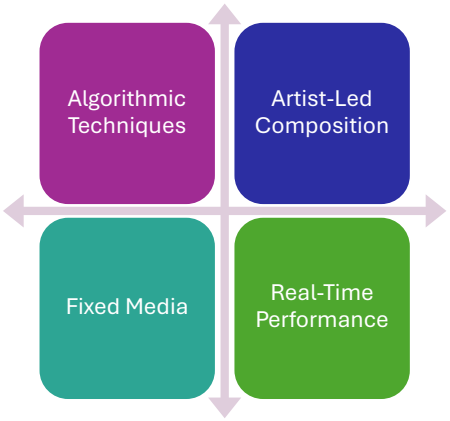
The creative Journey - Key Themes…



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Visual Music

Definitions and Terminology

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Defining Visual Music

- An **artform**
  - Frequently using abstract imagery with synergistic sound
- **Visual music seeks to achieve audio-visual *cohesion* and includes a visual medium that possesses musical aesthetics**
- Originates from…
  - Visual art, painting – Kandinsky and Klee at the Bauhaus
  - Lighting – Wilfred and Lumia
  - Film stock techniques and animation – Fischinger, Bute etc

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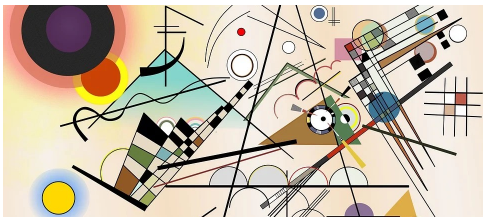
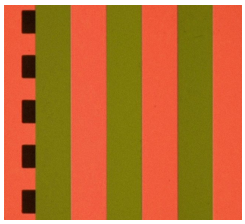
Traditional Visual Music Artists and Artworks



- Surnames of people associated with the genre
- Castel, Bishop, Ruttman, Kandinsky, Klee, Fischinger, Eggeling, Richter, McClaren, Bute, Wilfred, Greenewalt, Lye, Belson…



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Electronic Visual Music as a Contemporary Artform

- Prefer to use the contemporary term **'Electronic Visual Music'**
- In UK academia, a favoured term has become '***audiovisual composition'*,** that distinguishes it as a contemporary practice distinct from visual music.
- ***Audiovisual composition*** seeks to create works with an equity between image and sound and intermedia **cohesion** and synergy (Harris 2021).
- This description can also be applied to contemporary visual music, however…
  - traditionally it prioritised the visual and is one reason the term visual music is not currently favoured.
- The ***visual music*** title captures the essence of this genre where musical qualities are used to inform the development of, and are reflected in, the visual medium

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Key Terms in Visual Music

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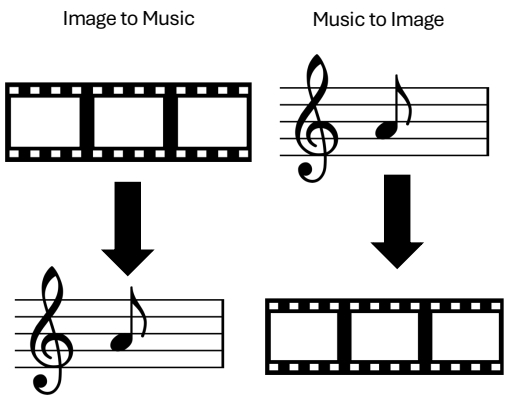
Material Transference and Compositional Thinking



- Methods for achieving cohesion between sound and image…
- **‘material transference’** (Hyde 2012),
- The predominant technique
  - qualities from one medium are transferred to the other.
    - E.G. Parametric mapping, coloured hue mapped to musical timbre for example
- **‘compositional thinking’** (Hyde 2012)
  - Artistic Interpretation and intuitive alignment
    - Choose specific musical qualities at the micro- or macro-structural level that you wish to ‘visualise’.
    - The music is considered as a metaphorical source for informing visual compositional features.

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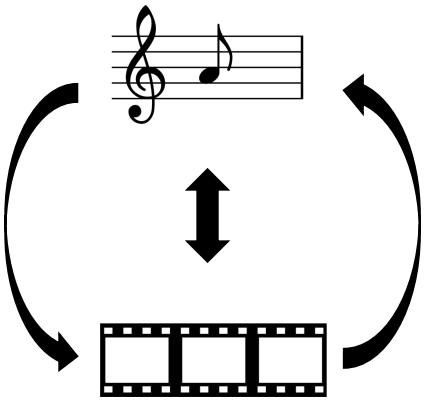
Iterative and Bidirectional Transference

- Favoured by Harris (see Payling 2023)
- Fluid and iterative approach
- Each medium is partially completed before switching to work on a subsection of the other medium.
  - A time-consuming evaluative process
- E.G. compose a section of music to a partially completed video. Evaluate and modify the visuals to improve overall cohesion.
- Once the results are satisfactory it might be necessary to adjust either medium so it integrates even more closely with the other.
- This process continues in a cyclical manner
- It can result in greater cohesion between sound and image as they are constantly being evaluated and attuned to bind more closely;
- the sound and image relationships are created at a finer granular precision.



