

Contextualizing Programming with Algorithmic Art Practices Using Computational Thinking Principles for Undergraduate Design Students

Thesis Jury Tick 01 →



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Overview

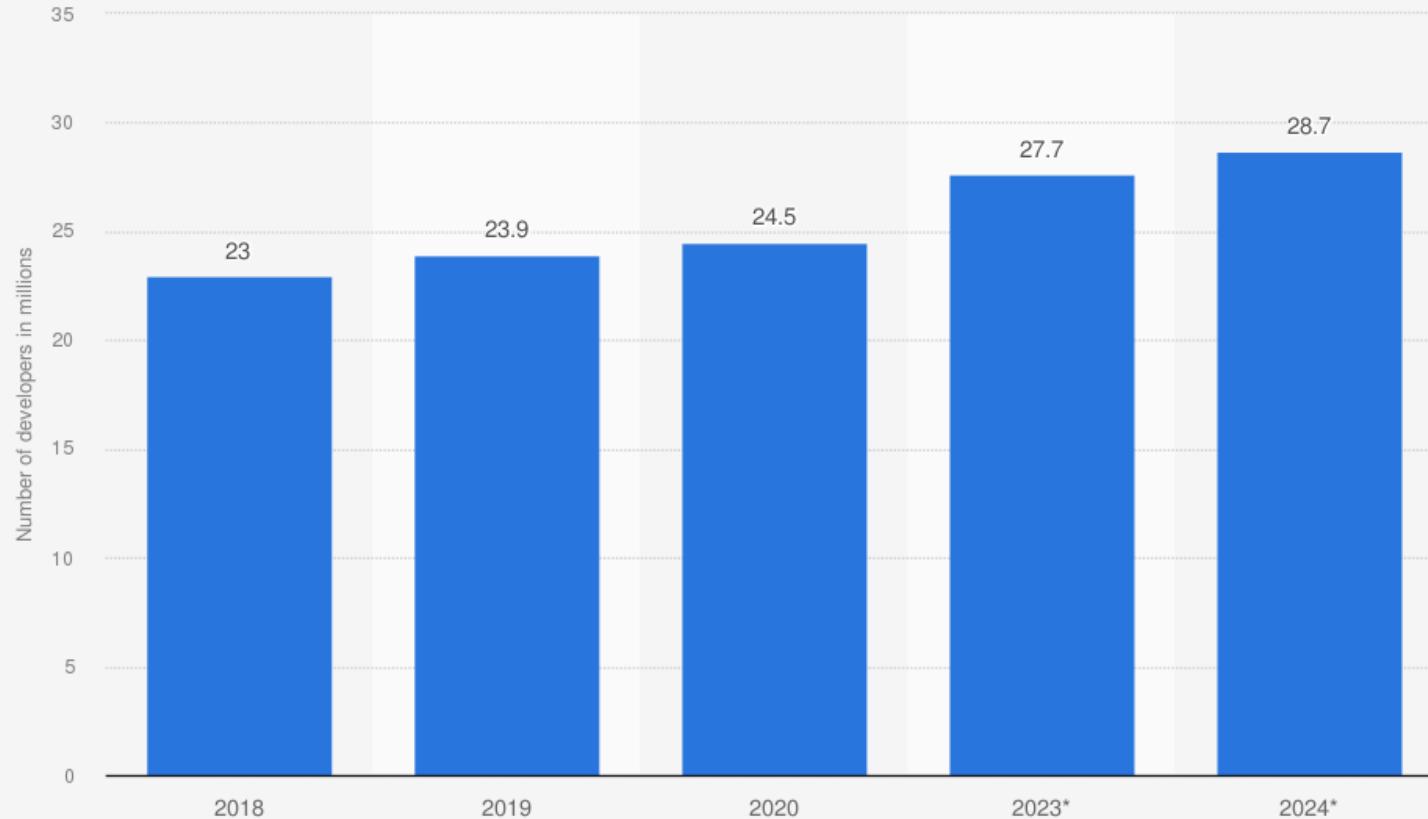
- Theoretical Basis → Constructionism ~ Pragmatism
- Point of View → ANT ~ Script Theory
- Algorithmic Art Praxis (ALAP) to Contextualize → Computational Thinking ~ Programming Fundamentals

Introduction & Background

Programming knowledge becomes a required skill more than before.

