

**Quelic Berga Carreras****An online short-film editing machine with a fixed structure and pseudo-infinite combinations. - Paper**

**Topic: Audiovisuals,  
Generative Editing, Art**

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**Main References:**

- [1] Gifreu-Catells, A. (2011). "The Interactive Documentary. Definition Proposal and Basic Features of the New Emerging Genre".
- [2] Laskari, D. I. (2008). The Generative Audiovisual Narrative System.
- [3] Manovich, L. (1999). Database as Symbolic Form. *Convergence: The International Journal of Research into New Media Technologies*
- [4] [See the working project at: http://iam.caotic.net](http://iam.caotic.net)

**Abstract:**

The article reflects on 3 main ideas, using an art project to analyse them.

It is known that viewing the same video many times give us different information and our perception of it evolves. Would viewing many instances of a pattern be more efficient on communicating an abstract concept than the repetition of an specific instance several times? Can the montage of a film be generative and still allow a story with it's climax and flow to stay alive? Is it relevant for the audience to know that what they view is a unique instance or do they prefer a common cut?

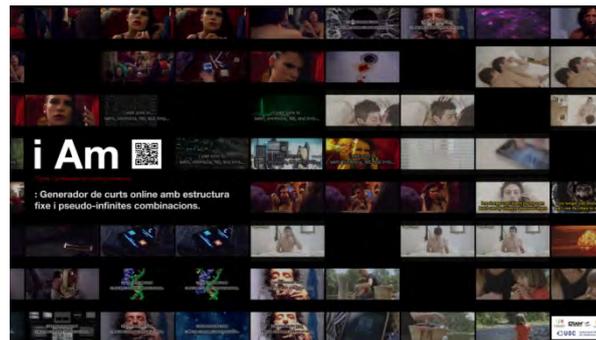
The online art project intends to reflect on the possibilities of generating automated, pseudo-aleatory cuts of a 25" short-film. The director's cut becomes a software's cut created, by a viewer's demand, as a unique random instance of the potential combinations of the short.

The artifact involves the shooting of an audiovisual repository according to a specific script, a web-based software interface based on a visualization of the amount of footage and its possible instances/combinations, and a server-side software that dynamically edits the selected shots in real time and encodes the result into a web-friendly format for online viewing.

The audiovisual content of the shots reflects on how technology is changing our daily lives and often shifting us from natural contexts to stressful landscapes of information overload. It questions who is really in control: humans or machines.

The very design of the project reinforces this dilemma by generating an automated cut, never edited before and only conditioned by the pattern set up by the director, but out of his control.

The content has 6 different situations/sets, with a total of 123 different takes, 5 sound tracks, 5 sub-themes with 32 written sentences and more than 20 minutes of archive footage that can be randomly combined in a structured manner to generate a 25-second almost unique resulting clip.



*Image: Poster of the on-line short film project.*

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**Keywords:** generative video editing, interface, data visualization, co-authorship, technology, patterns, processing.org, web-based, open-source

# An online short-film editing machine with a fixed structure and pseudo-infinite combinations

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## **Abstract**

Books, recordings and films are common media in our culture to create and share stories. Due to their physical support, once they are published the story is fixed. In other mediums used to transmit stories, for example, in oral communication of tales, popular songs or myths, the message is transmitted in a more organic way, and it has not a fix form but still keeps the essence of the story.

With the popularization of computers and IT, new possibilities on the ways to narrate and transmit information appear. This article explains how an online artefact has been build as an artwork to experiment on the possibilities of opening audiovisual fictions into a more flexible and changing formalization while keeping the essence of the story. It is based on theories of generative computational art, computational design and database cinema. We describe a technical solution to implement a generative self-editing short-film.

The resulting artwork is an artefact to study further possibilities on how to narrate nowadays.

## **1. Introduction**

From print, to sound recording and film, our culture has been developing machines to record and reproduce culture and memories. Those mechanical processes have help us storing information and archiving data. Saving memories and keeping a record of almost everything we do is a common practice today.