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Approaches to Creating Visual Music

Algorithmic and Artist Led Media Creation

Algorithmic Techniques

Tecnicas Algorithmicas

Artist-Led Composition

Liderado pelo artista

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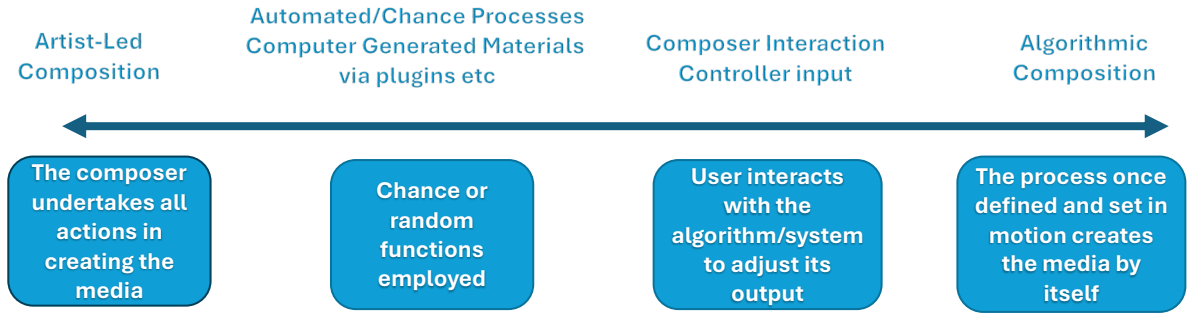
The Artist and the Algorithm

- A continuum exists between full determination by the composer and full control by an algorithm
- For algorithmic productions see the works of Bret Battey such as Autarkeia Aggregatum (2005)
- More common to be towards the left of this spectrum
- This talk will explore both ends of this spectrum



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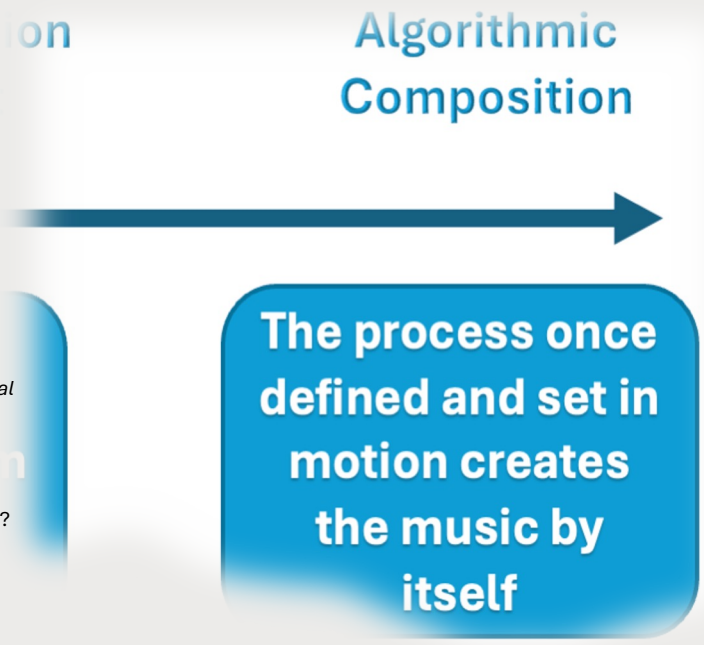
Algorithmic Composition in Music

- Algorithmic Composition
  - *'Using some formal process to make music with minimal human intervention… often done with the aid of a computer'* (Alpern, 1995).
    - Alpern, A. (1995) Techniques for Algorithmic Composition of Music. Hampshire College
- Generative Music / Art
  - '*Generative art refers to any art practice where the artist uses a system, such as a set of natural language rules, a computer program, a machine, or other procedural invention, which is set into motion with some degree of autonomy contributing to or resulting in a completed work of art.* (Galanter, 2003)
    - Galanter, P. (2003) What is Generative Art? Complexity Theory as a Context for Art Theory. 6th Generative Art Conference. GA:USA
- Generative music is a real-time sub-set of algorithmic composition



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Sonification and Auditory Display

Hermann, T., Nehls, A.V., Eitel, F., Barri, T., & Gammel, M. (2012). Tweetscapes - Real-time Sonification of Twitter Data Streams for Radio Broadcasting.
Kramer, G., Walker, B.N., Bonebright, T.L., Cook, P.R., & Flowers, J.H. (2010). Sonification Report: Status of the Field and Research Agenda.

- *'the use of nonspeech audio to convey information. More specifically, sonification is the transformation of data relations into perceived relations in an acoustic signal for the purposes of facilitating communication or interpretation'* (Kramer et al 2010).
- Supported by the annual international ICAD (International Community for Auditory Display) conference
- E.G. Tweetscapes (Hermann et all 2012)
  - a system that transforms message streams from Twitter in real-time into a soundscape that allows the listener to perceive characteristics of twitter messages such as their density, origin, impact, or how topics change over time.

ICAD
International Community For Auditory Display

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How can Images be Converted to Sound?

- Some systems use pixel brightness to determine the loudness of multiple sine wave oscillators
- Alexander Zolotov's Virtual ANS (Zolotov 2014)
  - Zolotov, A. 2014. WarmPlace.Ru. Virtual ANS Spectral Synthesizer. WarmPlace.Ru. Available at: http://www.warmplace.ru/soft/ans
- The resulting sound is artificial
- I wanted a more natural sounding soundscape

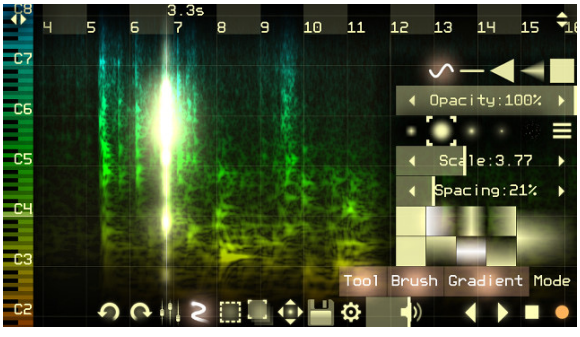

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Image Analysis Type 1 - Simple