- Paradigmatic Shift in Technology Usage... But Why?
- Increasing Number of Programmers (1.1. The 4th R)
- Changing Grammars in Technology (GUI → CBI) (1.2. Emerging Tendencies)
- Fresh Problem-Solving Paradigms (1.3. Computational Creativity)

Number of software developers worldwide in 2018 to 2024 (in millions)

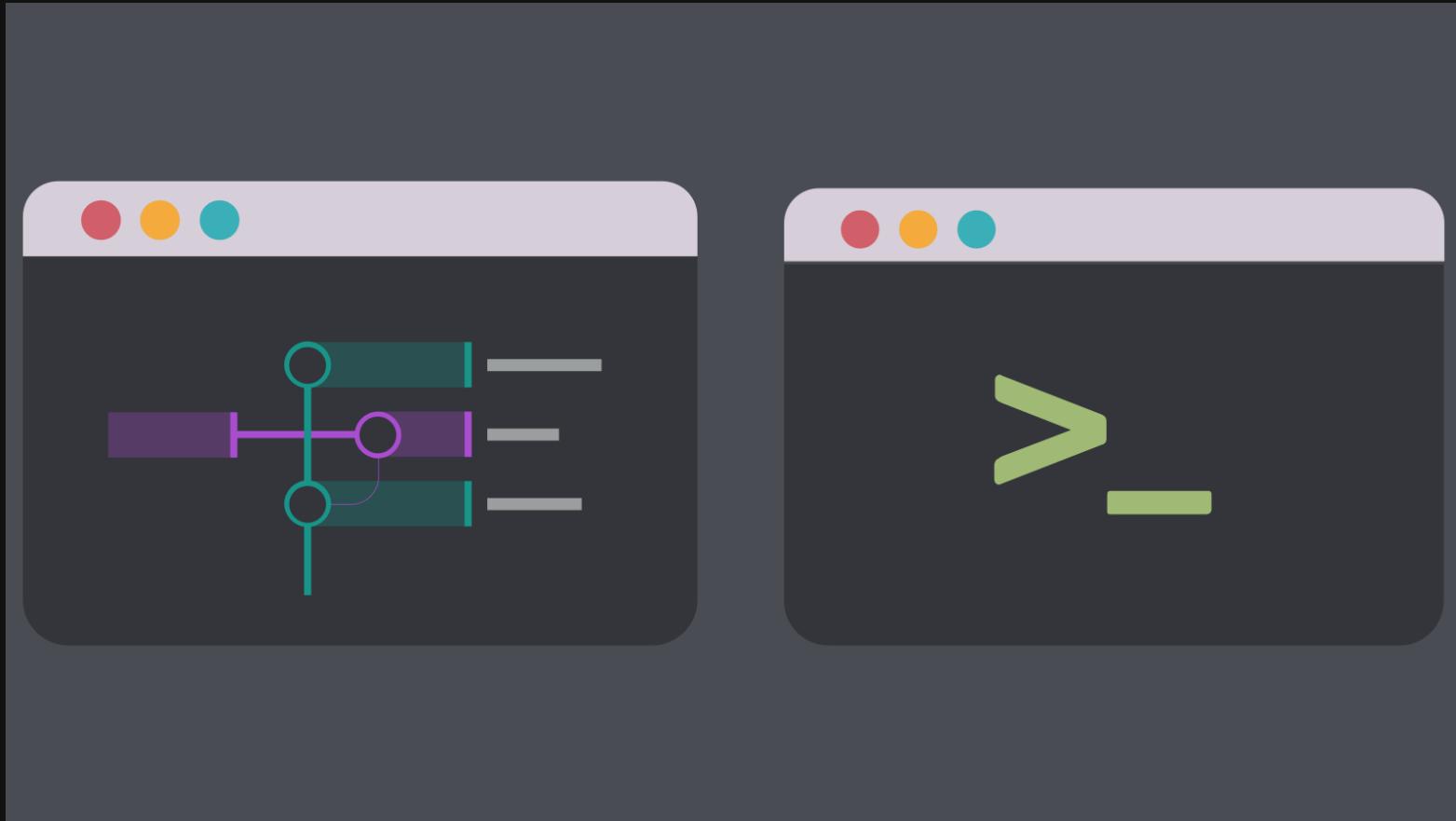


Sources

Evans Data; Computerwelt
© Statista 2022

Additional Information:

Worldwide; 2018 to 2020





Using slash commands
Notion



Paylaş

Using slash commands



Tips & tricks
İzlemek için: YouTube

MEDIA

- Image**
Upload or embed with a link.
- Web Bookmark**
Save a link as a visual bookmark.
- Video**
Embed from YouTube, Vimeo...
- Audio**
Embed from SoundCloud, Spotify...
- Code**
Capture a code snippet.
- File**
Upload or embed with a link.