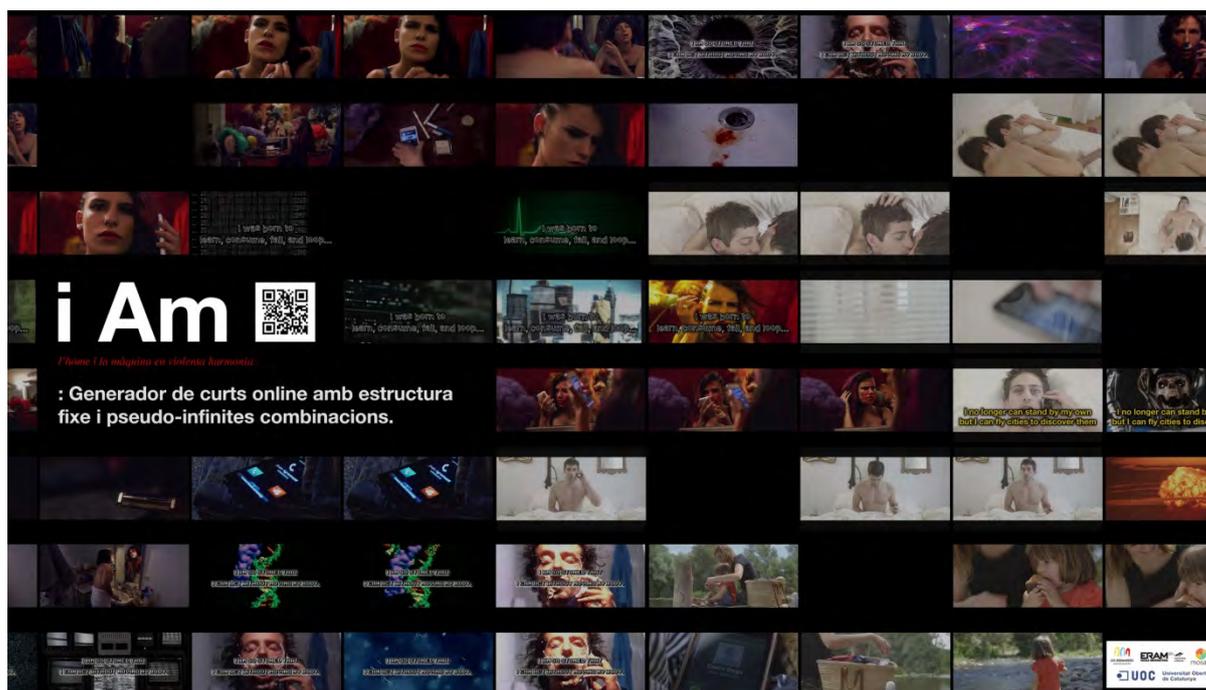
With the development of computers and networks, several new paradigms appear. Data is coded and

electrically transmitted. This makes that all textual and audiovisual objects stored in a computer have to be transformed into information (abandoning their original physical support) and converted into binary code. Once digital, physical supports and materials are not transmitted, but information is [1].

Once information is transmitted it needs to be decoded and processed in order to be rendered. Nowadays seeing a film in a computer means to decode it.

In "The language of new media" Manovich [2] describes cinema using the metaphor of data base. He also refers to hypertext and data base as new ways to access the audiovisual footage online. "Film editing in general can be compared to creating a trajectory through a database" [2]. Furthermore, "we can think of all the material accumulated during shooting as forming a database, especially since the shooting schedule usually does not follow the narrative of the film but is determined by productions logistics. During editing, the editor constructs a film narrative out of this database, creating a unique trajectory through the conceptual space of all possible films that could have been constructed. From this perspective, every filmmaker engages with the database-narrative problem in every film, although only have done so self-consciously" [2], and argues that "Given the dominance of the database in computer software and the key role it plays in the computer-based design process, perhaps we can arrive at new kinds of narrative by focusing our attention on how narrative and database can work together. How can a narrative take into account the fact that its elements are organized in a database? How can our new abilities to store vast amounts of data, to automatically classify, index, link, search and instantly retrieve it, lead to new kinds of narrative?" [2].

