



UNIVERSITÀ DEGLI STUDI DI MILANO

DIPARTIMENTO DI INFORMATICA

Giorgio Presti
Researcher @ LIM

L'opera multimediale nell'epoca della sua irriproducibilità tecnologica (2024)



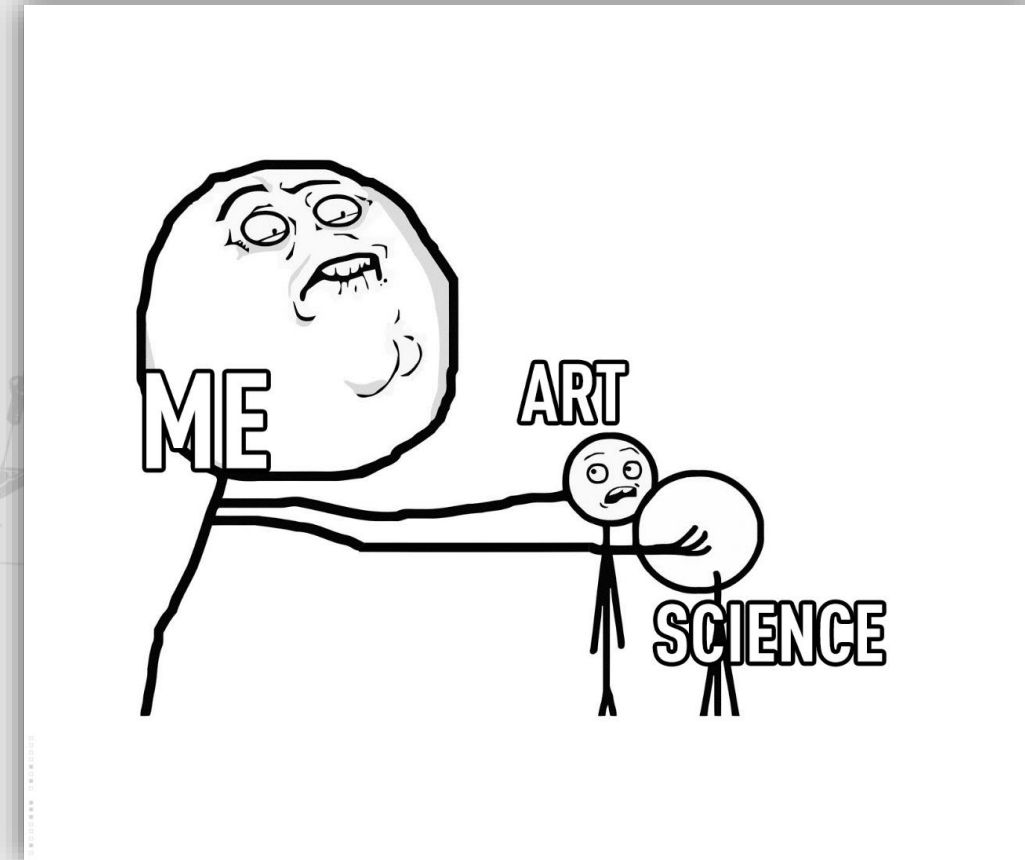
Chi è questo?

Giorgio Presti

- Docente e ricercatore al Lab. di Informatica Musicale (Dip. di Informatica, UNIMI)
- (ex) Docente di Multimedialità per i Beni Culturali II, Accademia di Belle Arti, Brescia
- Musicista e Sound Artist

giorgio.presti@unimi.it

<https://homes.di.unimi.it/presti/>



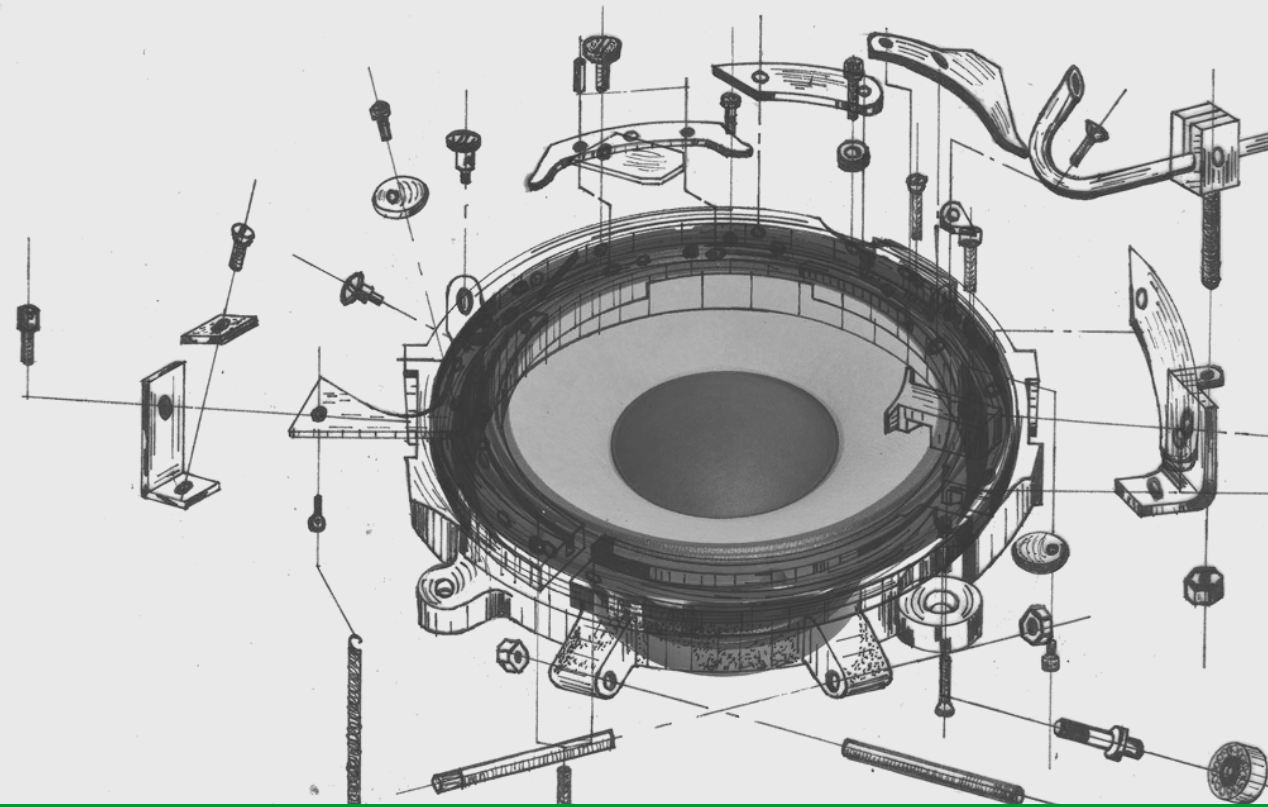
Il programma di oggi

- Il Problema delle Due Culture
- Informatica e New Media Art
- La Conservazione delle Opere Multimediali

Disclaimer: le slide sono un po' in inglese e un po' in italiano perché provengono da un mix di presentazioni che ho fatto nel tempo... Sorry.

