Instrumental genesis through interdisciplinary collaboration

–

reflections on the emergence of a visualization framework for video annotation data

Olivier Aubert - Thomas Scherer - Jasper Stratil
University of Nantes, France & Freie Universität Berlin, Germany

EADH2021

Audiovisual media annotation timeline

Genealogy of an annotation timeline for the analysis of film (& other time-based media)

From 'tool development' to 'instrumental genesis': importance of methodical & theoretical reflections in interdisciplinary DH-projects

Humanities context

- Film & Media Studies at Freie Universität Berlin
- Theoretical interest in nexus of temporality of audiovisual images, its expressivity and the experience of film-viewing
- EMAEX method for film analysis developed in previous projects
- Digital Humanities: AdA project ("audio-visual rhetorics of affect") – make this approach more systematic and scalable:
  - define a precise ontology
 - use it to annotate audiovisual images

Is there any software allowing this kind of video annotation?

Affektrhetoriken des Audiovisuellen

# Computer science context

- Computer science research project
- [Advene project](#) – for movie annotation, using flexible data structures, and hypervideo authoring
    - aimed at audiovisual active reading
    - accompanying evolving knowledge of scholarship work
- Flexibility & adaptability as core principles – instrument adaptable to needs

In what ways do Advene and AdA project meet? What is specifically needed for the project?
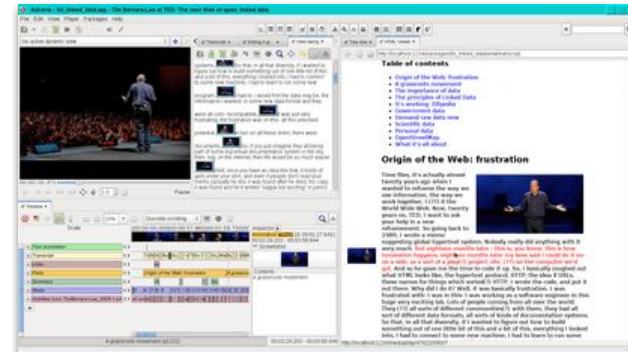
Common ground: flexibility & adaptability

- Interest in **media-specific analysis**
  (e.g. temporal unfolding of images with interplay of different dimensions in analysis)

- **Dynamic dominants** for analysis: not a fixed dimension as pre-set core
  (e.g. language or cutting rhythm)
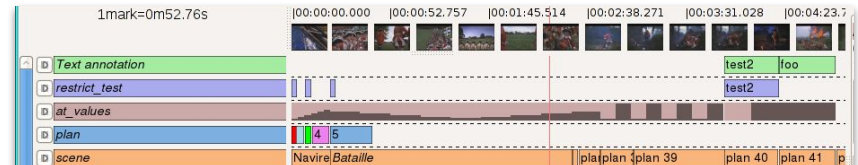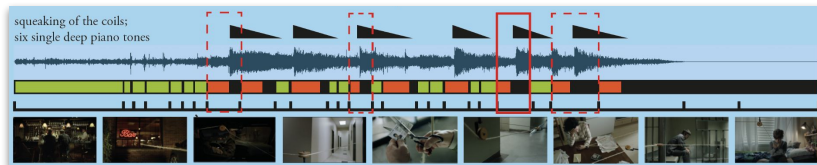
Data and usage context

- [Semantic annotation](#) of audiovisual media:
    - controlled vocabularies: building a machine-readable semantic ontology ([AdA-Filmontology](#) with HPI)
    - manual annotation: building ground truth for automatic annotation (for algorithms integrated by HPI)