In this project we followed the ideas of Manovich with the aim to create a working demo. The iAm project [Figure 1] is an online artwork that more than a tool in itself, it should be rather considered a piece of generative computational art, "produced by leaving a computer program to run by itself, with minimal or zero interference from a human being." [3], with the aim of generating fictional short-films



online.

Figure 1. Poster of the short-film

Since the early XXI century, online video have been democratized due to an increasingly higher bandwidth, better compression codecs and the popularization of technologies like Macromedia Flash and, more recently, HTML5. Platforms like Vimeo (2004) and YouTube (2005) have fostered the presence of audiovisual documents in the net.

Nowadays, in this context, audiovisuals are realized, produced and distributed mainly using this new digital environment [4]. According to Murray, instead of just translating the analog content to a digital container, "digital design is about shaping interaction within new combinations of the format and genre conventions that make up a new medium" [5]. Some of the audiovisual genres have been adapted to those new properties, such as video-games, videoclips or web-docs [6]. For this paper we will not focus on interactive projects, or installations, but on generative audiovisual fictions.

In our research the aim is not to generate an interactive documentary where the viewer feels part of the investigation process, nor is to create an interactive fiction or a participatory story telling project. Neither we are interested in an immersive experience of virtual reality or video-game. We are interested in the idea of changing the formal aspect but keeping the essence of the narration, keeping the linearity and flow of the film, with its rhythm and climax. John Maeda, with his theories and works on computational design and creative coding [7], is a good example in the field of graphic design. Several ideas from his work have been translated to our field of research to think about a possible *computational audiovisual*.

In the field of generative art we can find the Galatema (2010) project, by Alain Lioret that is much more focused on generating synthetic images. Or the Energy Flow [7] by Vera-Maria Glahn and Marcus Wendt from the Field studio which is an app that creates stories with a 3D rendering motor. In both cases, they do work with synthetic images, while we are more focused on photorealistic footage and on the possibilities of generative film edition.

## 2. 2. Description of the demo process

### 2.1 Conceptualization

The seed of the project was a poem [8] by Quelic Berga, reflecting on our relation with computers from a personal point of view. The poem was mainly composed by aphorisms and images that reflect on the co-dependence, the addiction and the increasing adoption of technology in our daily life. The sentences of the poem can be read randomly and still make sense.

Berga was asked to turn the poem into an audiovisual project, and then a clear synopsis raised "When we connect with technology, we disconnect in a way with other things", but when trying to write the script and the storyboard he found there were many ways to express that synopsis. The author did not intend to fix it with an specific case. Should the protagonist be a man or a woman? Young or old? Techie or hippie? To answer those questions he decided to meet two filmmakers to discuss on the possibilities to do a generative short-film.

### 2.2 Design and creation methodology

One of the first issues that had to be addressed was to think in a different way and to understand the possibilities of computational media, avoiding the conventions made for example by Final Cut or Adobe Premiere. The team had to discuss on methodologies to allow new ways of thinking and writing the script. The second issue was that the coding part of the project was developed while

deciding how to do the shooting. That could be seen as a problem, but as Design and Creation Methodology was being used, the team establish some discussions on how to develop both, the script and the program, in several iterations [Figure 2].

For the ideation process of how would the story work, and to solve the first problem, several conversations between the programmers, project director and the filmmakers were done to address the preconceived notions of what can be done and what cannot be done. During the process of setting the possibilities of the software, a balance between the budget, the knowledge and the efficiency of the resulting proposal had to be adjusted to ensure the success of it. Some ideas or proposals had to be discarded due to lack of time, knowledge or budget, others are now part of the further research intentions.