Il Problema delle Due Culture

O più in generale:
*Perché Arte e Scienza
devono fare pace*



Il problema delle *due culture*

- La **poca comunicazione tra scienza e mondo umanistico** porta alla mancata soluzione dei problemi nel mondo
- La **dicotomia tra artisti e scienziati** non permette di raggiungere il potenziale espressivo e tecnologico che si trova a cavallo tra quei mondi

– *Charles P. Snow, 1959*

Gli scienziati spesso vogliono essere considerati artisti, gli ingegneri e i ricercatori più creativi hanno il loro senso estetico, che corrisponde a quello di artisti tradizionali con probabilità nulla.

– *Lillian Schwartz & Michael Noll, Bell Labs*

La funzione dell'arte è di reggere lo specchio alla natura.

– *Douglas Adams (parafrasando Shakespeare)*



Gli specchi e la natura

Dave Featherstone, professore di biologia e neuroscienze:

« Science = Art. They are the same thing.

Both science and art are human attempts to understand and describe the world around us. The subjects and methods have different traditions, and the intended audiences are different, but I think the motivations and goals are fundamentally the same.

Both artists and scientists strive to see the world in new ways, and to communicate that vision. When they are successful, the rest of us suddenly 'see' the world differently.

Art = Science »

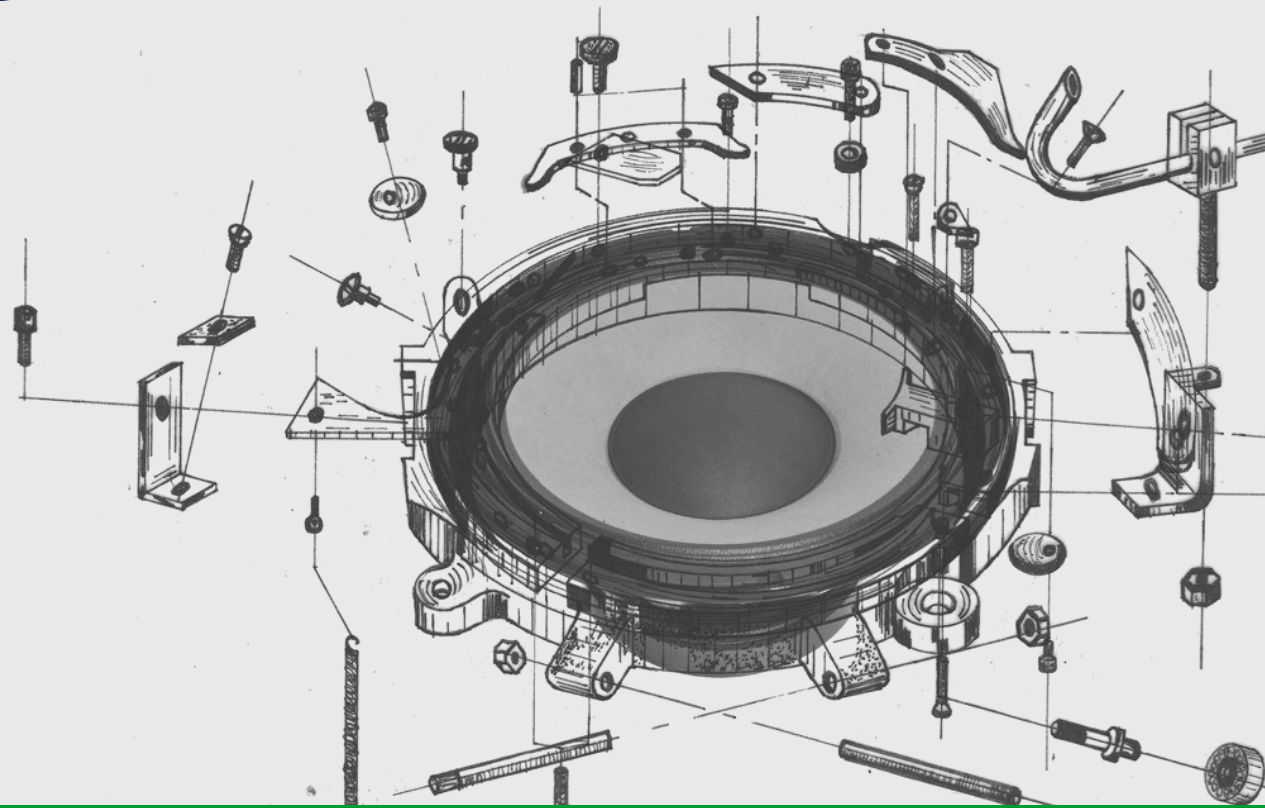
<https://www.forbes.com/sites/quora/2016/03/16/why-art-and-science-are-more-closely-related-than-you-think/>

Mae Jemison (astronauta, medico, collezionista e ballerina) **nel 2002** denunciava la ricaduta del problema delle *due culture*, e incitava all'attivismo per abbattere questa dicotomia.

«Frantz Fanon disse: *«Ciascuna generazione deve scoprire la propria missione, e quindi compierla o tradirla»*. **Penso che la nostra missione sia di riconciliare scienze e arti**, perché ora c'è uno scisma nella cultura popolare.»

L'impatto dell'informatica nella New Media Art

L'informatica che produce
beni culturali



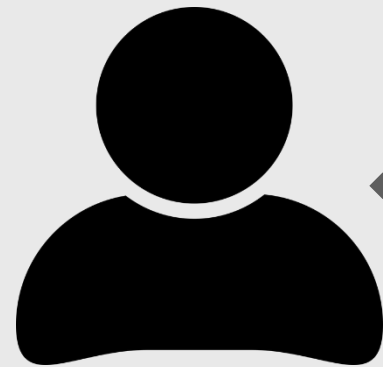
A philosophical perspective on computer science



A philosophical perspective on computer science

Type, Class, Shape, Idea: abstraction of a concept, ideal form

Instance, Replica, Object, Implementation: the concrete, real thing



Human
(idea, class)