- Envisioned usage scenario: film scholars (without specific programming skills) on their home computers
    - ontology-defined schemas as well as flexibility to add unstructured observations
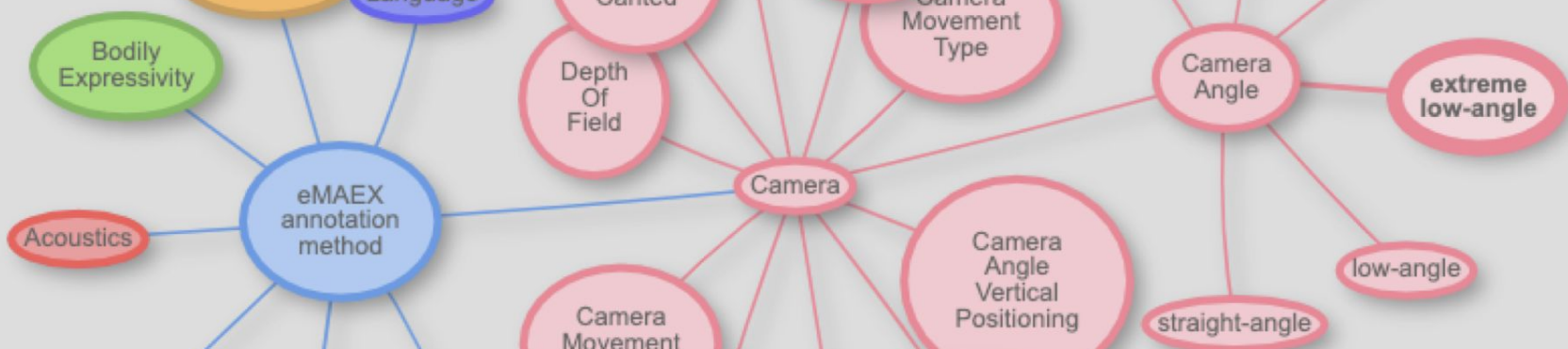
Timeline visualisation

- Existing timeline as interaction component for visualisation & editing
    - does not scale well with number of annotations (> 20k)
    - doesn't allow to grasp most annotation contents visually

We can build a new one more oriented towards visualisation. What would the requirements be?
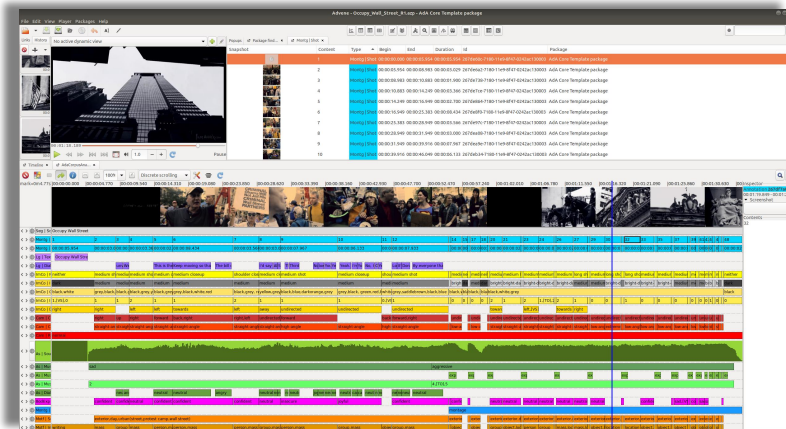
New timeline requirements

- different visualisation modes that remain comparable on the x-axis
- dynamic & interactive usage for exploration and hypothesising
- reproducibility for other researchers
- static export for the further appropriation and publication in traditional publication formats
  - clear visual language for communicating results
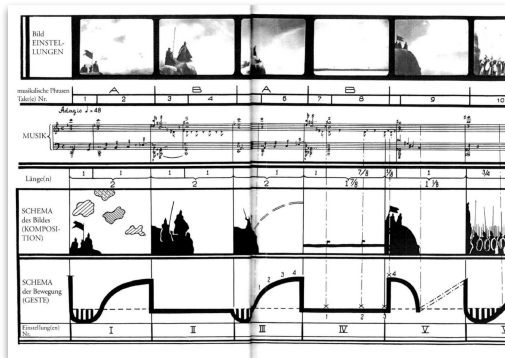
Eisenstein 1938
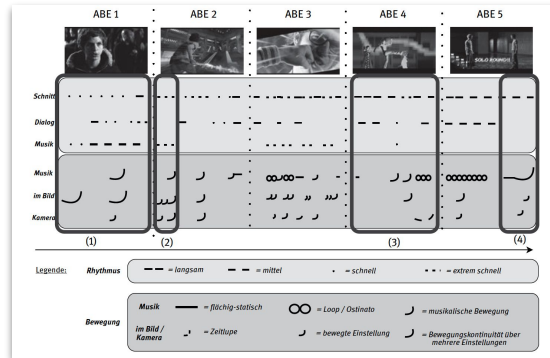
Bakels 2017

