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Challenges in Enabling Mixed Media Scholarly Research with Multi-media Data in a Sustainable Infrastructure.

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Challenges in Enabling Mixed Media Scholarly Research with Multi-media Data in a Sustainable Infrastructure

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Providing scholarly access to large collections that are distributed across various content providers, and to create user-friendly applications to work with that data in a diversity of scholarly projects is the underlying goal of the development of the Common Lab Research Infrastructure for the Arts and Humanities (CLARIAH)¹.

Big-scale infrastructure projects in the humanities and social sciences such as the Digital Research Infras-

¹ <https://clariah.nl/>

structure for the Arts and Humanities (DARIAH) (Edmond et al., 2017), or the Common Language Resources and Technology Infrastructure (CLARIN) (Hinrichs and Krauwer, 2014) aim to provide solutions for both preservation and access to collections and data necessary for scholarly research (Zundert, 2012). Some infrastructure projects build decentralized “atomic” software services, e.g., as in the LLS infrastructure project (Buchler et al., 2016), while others prefer to build more centralized virtual research environments, as in the European Holocaust Research Infrastructure (EHRI) (Lauer, 2014). Also, even within a single infrastructure project, these two models can coexist. This is the case of the CLARIAH infrastructure, where different approaches have been taken to date for serving different user groups, i.e., several specialized tools for linguists (Odijk, Broeder & Barbiers, 2015), or a research environment (the *Media Suite*) that serves the scholarly needs for working with audiovisual data collections and related mixed-media contextual sources that are maintained at cultural heritage and knowledge institutions. This paper discusses the rationale and challenges behind the development of the *Media Suite*.

The CLARIAH Media Suite

Whereas in some domains of scholarly research the focus is on the creation of private data collections, in other domains scholarly research focuses on already *established* data collections maintained at heritage and knowledge institutions. Access to and use of these latter collections is often restricted, especially when they concern audiovisual media, due to intellectual property rights (IPR) or privacy issues (e.g., with respect to recorded interviews). Therefore, many scholars end up using collections that are openly available. Or, they spend considerable amounts of time in doing on-site visits to archives where data are available for consultation. Data collections at these institutes are “locked,” scattered, or at least hard to use for scholarly research.

To open up these collections for research and let scholars take advantage of the sheer quantity and richness of these data sets, we developed the *Media Suite* (Figure 1),² a research environment or high-level tool that works as a data aggregator where the metadata and the media content can be explored, browsed, analyzed, stored in personal collections, annotated manually, enriched automatically, and visualized, and where the user annotations can be exported.

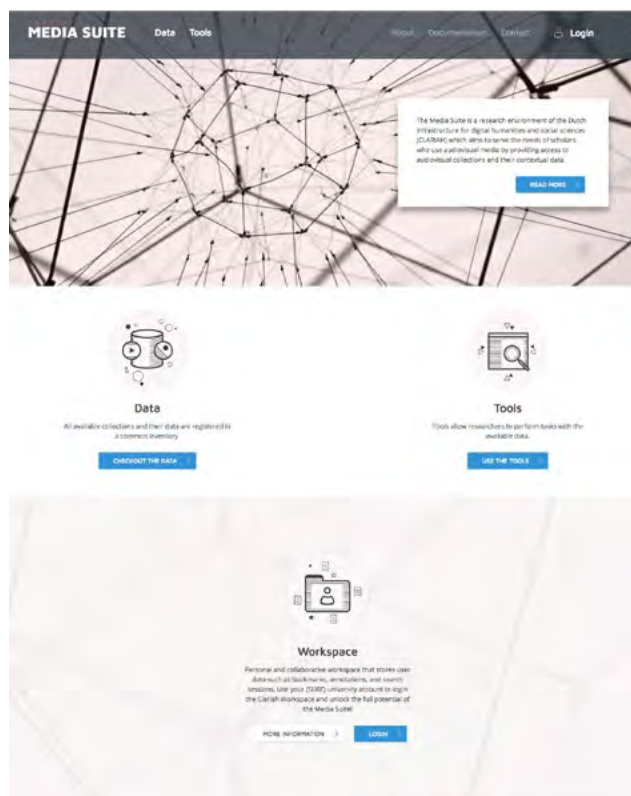


Figure 1. The CLARIAH Media Suite's homepage (<http://mediasuite.clariah.nl/>, version 2)

The ultimate goal of the *Media Suite* is to: (i) enable distant reading (Schulz, 2011), that is, identifying patterns or new research questions in all aggregated collections; (ii) facilitate close reading: the detailed examination of individual items (e.g., videos) in a collection or parts of these items (e.g., video segments) during search and scholarly interpretation, and (iii) make sure that the “scholarly primitives” (Unsworth, 2000, also described as an infrastructure framework in Blanke and Hedges, 2013) are well supported.