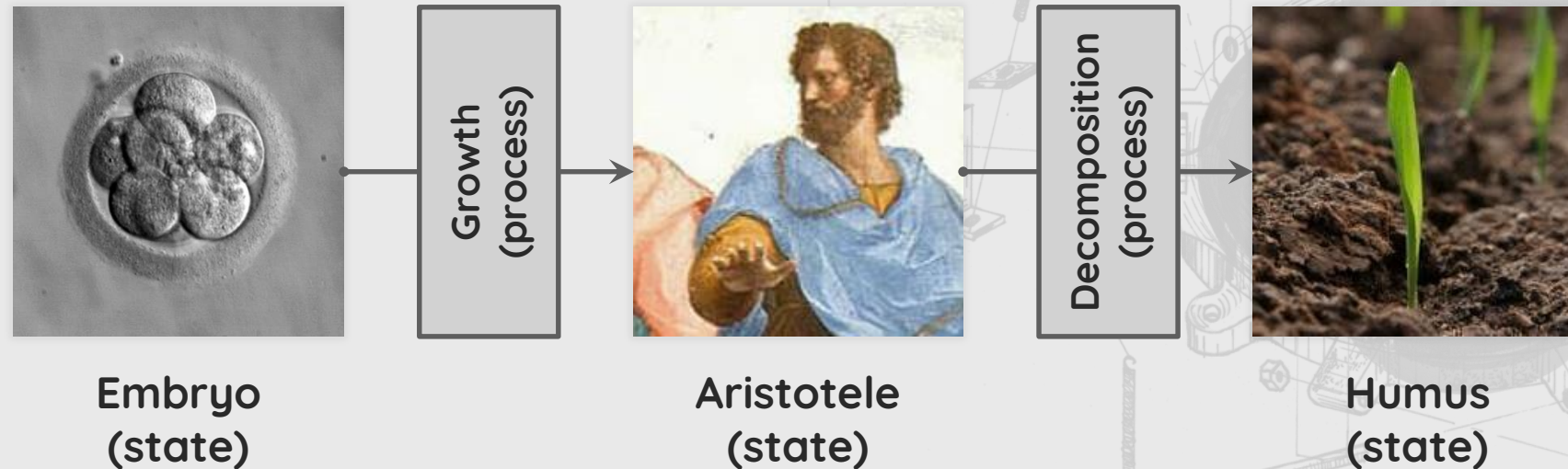


Plato
(instance)

A philosophical perspective on computer science

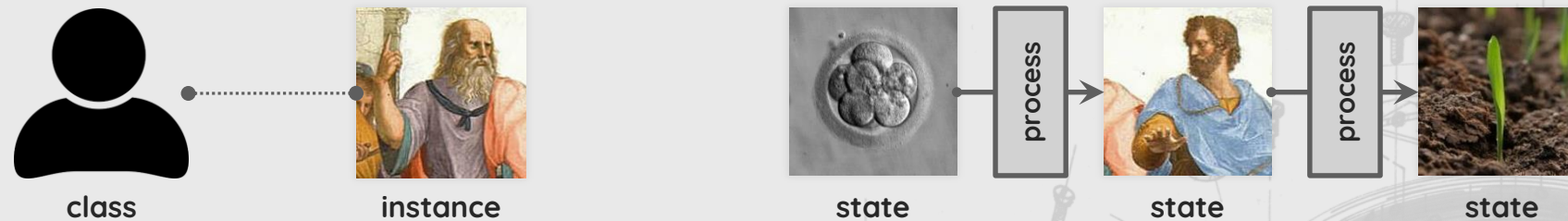
Data, Idea, Matter, State, Configuration: the world in an instant

Function, Process, Transformation, Transition: transition from one moment to the next, manifestation of potential, action



A philosophical perspective on computer science

Programming is a **creative action**, the product of which is an *ontology*, a metaphysical **system**.



Programming is creating worlds and leaving them free to evolve.

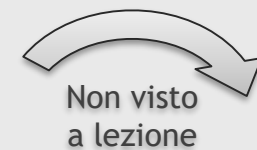
Programming should be the favorite practice of every philosopher because it allows one to put every possible reading of the world on the test bench (provided that this is unambiguous, complete and finite).

A philosophical perspective on computer science

This also applies to non-computer based work; think of *programming* as an attitude:

A common factor of almost all generative art forms is that the artist does not just create an *art object*, but an entire **system**, of which the spectator is often an integral part.

A philosophical perspective on computer science



When programming is involved there is a substantial difference with other forms of expression: programming allows an effective **reuse** of previous creations. A work almost always physically becomes an **instrument** and foundation for different works.

Generative & Creative-Coding talks: [\[Talk#1\]](#) [\[Talk#2\]](#) [\[Talk#3\]](#)



I russi...

Kinetic Construction (Standing Wave)

Naum Gabo, 1919

Un *volume virtuale* creato dal movimento

Naum Pevzner, formazione da ingegnere e matematico, tra i fondatori del Costruttivismo.

“Science is another way [to do] art”

<https://www.facebook.com/watch/?v=556002364927939>



1955: The art of creating art with machines

Métamatics,
Jean Tinguely
1955-1959

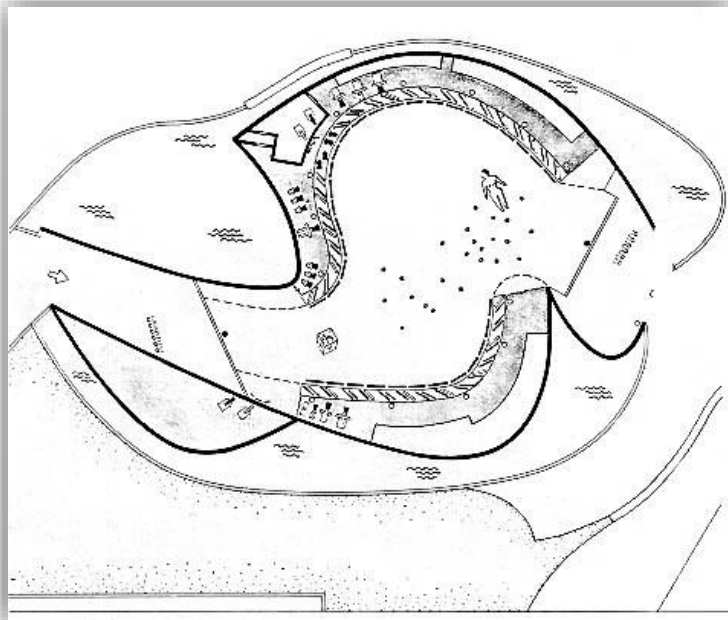
All'Hangar
Bicocca fino
al 2/2/2025!!!