Original image resampled to an 8x8 grid

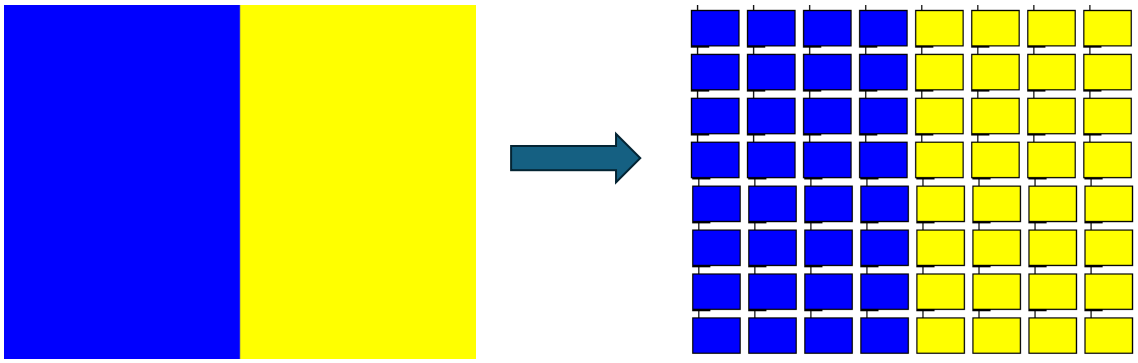

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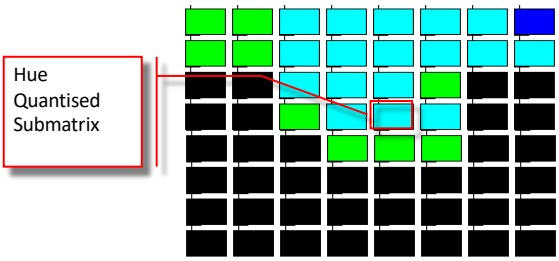
Image Type 2 - Complex

- With more complex images the colours must be quantised to the available hues
- Black, Red, Green, Blue, Cyan Magenta and White



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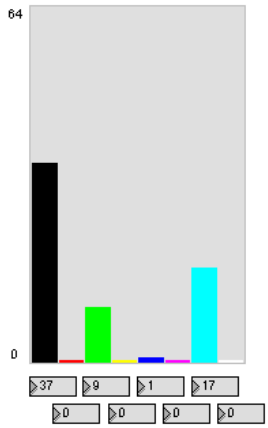
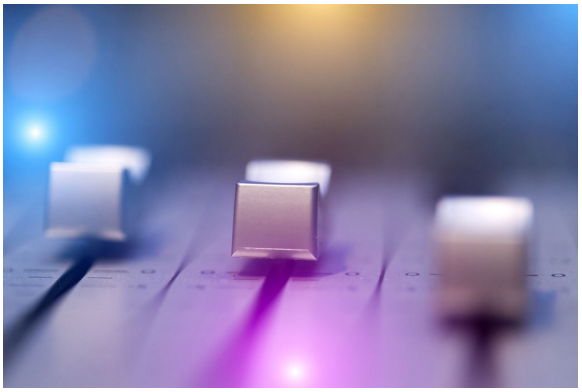
Colour and Timbre

- The quantity of each quantised colour is counted
- These are displayed in a histogram
- These values are applied to the audio mixer
- In this case the loudest timbre is that associated with the colour black





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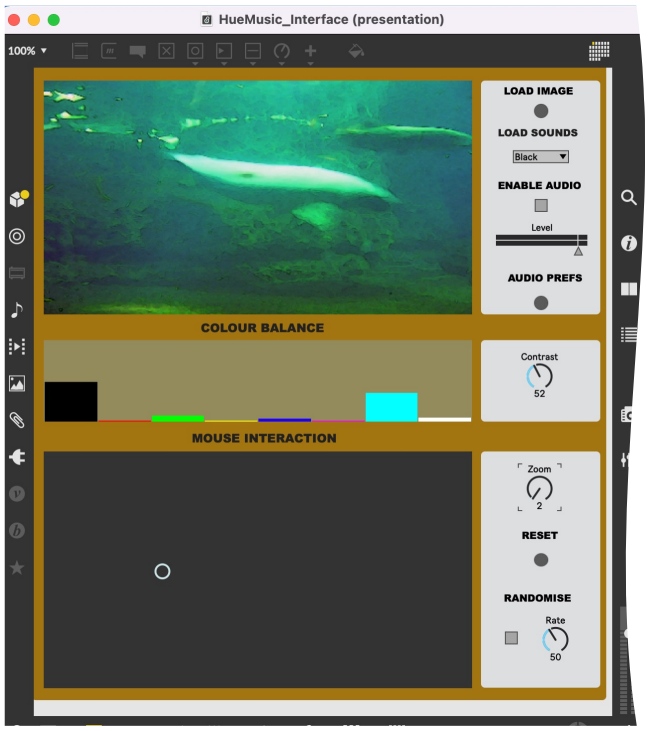

Hue Music - Generative Auditory Display

- Creating Timbral Soundscapes from Coloured Pictures (2007)
- A technique to convert 2 dimensional images into music by associating hue values with timbres.
- A type of generative auditory display
- Created in the Software, Max: https://cycling74.com/products/max
- The colour information in 2D still images drives an 8 channel timbral audio mixer.
- 8 musical timbres were recorded to represent 8 hue values and these timbres were changed in amplitude dependent on the quantity of each hue in the image.
  - For example: A maximum of 64 blue 'pixel-blocks' creates a sound that is produced exclusively by the timbre associated with blue.