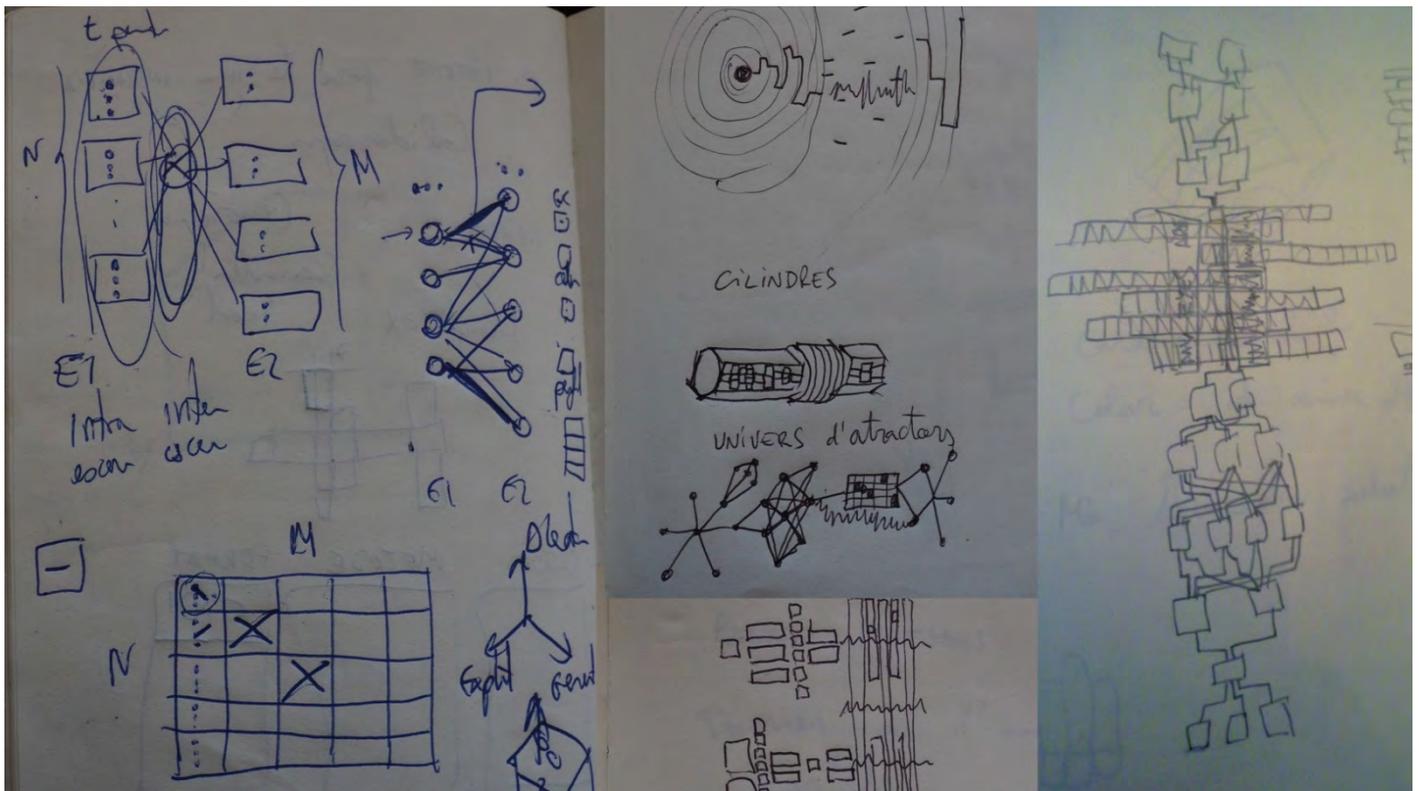


Figure 2. Pictures of some sketches

Finally the team decided to plot 6 stories that all shared the same synopsis:

“Someone is doing a common thing and gets distracted by a phone call; when trying to talk on the phone he/she get exposed to a big amount of images/information; when they hang up the phone what they where doing has changed dramatically.”