1958: Architecture, electronic music, space

Poème électronique, Edgard
Varèse

(Philips Pavilion, Expo of
Bruxelles, 1958)



<https://www.youtube.com/watch?v=R-R3F3ZVbi8>

1962: Olivetti, Munari, Eco: Arte Programmata

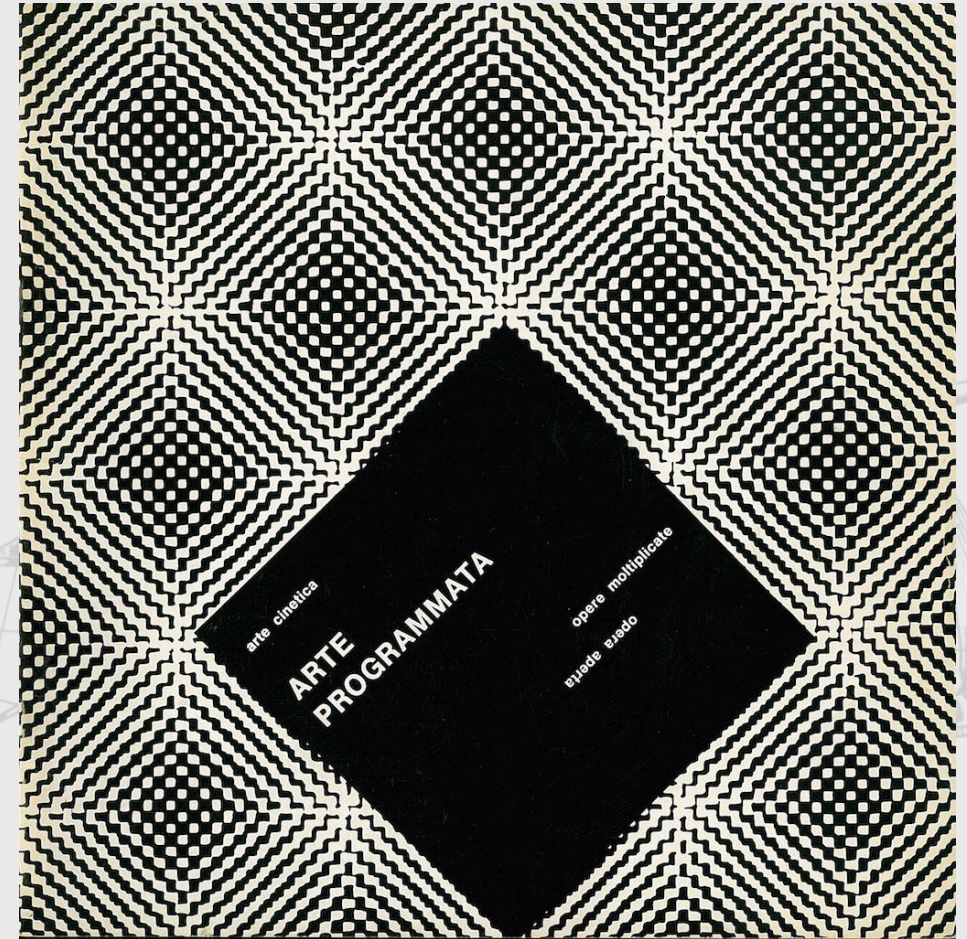
The works on display are designed to be transformed by the interaction with the visitors

It is art conceived by thinking at the transformations expected from the imminent “digital revolution”

Computer art, made without computers.

https://youtu.be/iji_cT9L6RQ

<http://www.reprogrammed-art.cc/library/33/Arte-programmata.-Arte-cinetica.-Opere-moltiplicate.-Opera-aperta.>



1959: New visualizations

1959, **PDP-1** is born

The first computer to run a game with non-text graphics.

There are at least 3 examples of art done on this system:

1. **Spacewar!**
2. **Some code by ?**
3. **Munching Square (1962)**

<https://www.youtube.com/watch?v=1EWQYAfuMYw>

<https://www.computerhistory.org/collections/catalog/102664156>

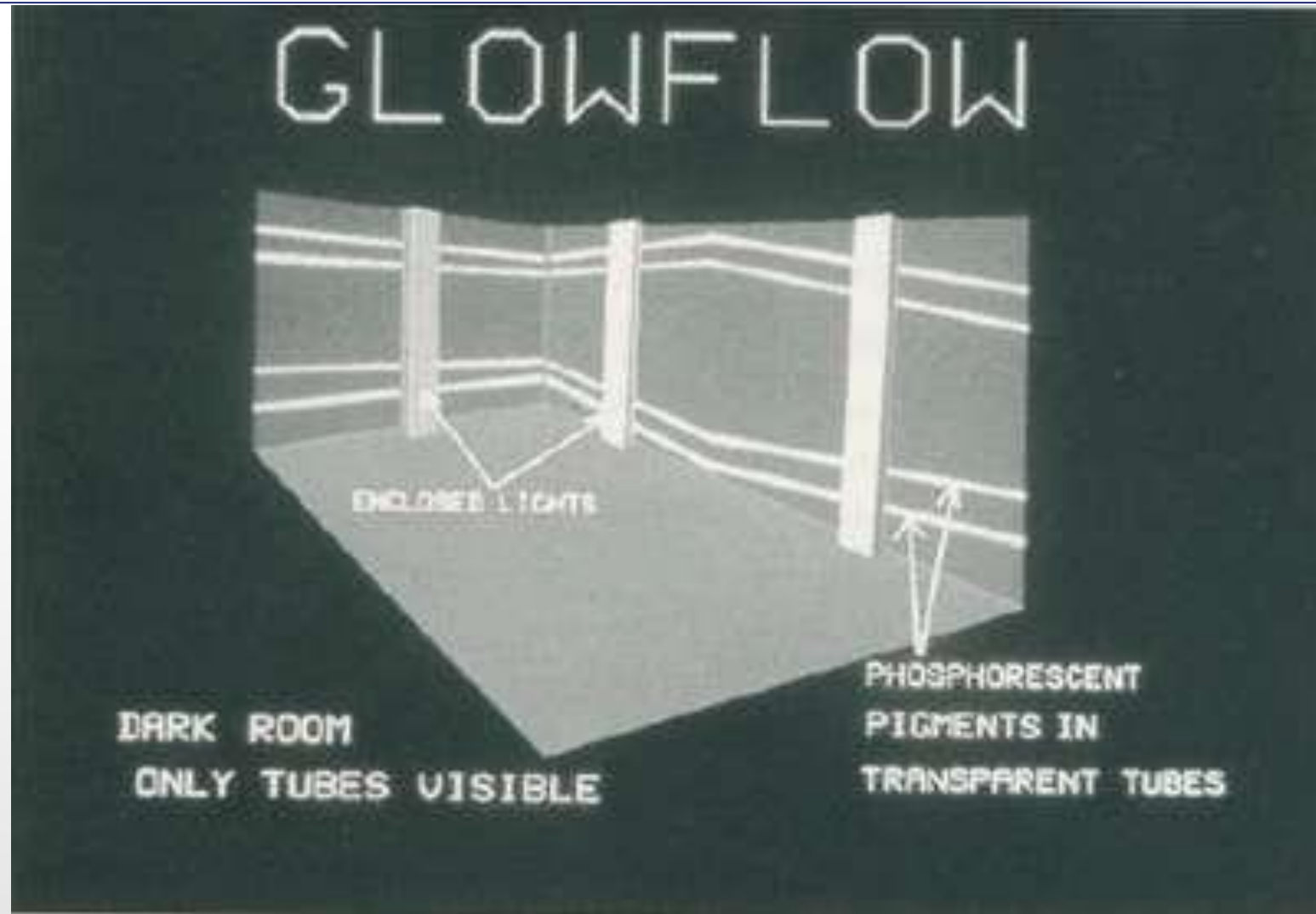


1969: Interactive

Glowflow, Myron W.
Krueger, 1969

Considered the first
interactive digital
installation

A computer controls the circulation of a
phosphorescent fluid and the sounds emitted
by a synthesizer, depending on the steps of
the users