Sketch

New timeline version

- [web-based](#)

- scalable (between whole movies and a few shots)

- very flexible and customizable, with a text-based syntax (for experimentation)

- reproducibility: to share not only screenshots but the underlying data and the dynamic timeline visualisation

```
data=timeline.json&types=Shot(height:80 labels:true),
Volume(representation:wave height:80 labels:true),
FieldSize(labels:true legend:true),
ImageIntrinsicMovement(labels:true legend:true representation:hist height:80
colorscheme:viridis),
CameraMovementDirection(representation:rect labels:true legend:true),
CameraMovementType(labels:true legend:true),
ColourAccent(single_line:true labels:true),
SoundGestureDynamics(labels:true legend:true),
MusicMood(labels:true legend:true),
BodyLanguageEmotion(labels:true legend:true),
```
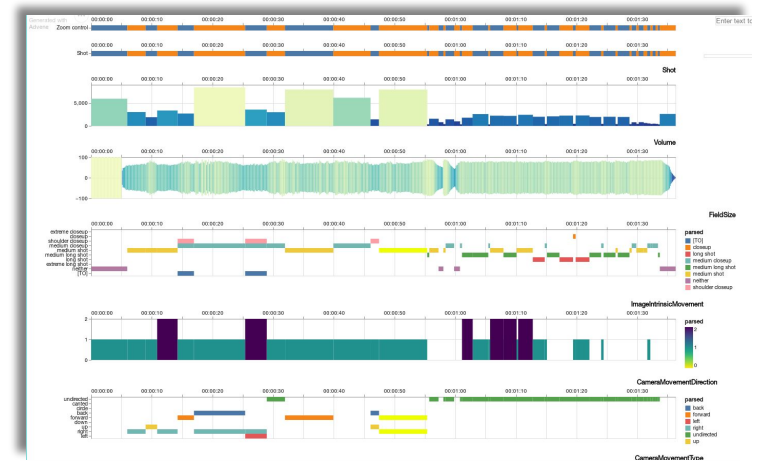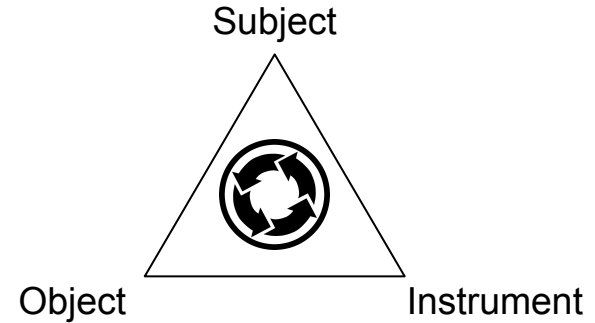
Instrumental genesis

Look back on the process as **instrumental genesis**
as defined by Rabardel 1995: co-evolution of the instruments
and the practices they make possible.

Double-development of instrumentalization and instrumentation:

- "This developmental transformation is called instrumental genesis, and it consists of a double-development movement between two sub-processes:
the **instrumentalization process**, which is artifact-oriented and concerns the *evolution of the material side of the instrument* (i.e., new functions attributed to the artifact),
and the **instrumentation process**, which is subject-oriented and relative to the *emergence and evolution of the subject's utilization schemes* (ie, the emergence of new activities and practices due to change in the user's behavior)."
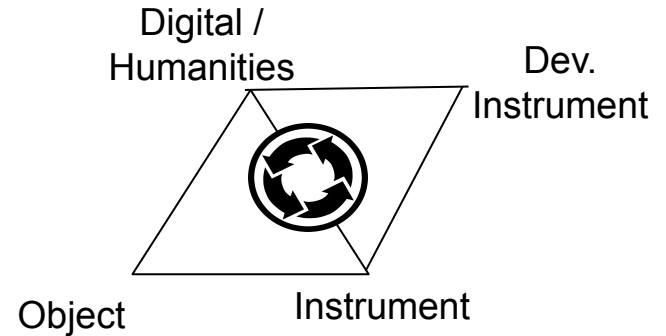
(Pargman et al 2017)

# Interdisciplinary instrumental genesis

From distinct concerns...