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Music in Vision

The Artist-Led Approach to material transference and compositional thinking

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Artist Composition

Automated/Chance Computer Generate via plugins

The composer undertakes all actions in creating the music

Chance rando functio employ

Artist-Led Composition

- My current practice has moved to the left of the continuum
- Transferring musical qualities to the visual medium
- Using compositional thinking for intuitive interpretation
- Direct editing in workstations

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Electroacoustic Structuring Processes in Abstract Visuals

Electroacoustic music theories related to gesture and texture have informed these composer-led processes

This explores composition from a theoretical perspective rather than a practical process

These concepts are considered during composition and afterwards for analytical purposes

Best illustrated by several examples…

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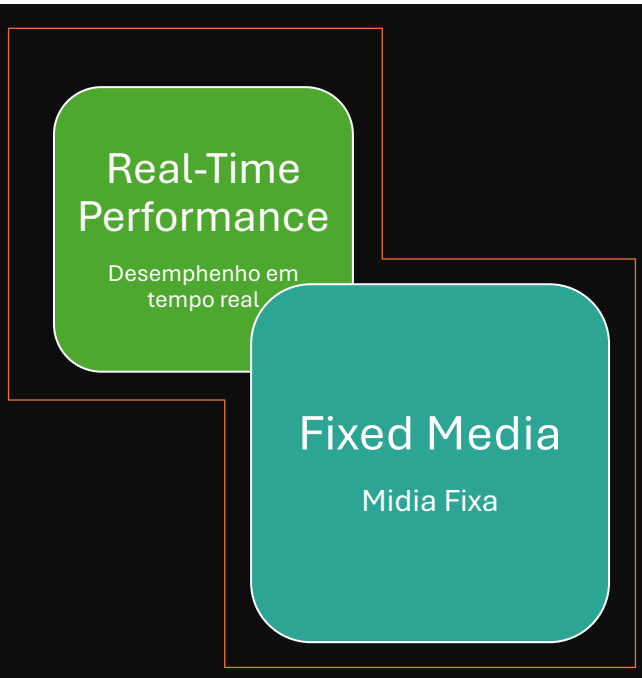
Visual Music Fixed Media

Gesture Texture Illustrations



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Musical and Visual Gesture

- Musical gesture in acoustic instruments involves physical gesture and performer agency converted to sound
- In electroacoustic theory, gestural qualities can also be heard in sounds themselves.
  - A purely sonic gesture involves pitch changes, edits, dynamic filtering and other audio 'modulations'
- Abstract visual form can similarly contain motion gestures
- These types of abstraction can be seen and heard in *Things I Have Seen in My Dreams* (Oliveira 2019).
- The whole visual composition in this piece involves various transforming abstract figures
- The soundtrack is similarly gestural, exhibiting granular type effects which constantly evolve, sometimes rapidly, and which reinforce the visual behaviours creating a cohesive sound and image experience.

Oliveira, João Pedro. 2019. *Things I Have Seen in My Dreams.* https://vimeo.com/336105455 .

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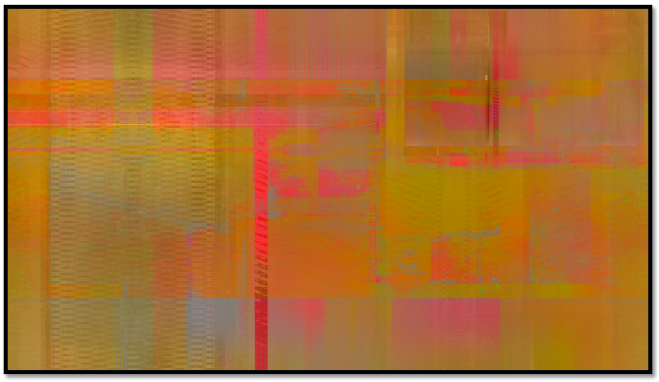
Audiovisual Texture

- Sonic textures are continuous sounds such as drones and atmospheres that have limited identifiable changes… or… a sound that changes more gradually
- Visual textures inhabit the visual space, do not contain any identifiable figures and consist of colours and patterns.
- *Digital Alchemy* (McDonnell 2018) is one textural example.
- While the shifting colours and line motions in this piece can be equated to gestural elements, the whole opening section up until 3 minutes is constructed of a textural visual surface which is reinforced by the micro-tonal drone sounds of van Tonder's music…
- *'The overall screen area for the visual composition was conceived of as being a complete whole animated and alive surface that does not fundamentally change in terms of form but remains intact throughout the piece'* (McDonnell 2020, 255)…



McDonnell, Maura. 2018. *Digital Alchemy*. Digital Video. Visual Music. https://vimeo.com/286607499 .