<http://dada.compart-bremen.de/item/artwork/1347>
<https://vimeo.com/328548584>

1974: Electronic Media

String Game, Vera Frenkel, 1974, Bell Canada Teleconferencing Studios

The first work/performance to use communication between remote devices and videoconferencing. The lack of critics capable of understanding this aspect caused the work to fall into oblivion.



Non visto
a lezione



1997: Inaccessibilità

Sealed Computers, Maurizio Bolognini, 1997

Computer (privati del monitor) che generano immagini per poi distruggerle, senza che queste possano essere viste.



Evolution of multimedia technologies

TEXT, IMAGES, SOUNDS, MOVIES / THE INFINITE LOOP



1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012

MAEDA
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TEXT

IMAGES

SOUND

MOVIES

https://www.ted.com/talks/john_maeda_how_art_technology_and_design_inform_creative_leaders



LIM: Laboratorio di Informatica Musicale
www.lim.di.unimi.it



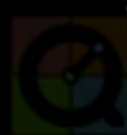
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Welcome to
My
Home Page



YouTube

TEXT

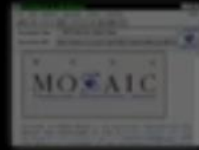
IMAGES

SOUND

MOVIES

Evolution of multimedia technologies

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TEXT

IMAGES

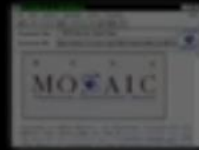
SOUND

MOVIES

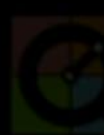
Evolution of multimedia technologies

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TEXT
IMAGES
SOUND
MOVIES



1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012



Welcome to
My
Home Page



You Tube



Messages



Photos



Music



Atoms are the new Bits

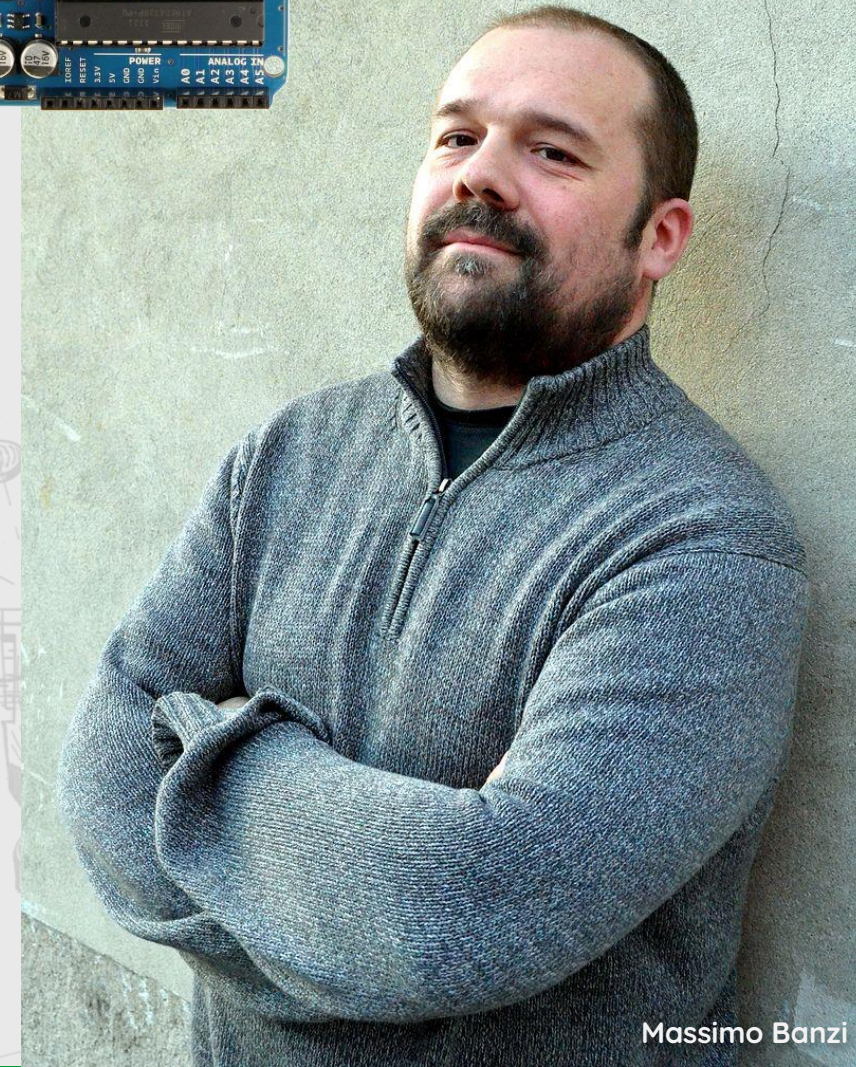


In 2005 the Interaction Design Institute of Ivrea completed the **Arduino** project: a small programmable device designed to simplify the process of **including aspects of *interaction* and *programmability* in design elements.**

Similar tools have existed in industry since long before, but this is the first to be **designed for non-programmers** and is completely **open-source.**

Thanks to its ease of use, **interactivity and algorithms burst into the world of multimedia installations.** Now it's possible to do in the real world what Creative Coders do on screen.

https://www.ted.com/talks/massimo_banzi_how_arduino_is_open_sourcing_imagination?language=it



Massimo Banzi

Atoms are the new Bits

Constellation,
Pangenerator, 2013

Arduino (and
similar) become
the *nervous system*
of objects

<https://vimeo.com/76479685>



Full-Body interaction

In 2010, Microsoft released **Kinect**, a device for Xbox capable of **recognizing a player's body in 3 dimensions** and using it as a game controller.