Even though these are accepted scholarly approaches that should be taken into account by infrastructure projects in the humanities nowadays, the question is: How to facilitate “close reading” when the media objects cannot be accessed because of copyright issues? How to enable “distant reading” when the content cannot be fully automatically processed or when their metadata is diverse and incomplete? How to cater to the needs of scholars with specific research questions and methods in the context of an infrastructure that has to be generic enough to be feasible?

Challenges and solutions

The approach of the CLARIAH Media Suite to tackle these challenges is: (i) to organise and implement a federated authentication mechanism to overcome access barriers

² The first of a four release versions was introduced in April 4, 2017.

(Figure 2, number 5), and (ii) to provide mechanisms that enable researchers to work with tools and aggregated data *within* the infrastructure. We refer to this approach as to “bringing the tools to the data”, as opposed to “bringing the data to the tools”.

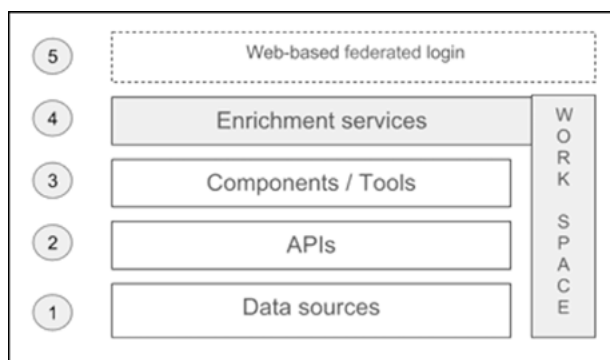


Figure 2. The building blocks of the CLARIAH Media Suite

Figure 2 shows the main elements that constitute the *Media Suite* research environment. We explain below to which challenge is each element an answer to:

Data Sources -- Data Governance

Institutional collection maintainers have internal data governance processes to ensure that data assets are formally managed. One important aspect covered by governance processes is licensing: who has permission to access the data. However, data governance with respect to external processes --loosely defined as being part of an 'infrastructure'-- is typically not accounted for. This means that key data governance areas such as availability (e.g., metadata can be harvested), usability (e.g., source data can be viewed), integrity (e.g., protocols are in place to handle duplication and enrichment) and security (e.g., provenance information is maintained), need to be (re)organized or (re)considered, formalized and supported by the *Media Suite* and the emerging infrastructure in which it is embedded.

APIs -- Sustainable development

A digital infrastructure should use existing protocols, conventions, and standards. Besides obtaining data by harvesting using the OAI-PMH protocol, or using APIs, the functionalities have been organised in a modular approach, which includes (Matínez et al., 2017):

- Components: which use the API's to perform specific tasks.
- Tools: which incorporate a number of components in a tool.

Moreover, all components and tools developed in the

project are open source. In addition, the *Media Suite* offers public APIs, which provide mechanisms for software programmers to create functionalities using API building blocks or components. We offer a Collection API, a Search API, and an Annotation API, which provides functionality for adding data annotating existing data, using the W3C Web Annotation data model (Sanderson et al., 2017).

Components/Tools -- User friendly interaction design

Developing new tools “from scratch” would be a very inefficient (and costly!) endeavour. The digital infrastructure should provide tools that are suitable both for common scholarly tasks, and for specific tasks required by each discipline. However, the digital humanities community incorporates a wide diversity of scholars with different research questions, methods, and levels of expertise in working with information processing techniques and technologies. As every infrastructure, we also have to tackle “the generalization paradox” (Zundert, 2012). We address this challenge by (i) focussing on the similarities in research methods from different disciplines (e.g., De Jong, Ordelman, Scagliola, 2011; Melgar et al., 2017), (ii) analyzing tools that support qualitative methods (Melgar & Koolen, 2018), and (ii) working with scholars as co-developers in the process³. The resulting functionalities are built in a modular (lego) approach that supports both flexible software development of components and user friendly interaction with assembled tools. A current challenge is to provide entity-based browsing (Verhoeven and Burrows, 2017) of both linked open data collections (RDF) and tabular data via an exploratory browser (see De Boer et al., 2017).