Humanities

Digital

Object
(e.g. films)

Instrument

Dev.
Instrument
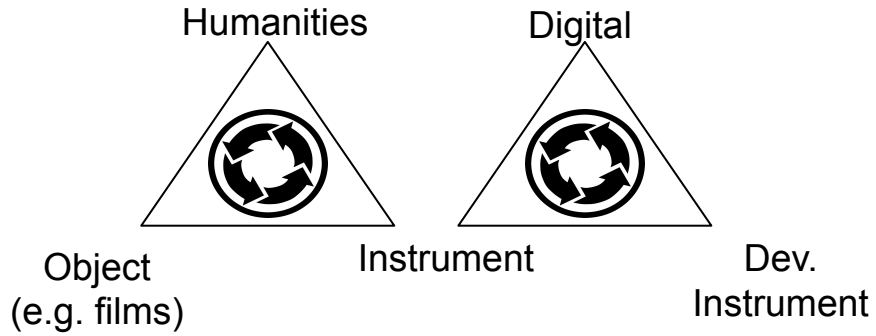
… to shared practices and interests

Digital /
Humanities

Dev.
Instrument

Object

Instrument

Instrumentalization *(evolution of the material side of the instrument)*

- Importance of considering adaptability from the ground up
  - Illustration of the validity of the flexibility & adaptability approach of the Advene project
- Importance of example uses and usage observation
- Need to arbitrate between generic features (for whole community) and features specific to the project
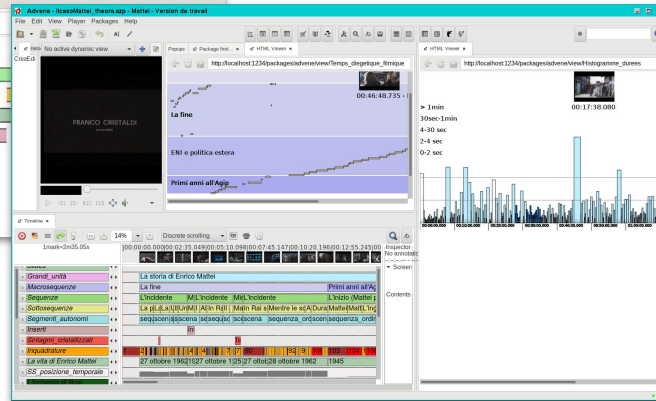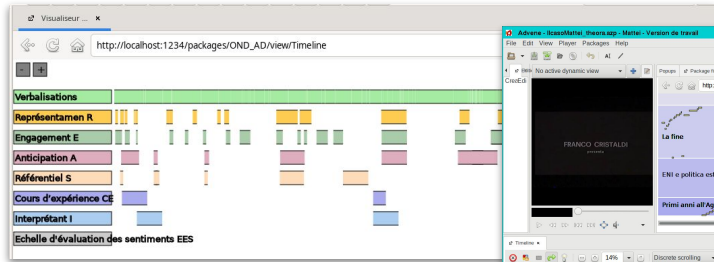
Instrumentation *(evolution of the subject's utilization schemes)*