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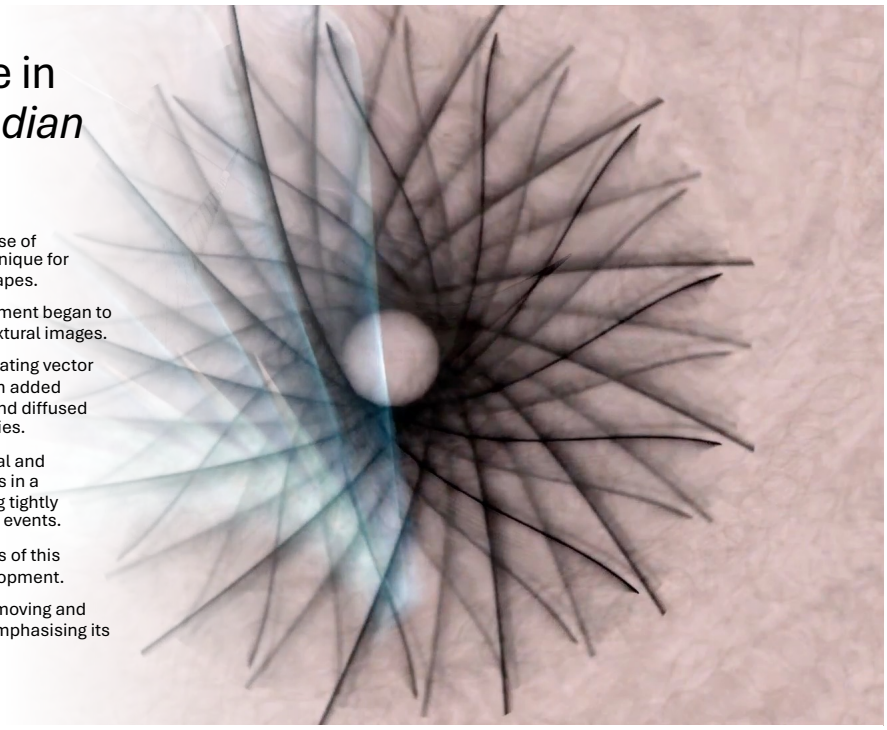
Gesture and Texture in Fixed Media – *Circadian Echoes* 2015



- Circadian Echoes (Payling 2015), made use of feedback and replication as a visual technique for creating complex images from simple shapes.
- The visual results generated by the instrument began to straddle the line between gestural and textural images.
- The raw visual materials comprised of rotating vector line figures. When these were rotated with added feedback however, it softened the lines and diffused the patterns imbuing more textural qualities.
- The music in this piece is primarily textural and contrasts with the rotating gestural figures in a complementary manner rather than being tightly synchronised to specific sonic and visual events.
- Audiovisual cohesion is created by means of this persistent sonic and visual textural development.
- The animated images are relatively slow moving and consistently paced throughout, further emphasising its textural qualities.

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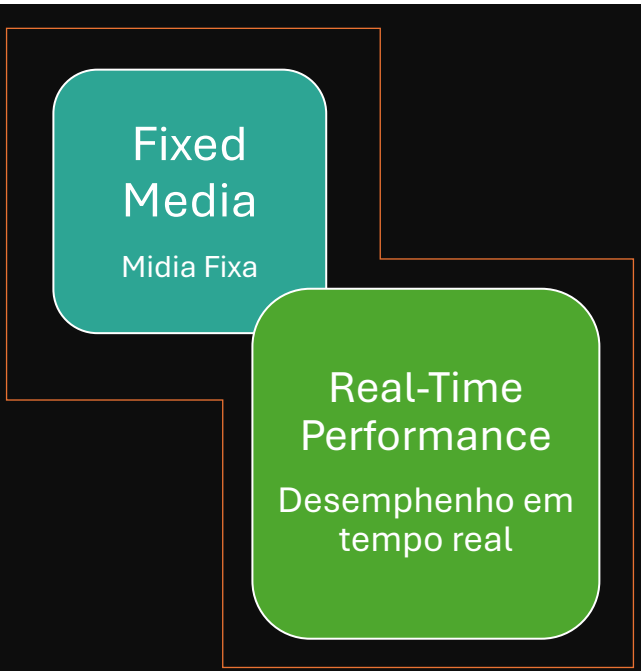
Visual Music Instruments

Real-Time Devices for Visual Music Expression



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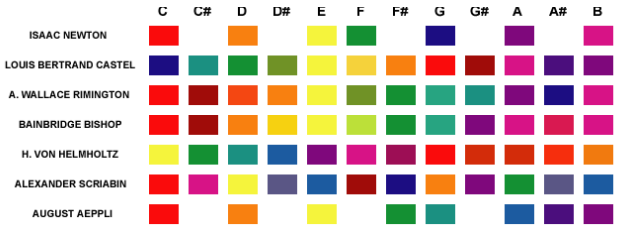
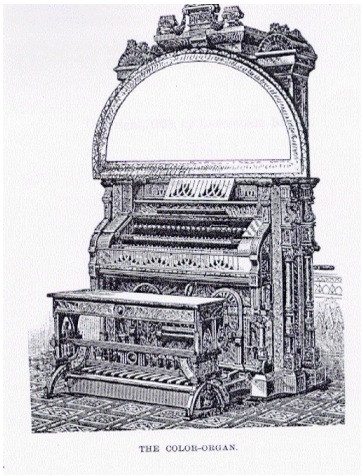
Visual Music Instruments

- The colour organ.
  - Bainbridge Bishop was one inventor who documented (1893) his concept of a device that used coloured lights which corresponded to different note pitches.
  - His choice of pitch and hue associations aligned the musical 12 tone scale to the rainbow colour scale, whilst other colour organs and artists made alternative choices (Collopy 2018).
- Colour organs inspired further work with light and colour-based instruments including
  - Mary Hallock-Greenewalt's 1919 Sarabet,
  - Thomas Wilfred's 1922 Clavilux, and
  - Alexander Lászlò 's 1925 Sonchromatoscope (Peacock 1988; Abbado 2018, 28–41)
- Each of these used light and colour as the primary materials for visual artistic expression.