The team decided that every scene would have several shoots to let the software choose between them, and also decided that the sentences and images that would appear during the phone trip would be common for any of the 6 plot stories. They divided the original poem into 37 sentences, letting one

sentence appear at a time for each short-film made. To enrich the project, 9 different soundtracks produced by two different musicians, and 2 hours of archive films related to the subject of the poem were added.

Each resulting short-film followed 1 of the 6 plots, choosing in between all the shoots per scene, choosing one over the 37 sentences, choosing 1 of the 9 soundtracks and choosing several frames from the 2 hours of film archive. For this first prototype, all the choices are selected randomly and the resulting short-film has a duration of 25 seconds.

This solution allows to control the flow and rhythm of the film, making sure it makes sense and it stays coherent, and at the same time a great number of combinations are possible.

### **3. 2.2 The filming process and the shooting**

The filmmaker team followed the common filmmaking notation to develop a synopsis, storyline, storyboard and film planning, but considering as many shoots from different angles as possible, so for each scene at least two different possible shoots where available. With this way of working the synopsis became a very strong guideline, and it allowed to add more rich diversity of shootings while respecting the structure.

For the whole project, a multidisciplinary team was created with 28 members, including filmmakers, producers, artists, actors, UX experts, and coders. The main difference between a common filming team was the presence of two software developers and an interface designer as well as having a director that had a background on filmmaking and software development.

Let us point at the main differences between a normal filmmaking process and the process that was followed for iAm:

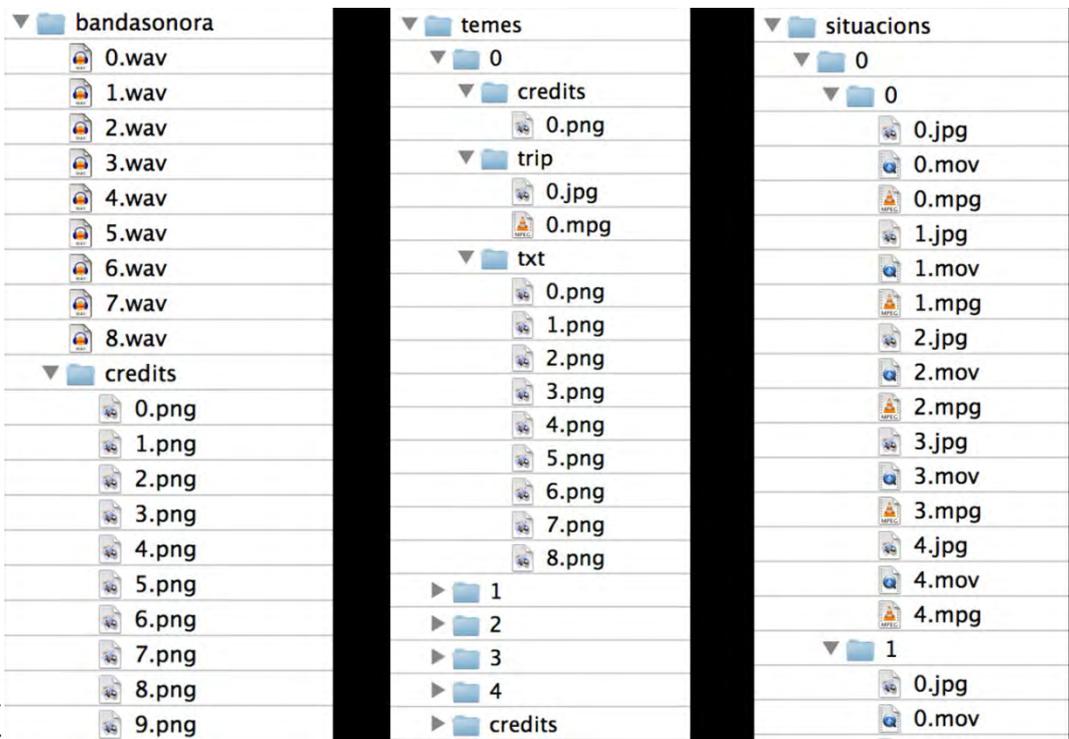
During the 3 shooting days, the team was trying to record as many valid takes as possible for each set. The premise was not to search for the good or right one, but the potential ones in each set. So for each take, at the end of the process there were at least two or more valid takes per set. After the 3 days of shooting more than 130 takes were recorded to edit multiple 25" short-films.