EMBEDS

- Embed**
For PDFs, Google Maps, and more.
- Google Drive**
Embed a Google Doc, Google Sheet...

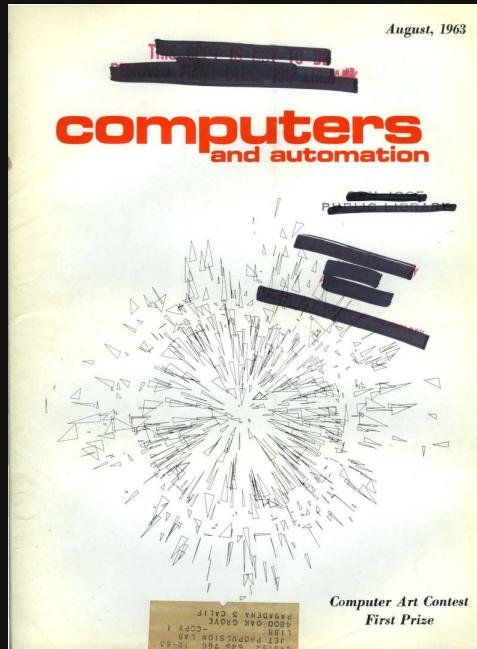
This Presentation is another proof-of-concept

Text-based presentation tool → Sli.dev

New Paradigms For Computational Creativity

Evolution of computational environments as instruments

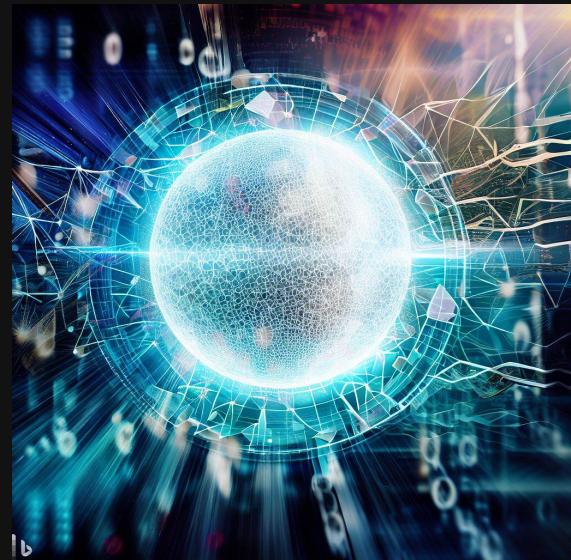
Conceptual Art, Algorithmic Art
and its sub-branches - 60s



1980-2000 Personal Computers,
Discipline-specific software tools



2000-Today Internet, Blockchain,
Digital Art, Artificial Intelligence



CBI AI Tools

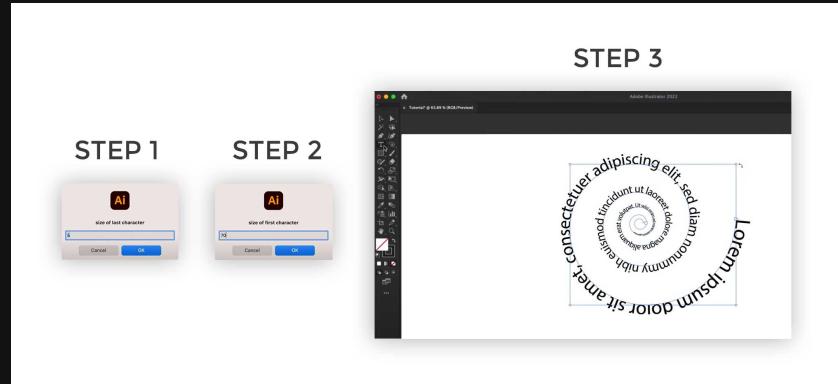
Eg. Mid Journey, DALL-E



"Prompt: A Panda fixing the rooftop."