Abbado, Adriano. 2018. Visual Music Masters: Abstract Explorations: History and Contemporary Research. 1st edition. Milano: Skira Editore.

Bishop, Bainbridge. 1893. The Harmony Of Light. New Russia, Essex County, N. Y: The De Vinne Press.

Collopy, Fred. 2018. 'A Hypothesis Driven Approach to Designing a Visual Music Instrument'. In Unpublished. Submitted. http://files.rhythmiclight.com/biblio/collopy2018.pdf.

Peacock, Kenneth. 1988. 'Instruments to Perform Color-Music: Two Centuries of Technological Experimentation'. Leonardo 21 (4): 397. <https://doi.org/10.2307/1578702>.

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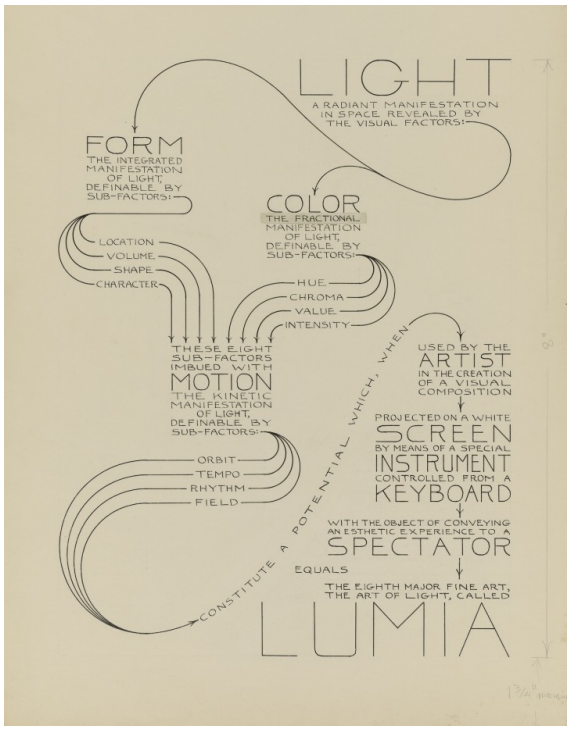

Lumia and Thomas Wilfred

- Visual Abstraction begins with Bauhaus and later Wilfred and many others.
- The Clavilux
  - Light based instrument – ethereal images but no sound
- Music is inherently abstract – without representation
  - it is a good match with Lumia
- However, Lumia was traditionally a silent artform
- Lumia and gesture and texture have informed my instrument development

Wilfred, Thomas. 1947. 'Light and the Artist'. *The Journal of Aesthetics and Art Criticism* 5 (4): 247–55.

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Digital Visual Music Instruments (DVMIs)

Pioneering use of digital techniques in visual instrument design was made by John Whitney in the 1960s.

Whitney strove for ***complementarity***, where both media worked cohesively…

> *'in composing both sound and image I try to find an interrelationship, a dialogue between the parts, a dialogue as natural as the voices of a sonata for violin and piano. When voices of light and tone join in such a dialogue I call this union a complementarity' (Whitney 1992).*

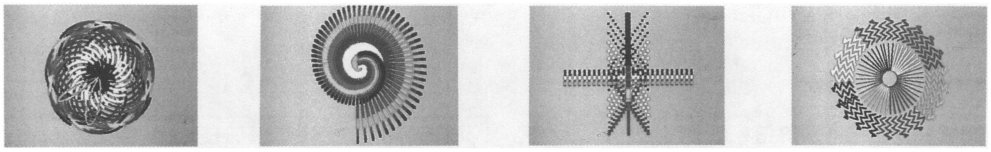
His computer program generated visual patterns by applying differential motion between multiple points in cartesian and polar co-ordinates (Whitney 1981; 1994).

In creating these images, he was inspired by musical ratios, intervals such as the fifth and the octave, their temporal structuring, and how he could create similar graphic ratios which resembled and paralleled the tensions and resolutions contained in musical composition.

Whitney, John. 1981. Digital Harmony: On the Complementarity of Music and Visual Art. McGraw-Hill Incorporated, US.

Whitney, J. 1992. *A Personal Search for the Complementarity of Music and Visual Art.* U-matic video cassette. Documentary, Pyramid Film. https://arrow.getty.edu/primo-explore/fulldisplay?vid=GRI&docid=GETTY_ALMA21129715240001551&context=L.

Images below from: Whitney, J. 1994. 'To Paint on Water: The Audiovisual Duet of Complementarity'. *Computer Music Journal* 18 (3): 45. <https://doi.org/10.2307/3681168>.



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The Digital Visual Musical Instrument

DVMI

Real-Time work in TouchDesigner

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Designing Digital Visual Music Instruments

Performative gestural input

Gestural Control Device

Media Generation Unit

- Digital Musical Instruments comprise
  - a gestural control surface, which captures the physical gestures of the performer,
  - and a sound generation unit, which produces the audio output (Miranda and Wanderley 2006, 3).
- **Digital Visual Music Instruments (DVMIs)**
  - Designed to facilitate the generation and manipulation of visuals.
- A **DVMI**, can be considered as the optical equivalent to the digital music instrument (DMI).
- DVMI design, by comparison, maintains a gestural input, but replaces the sound generation unit with an image generation unit.
- The VMIs used in my artistic works can be understood in these terms.