The second specific thing of this project was that, instead of editing a short-film, each take was edited individually and kept as a clip in order to to combine them freely later. For so, each clip was stored in a tree folder structure allowing storage of many clips in each set-scene folder. The same process was followed for the 9 soundtracks, the credits and the 37 poetic sentences [Figure 3].

Figure 3. Folder structure

#### 4. 2.3 Metadata

After that, an XML file [figure 4] was created to store the metadata. All the available information for each clip (cast, folder location of



the file, duration in frames, and to which narrative group it belonged) was stored in that file.

Once the clips and metadata were ready the programmers could test the software already online and the first films were generated.

The fact that we used an XML file to dynamically control the process allows the experiment to be extended to other footage or structures.

Figure 4. XML file

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <ism>
3 <corona id="Control" type="C" durada="576" numTrips="6" numEcos="5" duradaTrips="24" duradaEcos="14"/>
4 <corona id="Part A" type="S" offset="46" width="150" speed="1.7">
5 <situacio color="ead3c0" credits="Scene: 'I love you, smartphone!' directed by Terenci Corominas, DOP Jaon Agramunt, with Lavinia Vila
  and Andres Acebedo" duradaEco="492">
6 <planol opcions="5" durada="44"/>
7 <planol opcions="15" durada="50"/>
8 <planol opcions="3" durada="33"/>
9 <planol opcions="26" durada="48"/>
10 <planol opcions="3" durada="25"/>
11 <planol opcions="5" durada="30"/>
12 </situacio>
13 <situacio color="f2f5a5" credits="Scene: You have 1 mail! directed by Terenci Cormoinas, DOI Joan Agramunt, with David Planas as the
  postman, and Lavinia Vila and Andres Acebedo as the lovers" duradaEco="144">
14 <planol opcions="3" durada="48"/>
15 <planol opcions="5" durada="54"/>
16 <planol opcions="3" durada="50"/>
17 <planol opcions="3" durada="40"/>
18 <planol opcions="5" durada="20"/>
19 <planol opcions="1" durada="25"/>
20 <planol opcions="3" durada="30"/>
21 </situacio>
22 <situacio color="994d57" credits="Scene: 'I am a rockstar' directed by Albert Blanch, DOP Joan Agramunt, with Skull Kandy, Lavinia
  Vila and Yaya Dillon" duradaEco="242">
23 <planol opcions="7" durada="50"/>
24 <planol opcions="7" durada="55"/>
25 <planol opcions="6" durada="24"/>
26 <planol opcions="5" durada="43"/>
27 <planol opcions="3" durada="23"/>
28 <planol opcions="7" durada="20"/>
```

### 3. Online editing and film rendering process

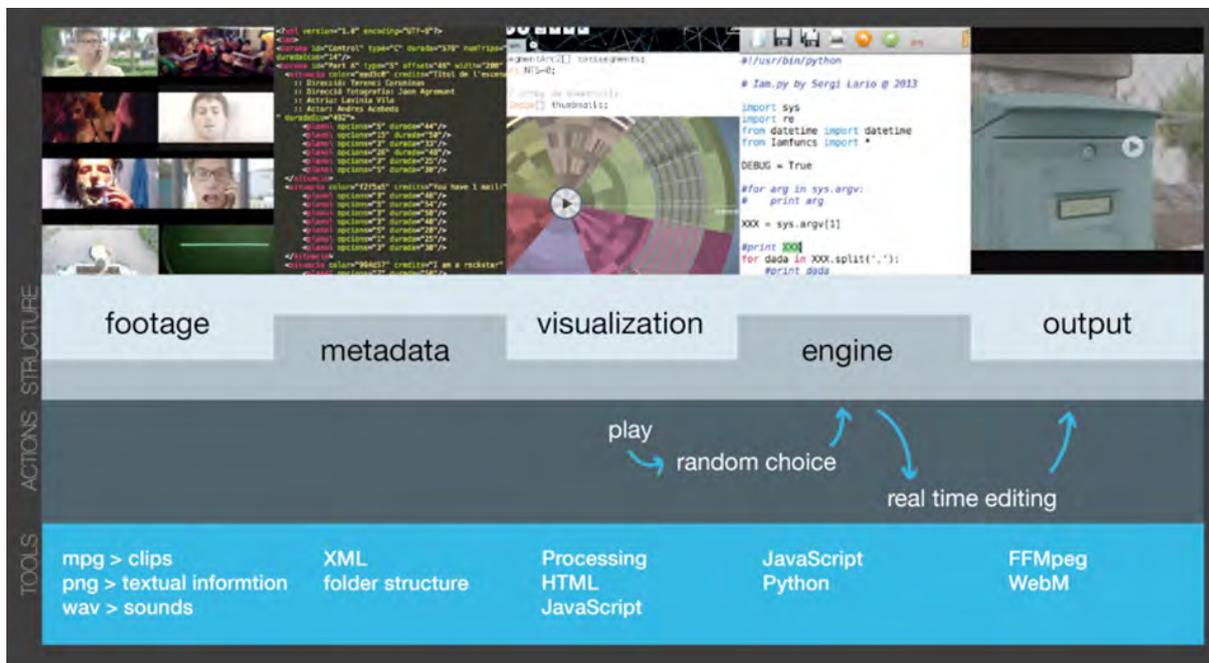


Figure 5. Software steps and architecture

When a user visits the website a *PHP* file loads a *canvas* that opens the file *iam.pde* using the library *processing.js* (a *JavaScript* port for *processing.org*). The *iam.pde* loads the data from *iam.xml* to plot a data visualization of the available footage and media.