Scripting

Eg. Adobe Illustrator



```

1 var aDoc = app.activeDocument;
2 if (aDoc.selection.length > 0) {
3   if (aDoc.selection.length < 2 && aDoc.selection[0].typename == "TextFrame") {
4     var aTFrame = aDoc.selection[0];
5     var theChars = aTFrame.characters;
6     var charLength = theChars.length;
7     var startSize = prompt("size of first character", 25,"start size");
8     var endSize = prompt("size of last character", 5,"end size");
9     var step = (startSize-endSize)/(charLength-1);
10    for (i = 0; i < charLength; i++) {
11      theChars[i].size = (startSize - i*step).toFixed (2);
12      redraw();
13    }
14  } else {alert("Please select only one text frame");}
15 } else {alert("No selection")}
  
```

reading, Writing, Arithmetics & Programming

Programming becomes the 4th R

In such an era design students should learn fundamentals of programming as well.

The Main Problem

Engagement of students

Literature Review Summary

- Programming is a tedious process for students
- The prejudice against coding among students causes declining attendance to computing classes (Allwood, 1986; Winslow, 1996; Robins et al., 2003; Ring et al., 2008; Yardi & Bruckman, 2007).
- The lack of inadequate computer literacy education at earlier ages (Guzdial, 2009; Yardi & Bruckman, 2007)
- The wrong choice of programming language and out-of-date course materials (Brown & Wilson, 2018; Robins et al., 2003; Guzdial, 2009; Hansen, 2019).
- Contextualizing Programming Fundamentals with Art Increases Student Engagement (Liao & Pope, 2008; Guzdial, 2009).
- But How?

How to Avoid from the Problem?

- Contextualize Programming With Art Positive results (Hansen, 2019; Guzdial, 2009).
- There is a need for elaborate approaches on programming education (Brown & Wilson, 2018).
- Design students are Visual Learners (Ref.)

But

- What is the scope of the Art?
- How to contextualize programming fundamentals with the Art?
- How to link a specific visual form with programming?

Research Question

How can we contextualize programming fundamentals through Algorithmic Art practices to improve students' Computational Thinking skills and engagement in design departments?

Answer

Categorization of Algorithmic Art Practices

- Identify patterns and similarities
- Organize knowledge and resources (Stahl, 2006)
- Develop effective teaching methods