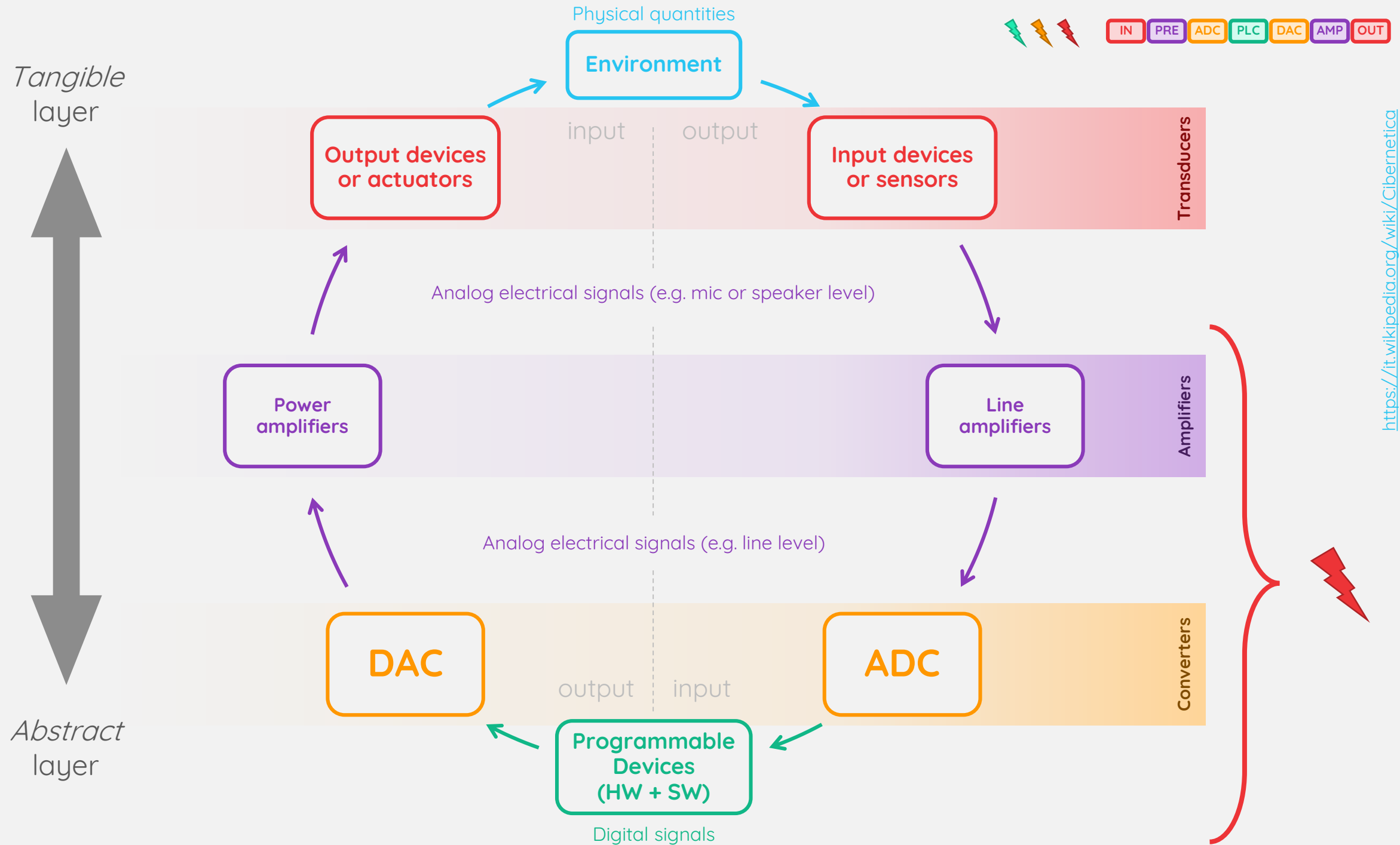


Full-Body interaction

Future You, Universal
Everything, 2019



<https://vimeo.com/337511882>



But New Media Art is a broader term...

Don't just focus on Computer Science!

NMA is defined as *all art created by using variable media* such as digital, biological, performative, and other...

Focus on NMA which is somehow:

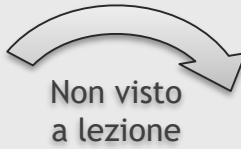
- **Time based**
- **Process based**
- **Interactive**

So, basically, an *instalaltion*...



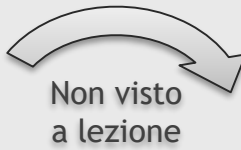
Aganetha Dyck

Some terms used to describe New Media Art...



- **Digital Art:** Art made by digital means, not necessarily programmed. also called computer art if the medium is the computer;
- **Generative Art:** The artist creates a system from which one or more possible instances of the work emerge, not necessarily digital;
- **Algorithmic Art:** Art made using an algorithm (not necessarily generative);
- **Interactive Art:** Requires some physical activity by the user to be enjoyed;
- **Net Art:** Art forms in which the internet is involved or more generally the connections between people, things, and concepts;
- **Data/Information Art:** Data-driven algorithmic art, where the form reflects that of some data;
- **Software Art:** Case in which the program is itself an object of art;
- **Creative Coding:** Artistic practice where coding is radically involved.

The life cycle of an installation



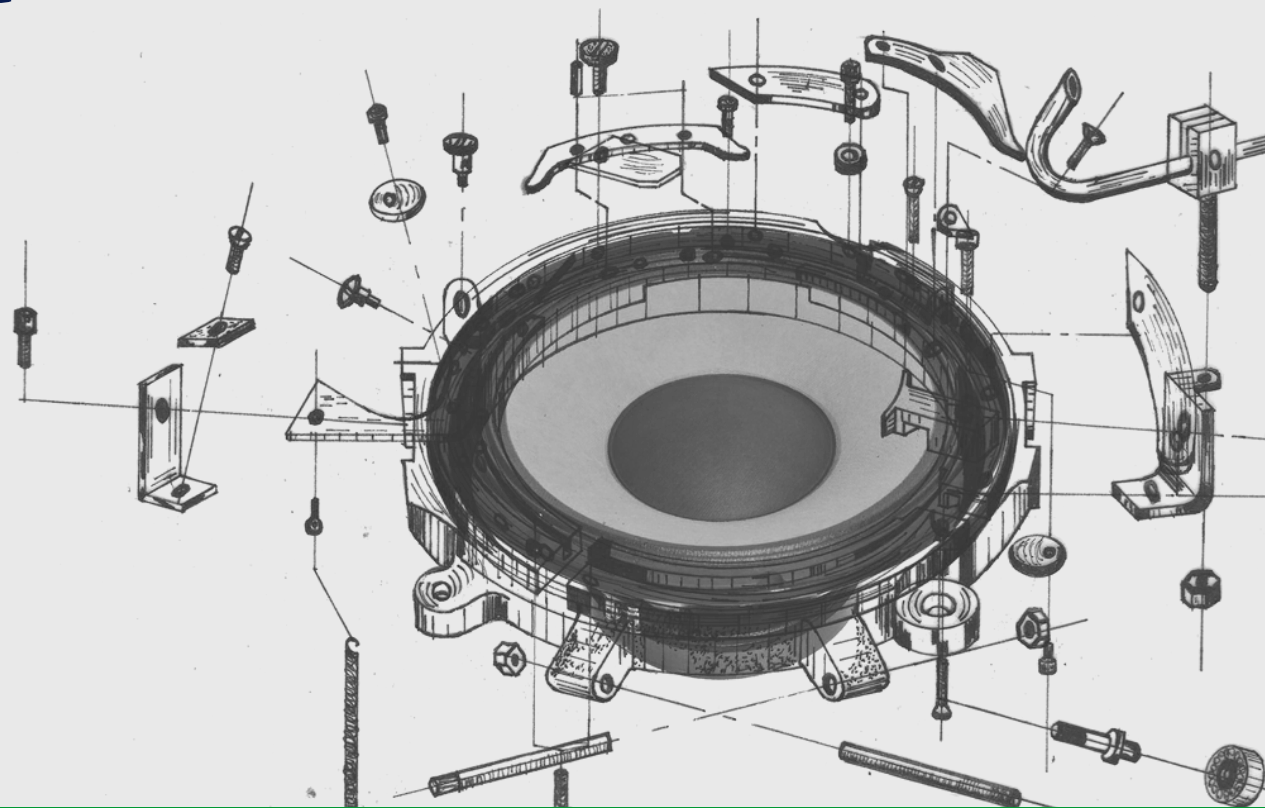
1. Definition of a theme
2. Definition of contents
3. Choice of the form
4. Definition of the structure
5. Collection of materials
6. Choice of tools
7. System design
8. System implementation
9. Assembly
10. Test
11. Communication
12. Deploy
13. Fine-tuning
14. Fruition
15. Maintenance
16. Retrospective
17. Archive
- 18. Preserve**