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Performative gestural input

Gestural Control Device

The Gestural Control Device

- Gestural control device involves hardware or touchscreen MIDI or OSC enabled device
- Using…
  - a MIDI controller – Novation Launch control XL and
  - iPad with an interface designed with Open stage Control

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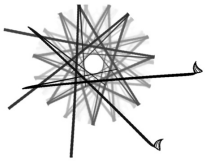
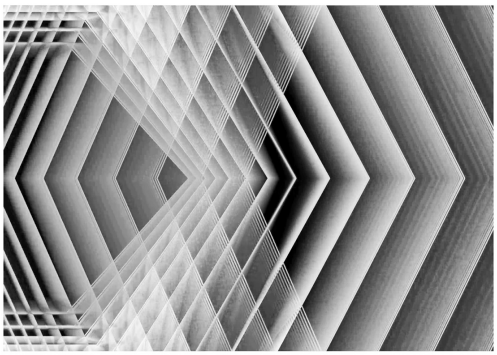
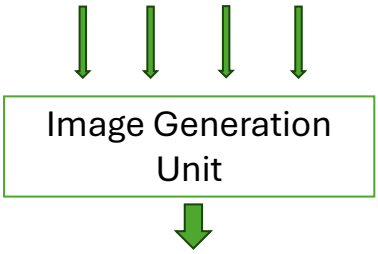
Media Generation







- The focus of my DVMI designs has primarily involved the development of a suitable image generation unit.
- Utilised visual geometric forms which could be repeated and transformed to create complex abstract imagery.
  - Multiple resized, distorted, translated and overlapping forms can create motion graphics with both gestural and textural qualities and provide a wealth of creative possibilities.
  - These are evident in the previous fixed media examples
- Akin to sound synthesis
  - Working with fundamental building blocks to create desired output
- Influenced by Whitney

Payling, Dave. 2023a. *Electronic Visual Music: The Elements of Audiovisual Creativity*. London: Focal Press. <https://doi.org/10.4324/b23058> .

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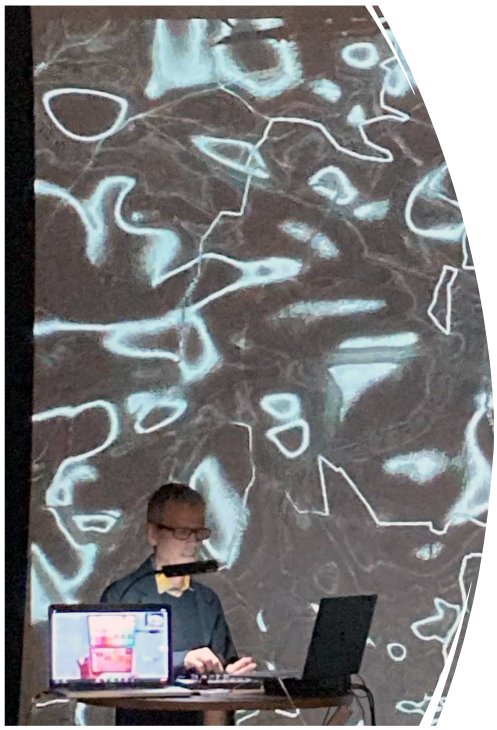

The *morphlux* DVMI

light transformer

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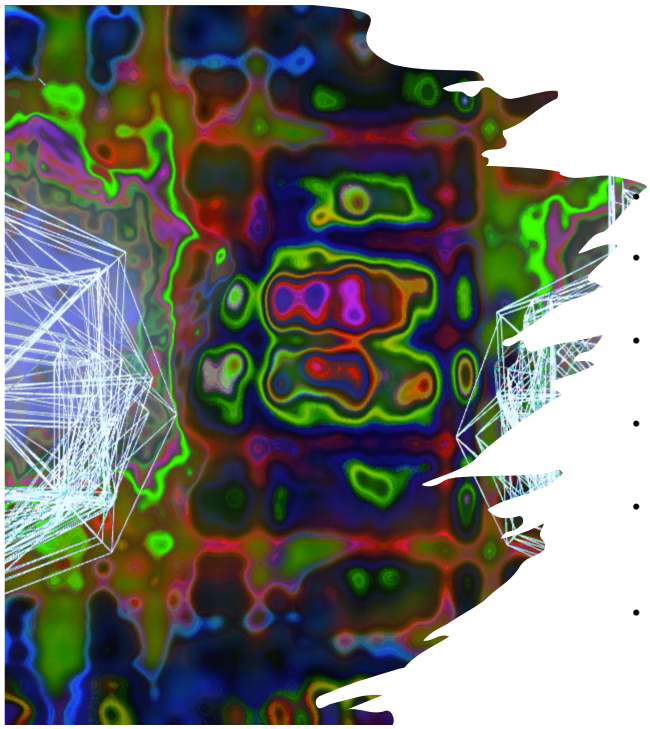

morphlux in performance

- *morphlux* is the name given to the new live performance instrument developed in TouchDesigner.
- The instrument is essentially still under development but has been used as part of the *biphase* duo comprising James Dooley (formuls) and myself.
- *Biphase* is an ongoing collaboration exploring individual sound and visual instrument design as well as collaborative visual music performance.
- It has been performed at NoiseFloor and ICMC 2022 (Payling and Dooley 2022), with the intention of further touring of the duo.
- In *biphase* Dooley performs electronic music, using his bespoke *formuls* software, and I perform the visuals with *morphlux*
  - A reversal of roles where I would normally be the musician
- *morphlux* incorporates many of the previously used concepts and techniques.