If the user press the play button, the process [figure 5] of creating a new short-film starts. The *iam.pde* file creates a random array with information pointing all the files that have to be rendered and its order. This array is sent to the *python* script that checks the existence of all the files and makes a call to the *FFMPEG* software to start the rendering of the film. Meanwhile *iam.pde* starts an animation to show which scenes and material is being used.

*FFMPEG* concatenates all the clips, adds a soundtrack, overlays one text of the poem in the footage, and finally composes the final image of the credits with the right staff for each version of the short-film. It saves it in *.mpg*, and then converts it to *.webm* or *.mov* depending on the version of the browser. Once ready it returns a “done” message to *python*.

*Python* finally sends the url of the new video to the *PHP* to update the website with the video.

The file is stored in a public folder in the server allowing visitors to access all short-films edited until the present date.

The project is designed to be able to do modifications or increment the footage archive by just updating the *XML* file and folders.

#### 4. Visualization and web interface

The website uses *html5*, *canvas* and *php* standards to render the site. The two dynamic *php* sections of the project are the “play” section and the “All shorts 'till today”.

The “play” section [figure 6] creates a *canvas* that reads the *xml* file to draw a visual representation of all the media in the repository. It visually sorts all the media in the space and represents their belonging to one or other situation. Each type of media (text, soundtrack, clips) uses a different graphical representation.



Figure 6. Screen-shoot of the visual representation of the footage with it's legend on the top.

The visual representation intends to visually convey the amount of combinations. The timeline as graphical pie represents the fact that, although there is only one starting point, the centre, the possible endpoints (on the perimeter) and the paths to reach them are virtually infinite.

Showing the process and the potential footage is an important part of the project. As Janet Murray states, new manners to design and represent have to come with new digital tools and systems [5]. In this case, there was the challenge to question the preconceived notion of fix narration and to explain how a generative editing short-film works.

## 5. Results

The project was officially presented on the 18<sup>th</sup> December 2013, as an online experimental short-film with the capacity to self-edit, entitled “iAm; man and machine in violent harmony”. Since then it has been exhibited as an artwork in several places [10,11]. Also academical interest have been shown and the project have been presented in conferences [12,13].

Until today more than 700 short-films have been generated and can be viewed on the same web [14] of the project.

## 6. Further research

This project has become a playground to test various experiments and essays.

Many questions arise: How do people perceive this type of generative films? Do they prefer to see a unique cut? Does it trigger a sense of distinction or value, or the opposite? If a tool for filmmakers was to be developed following the iAm principles, would they use it? how would they adopt it and in which cases?