Conservazione e restauro della New Media Art

Come si preserva un'opera quando l'opera è un *processo*?

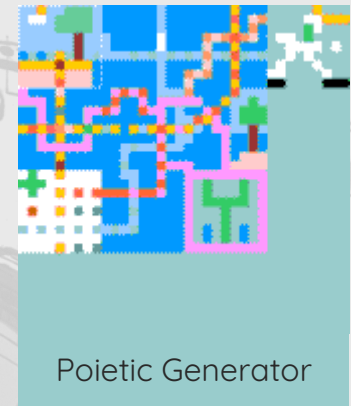
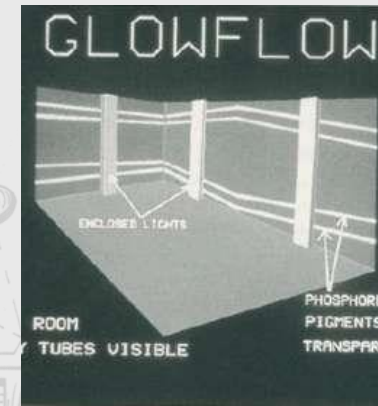
Come si archivia l'*inarchiviabile*?





All art is *time-based art*...

... if you choose the right time frame (if it weren't, there would be no need for restoration)



Slow
changes



Quick
changes

I think
about here

At which point traditional restoration techniques fails?

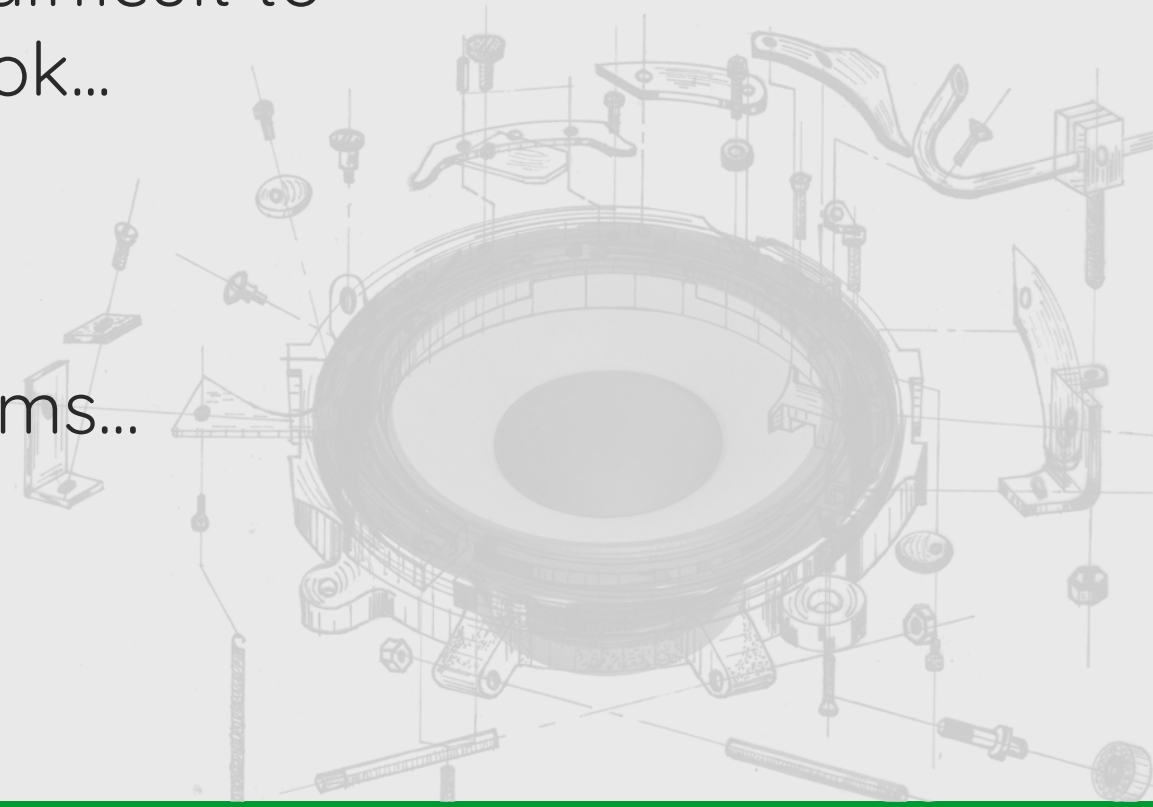
Defining the problem

Artworks based on (digital) technology are doomed to obsolescence:

- **Hardware** wears out, without possible replacement
- **Software** becomes obsolete and loses compatibility
- **Source codes** and intentions gets lost
- Newer systems **behave** differently from older ones

Not to be confused with...

- Remote fruition / Documentation:
Unlike paintings, installations are difficult to document and experience in a book...
- Media preservation:
Digital archives face many problems... that we do not address today.