- Step towards an empirical media aesthetics
- Comparability between different films/scenes becomes more important
- Timeline literacy as developing skill
- Different needs for creating, exploring and presenting
    - new data requires new modes of visualization
- Instead of assuming what will be needed and request features, we used a 'poor media approach' (Drucker) to create prototypes for specific use cases
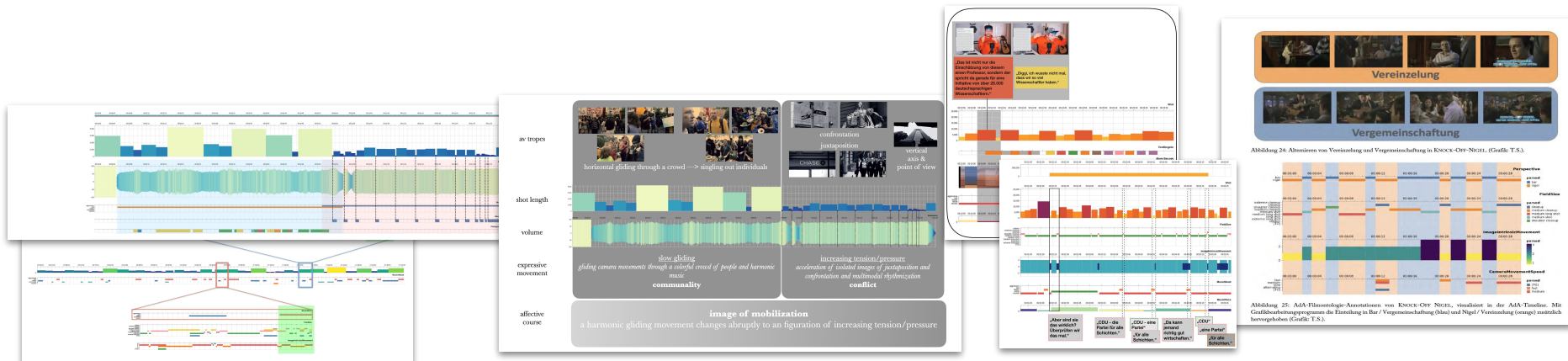
Interdisciplinary collaboration issues

How to create mutual understanding?
- finding a common language and having some members "*able to speak across various disciplines*" (El Kathib and Siemens et. al., 2019)
- learning to know each other by doing (existing uses, sketches, analyses, code) and express needs through active engagement
- using the tools as communication medium
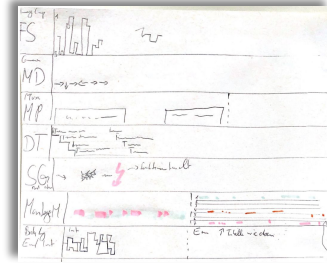
Who plays what role in the project?
- co-researchers, developers & testers, customers & contractors, community of practice...
- not only the question of what is said in what language, but also the question of who is speaking and when which role is helpful
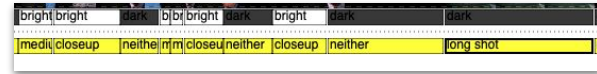
What constraints have to be considered?
- time as the most crucial ressource: how time consuming is which development step for whom?

Reflections through 'the instrumental genesis lens'

1) Tool development for/in DH projects not a mere acquisition or a simple exchange of requirements and funds but rather a **collaboration process** which requires **communication effort** from all project members

2) Development of an interactive visualisation as an interface for complex data types requires **iterative loops**

3) But this process of finding a common "language" can also depend on (non-verbal) forms of making and creating, appropriating and misusing. The 'common language' is so to speak **beyond language.**

4) The instrument (*AdA timeline*) serves as **a communication medium** during its own development

Not communicating *about* the tool but *with* the instrument

Take-away points

1) Include **prototypes** of tools as early as possible so that they **become minimum viable instruments** in the process. That requires the willingness of and possibility for humanities scholars to **engage in the development process** – even more so with Open-Source software.

2) To encourage processes of 'instrumental genesis', the development of tools has to be **considered in DH project proposals** not only as a mere acquisition but rather as joint **cooperation process that takes time** not only for the developers.

3) Consider and document **usage patterns as valuable outcomes** of exploratory and experimental research projects (and it can prevent disconnects between expectations and results)

Thanks for you attention.

References

Rabardel, Pierre (1995): *Les hommes et les technologies, une approche cognitive des instruments contemporains*, Armand Colin, Paris.

El Khatib, Randa / Wrisley, David Joseph / Elbassuoni, Shady / Jaber, Mohamad / El Zini, Julia (2019): "Prototyping Across the Disciplines", in: *Digital Studies/Le champ numérique*, 8, 1, p.10. DOI: 10.16995/dscn.282.

Pargman, Teresa Cerratto / Nouri, Jalal / Milrad, Marcelo (2018). "Taking an instrumental genesis lens: New insights into collaborative mobile learning". *British Journal of Educational Technology*, *49*(2), 219-234.

Advene – Video annotation and hypervideo authoring: https://advene.org/
AdA Timeline DEMO: https://olivieraubert.net/hpi/timeline.html
AdA project: https://www.ada.cinepoetics.fu-berlin.de/en/index.html / https://projectada.github.io/