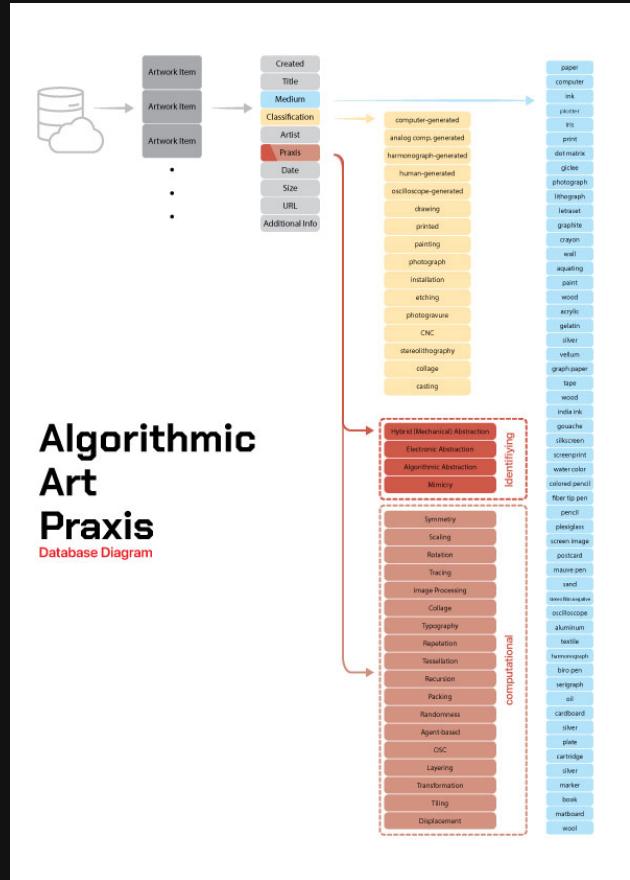
Methodology

Data Collection

22 data sources, 2000 images

Name	Content Type	URL
Atari Archives	Computational	https://www.atariarchives.org/artist/
Computer Art	Computational	http://dada.compart-bremen.de/item/artwork/318
DAM.org	Computational	https://dam.org/museum/
Digital Art Museum	Computational	https://digitalartmuseum.org/laposky/index.html
Guggenheim	Mixed	https://www.guggenheim.org/artwork/2184
Internet Archive: Computers and Automation Magazines (1940-1980s)	Mixed	https://www.archive.org
MOMA	Mixed	https://www.moma.org/artists/3528
MOMA San Francisco	Mixed	https://www.sfmoma.org/artwork/2015.9.1/
The MET Museum	Mixed	https://www.metmuseum.org/about-the-met
Monoskop	Mixed	https://monoskop.org/Monoskop
Rhizome	Mixed	https://rhizome.org/
Scanlines: Computers & Art 1970-1980 magazines	Mixed	https://scanlines.xyz/t/computer-graphics-art-1970s-magazines/58
Spalter Digital	Computational	https://spalterdigital.com/artworks/227/
TATE	Mixed	https://www.tate.org.uk/
The Art Story	Mixed	https://www.theartstory.org/
TOPLAP	Computational	https://toplap.org/2012/09/27/pdfs-of-computer-graphics-and-art/
Victoria & Albert Museum	Mixed	https://collections.vam.ac.uk
Whitney Museum of American Art	Mixed	https://whitney.org/search?q=algorithmic
Wiki Art	Mixed	https://www.wikiart.org/en/sol-lewitt/all-works#!%23filterName:all-paintings-chronologically,resultType:masonry
ZKM	Computational	https://zkm.de/en/person/frieder-nake

Infrastructure



Algorithmic Art Praxis Web App

Algorithmic Art Repo (1950-2000)

Gallery view Table Filter Sort ⚡ Q Reset

Created Artist Praxis Classification Medium Date + Add filter

					
Paul Klee Rhythmic (Rhythical) 1	Paul Klee Fire evening	Paul Klee Castle and Sun	Paul Klee Black Knight	Paul Klee Growth of the night plants	Paul Klee Fugue in Red
					
Paul Klee Crystal Gradation	Paul Klee Rock Chamber	Paul Klee Separation in the Evening	Paul Klee In the Current Six Thresholds (In der Strömung sechs Schwellen)	Paul Klee Neue Harmonie	Sol LeWitt Wall Drawing #260, On Black Walls, All Two-Part Combinations o
					
Sol LeWitt Untitled from Squares with a Different Line Direction in Each Half	Sol LeWitt Untitled from Squares with a Different Line Direction in Each Half	Sol LeWitt Untitled from Squares with a Different Line Direction in Each Half	Sol LeWitt Squares with a Different Line Direction in Each Half Square	Sol LeWitt Lines in Four Directions, Superimposed in Each Quarter of the Square	Sol LeWitt Lines, Not Long, Not-Straight & Not Touching
					

Item Detail View

Displays artwork properties

- Created
- Title
- Medium
- Artist
- Classification
- Praxis
- Date
- Size
- URL
- Additional Info

October 19, 2023 12:30 PM

Computer Graphics and Architecture Conference poster

lithograph print computer ink plotter

Aaron Marcus

computer-generated drawing printed

Algorithmic Abstraction Repetition Scaling mimicry Recursion Transformation

1968

17.15 x 45.72 cm

<https://www.sfmoma.org/artwork/2015.8/>

NA

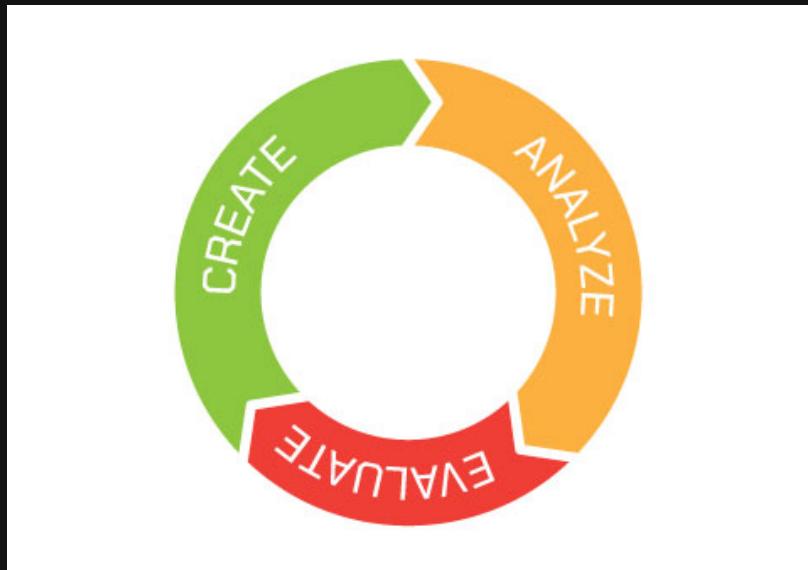
2 more properties

Displays values of artwork properties

Image of the artwork

Method for Classification

Cyclical Iterative Design Process



1. Accessibility: Easy to remember
2. Learning: Leverage previous knowledge
3. Programming Specificity: Linking words with programming terms