Some examples

- All Flash-based net-art (the most recent mass extinction of artworks)
- Jake Elwes' *Digital Whispers*, based on old Twitter API
- Nam June Paik's *TV Cello*, based on CRT televisions
- Teiji Furuhashi's *Lovers*, based on MS-DOS
- Myron W. Krueger's *Glowflow*, based on... who knows?

More details on the issues

Machine Related

- OS obsolete
- HW unavailable
- Data unaccessible

Source related

- Source code unavailable
- Language obsolete

Dependencies related

- Breaking changes
- Proprietary software unavailable
- Services unavailable

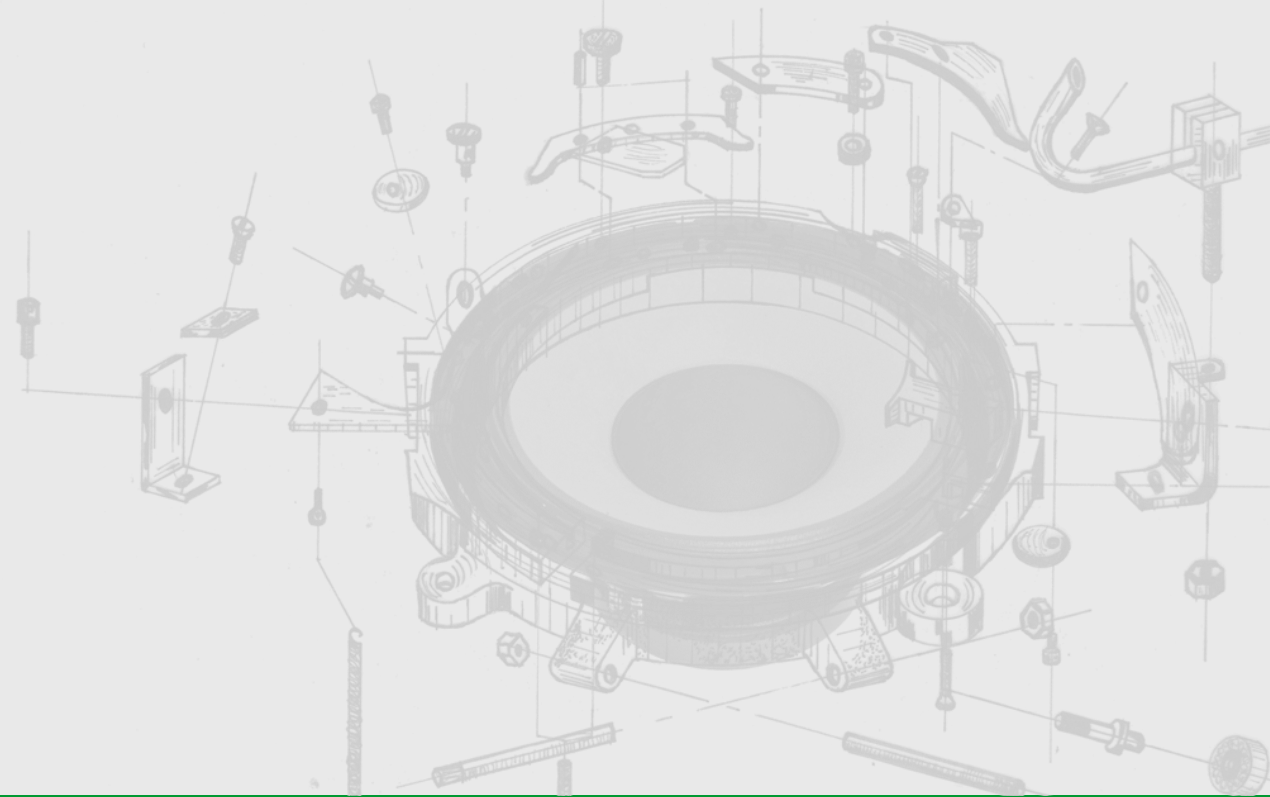
Knowledge related

- Missing documentation (also *operational* doc.)

Preservation strategies

A combination of the following practices can be used to extend the life of New Media Art:

- Storage
- Migration
- Emulation
- Reinterpretation



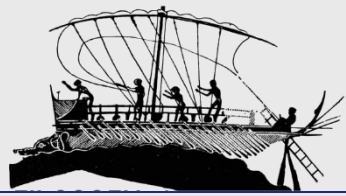
Preservation strategies

- **Storage**

The storage of the physical media/equipment keeping documents in their original formats but replacing the carriers.

E.g. Store files, hardware, sketches, pictures, movies...

- Bad at capturing the contextual aspects of works, such as interaction.
- Necessary for documentation and preservation of original medium.
- Beware of the short life of digital media carriers!



• Migration

Upgrade media format from old to new and open formats.

E.g. Change file formats, Digitising VHS to DVD, Change programming language...

- May introduce changes in quality and authenticity issues.
- Sometimes necessary in order to reactivate old installations.
- Beware of loss of functionality!
- Beware of misinterpretation or unintended corrections!

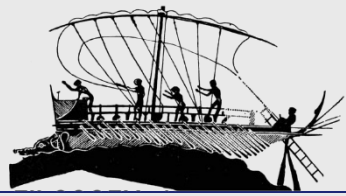
Preservation strategies

- **Emulation**

Simulating an older OS (or other supporting infrastructure) on a newer software or hardware platform.

E.g. Running old OS in a virtual machine, mimicking old HW with new HW.

- This can get very complicated for complex works.
- Maintains the original format.
- Beware of behavior changes!



• Reinterpretation

Reverse engineering and re-creation of the work (with or without the consent of the artist) for preservation purposes.

E.g. rewriting code, recasting a piece, changing the medium...

- Does not maintain authenticity, use only when all other strategies fail.
- It can be the most effective. (save the *process*, not the *instance*)
- Beware of loss of functionality, misinterpretation and unintended corrections!

Important aspects to be considered

- Involve artists in conservation (ideally since the creation of the work).
- Request / produce documentation (also *operational* documentation).
- Pro-act: don't wait for the work to go offline.
- Normal management systems are designed to catalogue unique physical objects, look for alternatives (e.g. Media Art Notation System).
- The relationships between the various digital components of the work (as well as their relationships to the physical components) also need to be recorded in detail.
- Collaborate with universities computer science departments and computer science museums.

Preservation may not be always welcome

The disintegration of the work may be part of the work itself, so consider collecting authors *digital-testament*

Alles nur künftige Ruinen

Material für die nächste Schicht

Nothing but future ruins, material for the next layer

Einstürzende Neubauten

Further reading...

The Conserving Computer-Based Art Initiative (CCBA)

<https://www.guggenheim.org/conservation/the-conserving-computer-based-art-initiative>

Avoiding technological quicksand: Finding a viable technical foundation for digital preservation.

<https://files.eric.ed.gov/fulltext/ED426715.pdf>

These slides:

<https://homes.di.unimi.it/presti>