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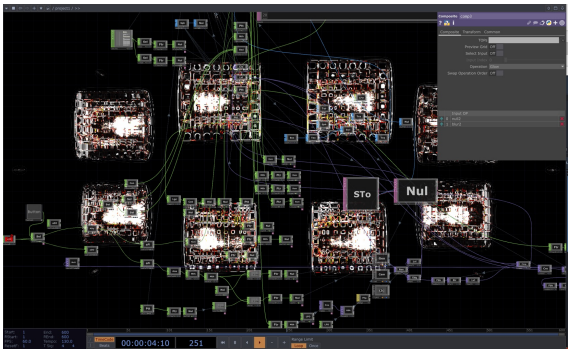
Morphlux

- Open Stage Control
  - Gestural control input from touchscreen
  - http://openstagecontrol.ammd.net/
- TouchDesigner
  - Parameter conditioning
  - Parametric mapping
  - image generation
  - https://derivative.ca/



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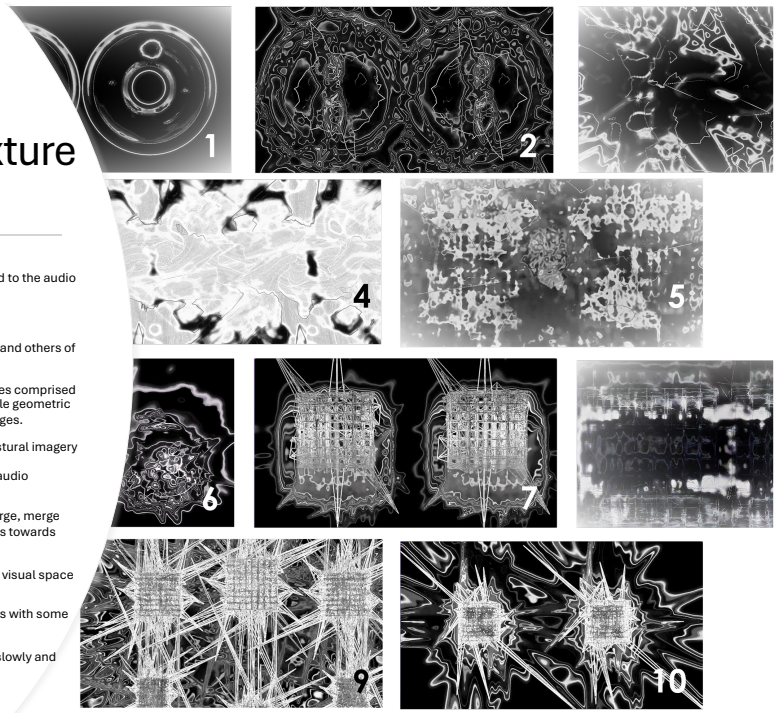
morphlux Gesture and Texture

- The choice of three visual primitive shapes, a circle, a torus and a grid,
  - these can be repeated, resized, repositioned and parametrically mapped to the audio amplitude being received from formuls.
- Control is enabled by gestural input from a MIDI or Touchscreen controller.
- Compositionally the music in biphase comprises passages of rhythmic gestures and others of long drone like textures.
- To reflect these qualities visually it was decided to use noisy spatial visual textures comprised of irregular lines and colour spaces to emulate the sonic drones, and recognisable geometric forms that reacted gesturally to the percussive pulses during the rhythmic passages.
- In previous performances the visuals have transformed between textural and gestural imagery
- In the opening phase of two circles, whose size is parametrically mapped to the audio amplitude, appear.
- As the piece progresses the drone becomes more pervasive and the shapes enlarge, merge and distort so they become unrecognisable from their original form; they progress towards textural imagery.
- Eventually the original circles lose all semblance of their original form and fill the visual space with a gradually morphing video texture.
- The resultant visual texture is formed from a homogenous space of distorted lines with some subtle colouring
- This sequence is therefore an example of how visual gesture and texture can be slowly and seamlessly transitioned to reflect similar behaviours in sound.



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Summary and Conclusions

Visuals Across Media

STAFFORDSHIRE UNIVERSITY
MUSIC AND SOUND

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Summary and Conclusions

- There are many approaches to creating visual music, between algorithms, artist-led, fixed media and real–time.
- Compared to fixed media real-time instruments facilitate spontaneous expression, albeit accompanied with the risk of undesirable results.
- All of these approaches have attempted to incorporate musical aesthetics in the visual medium, one of the original motivations behind visual music.
- In experimental visual music works there are a wealth of potential metaphorical relationships between sound and image that an artist can use in material transference.
- Specifically, the electroacoustic forming processes of gesture and texture have proven valuable concepts that have informed the development of visual music instruments and guiding strategies for my own compositions and live performances.
- The visual music instrument morphlux employs simple geometric shapes which were duplicated, transformed, distorted and animated to create complex imagery.
- This rendering technique also has a technological advantage in that most of the processing takes place on the GPU permitting the CPU to take on the audio work.
- This imagery was further enhanced using visual feedback and application of various blend modes that created a range of differently coloured effects where shapes overlap and transform.
- Although starting with relatively simple visual source materials, the end results are intricate evolving visuals comprised of gestural and textural elements.

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Conclusions

- The results of the inter-media material transference can be questioned—does this really achieve audiovisual cohesion, and do the visuals speak to me musically, are gesture and texture suitable descriptions of complex sound and image qualities? Ultimately these results are evaluated bythe individual observer.
- What has become evident to me is that using musical theory and aesthetics to inform visual music instrument development has proved to be a productive and analytical mechanism.
- The visual music and audiovisual pieces and performances created by artists which can be experienced at international festivals and conferences like this are frequently aesthetically and technically outstanding.

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Obrigado

- Questions?

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