With this first prototype we have a good seed with potential to grow in several different directions. We are looking forward to invite filmmakers to explore its expressive possibilities, and how it can be applied in several different domains such as publicity or videoclips. Can we use other ways to take decisions besides randomness without doing an interactive project?

An issue that we also want to address is the interface design, and we are considering working with a team of UX experts and researchers to analyse what things can be improved or changed.

Finally, we are now preparing a faster online version by changing all the footage to webm standards. Preliminary tests show that it will speed up about 80% the time of rendering process, thus delivering the resulting video much faster.

## 7. References

- [1] Echeverria, J. (1999). *Los señores del aire: telepolis y el tercer entorno*. DESTINO, Barcelona.
- [2] Manovich, L. (2002). *The Language of New Media*. The MIT Press, Cambridge, Mass., reprint edition.
- [3] Boden, M. A. and Edmonds, E. A. (2009). What is generative art? *Digital Creativity*, 20(1-2):21–46. Available from: <http://www.tandfonline.com/doi/abs/10.1080/14626260902867915>.
- [4] Vialas, S. (2013). Several articles on production, realization and distribution of online audiovisuals at online magazine Mosaic. Available from: <http://mosaic.uoc.edu/author/simon-vialas-fernandez/>
- [5] Murray, J. H. (2011). *Inventing the Medium: Principles of Interaction Design as a Cultural Practice*. The MIT Press.
- [6] Gifreu-Catells, A. (2011). The Interactive Documentary. Definition Proposal and Basic Features of the New Emerging Genre. Available from: [https://www.academia.edu/1491044/The\\_Interactive\\_Documentary\\_Definition\\_Proposal\\_and\\_Basic\\_Features\\_of\\_the\\_New\\_Emerging\\_Genre](https://www.academia.edu/1491044/The_Interactive_Documentary_Definition_Proposal_and_Basic_Features_of_the_New_Emerging_Genre)
- [7] Maeda, J. (2004). *Creative code*. Thames & Hudson, New York, N.Y.

- [8] <http://www.energyflow.io>
- [9] [http://iam.quelic.net/files/2013/02/IAM\\_v3.pdf](http://iam.quelic.net/files/2013/02/IAM_v3.pdf)
- [10] Exhibited at 3er Esquerra <http://blog.quelic.net/2015/espanol-exposicion-de-iam-en-3er-esquerra/>
- [11] Berga, Q. (2014). iAm al Digital4c. Available from: <http://blog.quelic.net/2014/iam-al-digital4c/>
- [12] Berga, Q. and Minguillon, J. (2013). Program of the Seminar Transmedia Literacy. Available from: <http://www.transmedialiteracy.net/program-of-the-seminar/>
- [13] Roig, T. (2014). Co-creating fiction, imagining futures: key challenges for collaborative design and development of multimodal narratives by local communities - IN3. Available from: [http://in3.uoc.edu/opencms\\_portalin3/opencms/ca/activitats/seminaris/agenda/2014/agenda\\_05\\_0](http://in3.uoc.edu/opencms_portalin3/opencms/ca/activitats/seminaris/agenda/2014/agenda_05_0)
- [14] <http://iam.caotic.net/llista.php>