Findings

Computational Thinking Framework

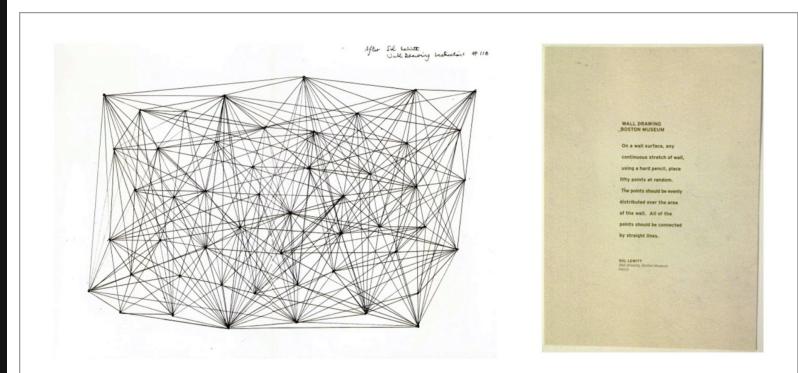


Figure 18 - Instructions for Sol LeWitt's 1971 Wall Drawing # 118 for the School of the MFA Boston 2012, (Russeth, 2012)

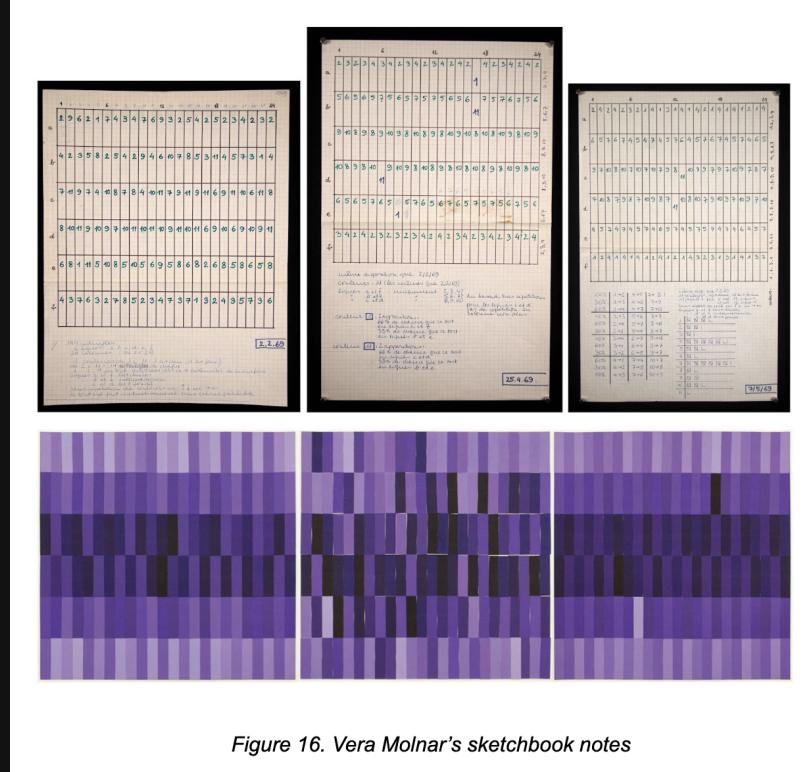
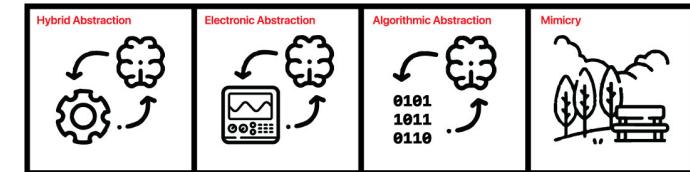


Figure 16. Vera Molnar's sketchbook notes

Discussion & Conclusion



Symmetry	Rotation	Scaling	Trace
Layering	Tiling	Tessellation	Image Processing
Collage	Typography	Transformation	Displacement
Repetition	Recursion	Packing	Randomness
Agent-based	Oscillation (OSC)	Algorithmic Art Praxis	
		Algorithmic Art Praxis	
		Cheat Sheet	

Future Studies?

Method exemplified (Empirical Study)

1. Decompose (De-scribe)
2. Translation (Implementing modular code blocks)
3. Algorithm Design
4. De-inscribe

END