Enrichment services and Work Space -- Working with audio-visual content and private data

In addition to IPR and privacy restrictions, access to the audiovisual content in the *Media Suite* is also limited due to its nature; consisting of pixels (video) and samples (audio) and some manually generated metadata or subtitles (text). Typically, scholars want to search audiovisual data using (key)words that may be ‘hidden’ (encoded) in the pixels or the samples. This is called the semantic gap (Smeulders, 2000) that needs to be “bridged” by decoding the information in the pixels and the samples to semantic representations, e.g., a verbatim transcription of the speech or labels of visual concepts in the video (a car, a face, the Eiffel Tower), that can be matched with the keywords from the scholars. These semantic represen-

³ Indeed, an adopted strategy at the CLARIAH project level, has been to offer grants to scholars to conduct small scale research pilot projects using the CLARIAH infrastructure. In the media studies focus that we describe in this paper, almost ten scholars participate as co-developers. We follow an Agile methodology for implementation, which despite criticisms has proved to be useful for this type of projects (van Zundert, 2012)

tations can be generated manually or, especially when data collections are large, automatically using automatic speech recognition (ASR) or computer vision technology.

The generation of semantic representations is addressed in different ways. On the one hand, we are currently developing an ASR service that resides within the CLARIAH infrastructure that can handle requests from the infrastructure itself (e.g., to process a data set that exists within the infrastructure), but also request from individual scholars that want to process their private collections. On the other hand, supporting manual annotation is key for interpretation in scholarly contexts (Melgar et al., 2017). The *Media Suite* aims to support the generation of both ways of semantic representations in complementary ways via information workflows centered around a “Work Space” (see Figure 3) which stores private session data and enables collaboration.

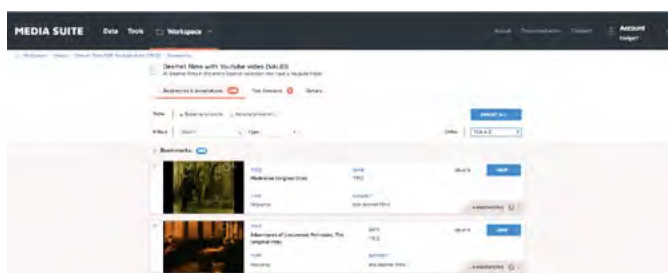


Figure 3. The CLARIAH Media Suite's Workspace

Conclusions and Future work

The paper describes the challenges found in building a sustainable, dynamic, multi-institutional infrastructure that can properly serve media scholars and digital humanists in general. We choose the approach of building a research environment that adheres to infrastructural requirements while at the same time being flexible and user-friendly. In order to ensure its used and further development after the project's lifetime, we need to carefully align the requirements of scholars with the context of the ecosystem the *Media Suite* needs to live in: an ICT infrastructure hosted and maintained by multiple institutions that in turn, adheres to a diverse set of institutional requirements with respect to, for instance, data access permissions and software development and maintenance. The *Media Suite* is currently functional and used by scholars doing actual research projects and will be developed further, e.g., by incorporating additional data sources (e.g., social media data), increasing metadata granularity (e.g., adding computer vision or emotion recognition), adding advanced annotation tools, and supporting missing data visualization (data critique) for heterogeneous datasets.

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El campo del arte en San Luis Potosí, México: 1950-2017. Análisis de Redes Sociales y Capital Social

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La presente ponencia tiene como objetivo analizar la estructura del campo del arte en San Luis Potosí, México, de 1950 a 2017, desde el estudio del capital social de sus actores, mediante la metodología del Análisis de Redes Sociales.

Por medio de las herramientas propias de la historia oral, sociología del arte, investigación bibliográfica y documental, se ha logrado generar una compleja base de datos que nos permite contar con los elementos necesarios para comprender la dinámica que el campo del arte, con énfasis en las artes visuales, ha tenido en los últimos 67 años. La información recopilada y generada con las metodologías anteriormente citadas, ha sido examinada y sistematizada mediante herramientas propias de las humanidades digitales, y estudiada por medio del Análisis de Redes Sociales. Así, se han generado una serie de indicadores que han sido procesados para ingresarlos en un sistema de información que nos permite conocer las características del campo del arte, y el peso por centralidad que cada uno de los actores tienen dentro de la red.

Los resultados obtenidos hasta el momento nos permiten comprender las diferentes corrientes, los intereses de los artistas, la manera en que están conectados entre sí, el papel de las instituciones, el vínculo que han tenido con el exterior, el estado del mercado del arte, y fundamentalmente, para los intereses de esta ponencia, el capital social acumulado por los artistas.

La pertinencia de este trabajo reside en lo planteado por Azam y de Federico (2014), quienes sostienen que si bien las investigaciones pioneras en el campo de la sociología del arte dan un lugar central a las interacciones y relaciones entre los integrantes del campo en cuestión, las investigaciones que recurren al Análisis de Redes Sociales son prácticamente inexistentes.

Ante este panorama, la presente ponencia busca estudiar el impacto que esta perspectiva puede tener para el estudio del campo del arte y la manera en que el uso de una metodología que es resultado de la interacción de herramientas y perspectivas teóricas de diversos campos, con enfoques contemporáneos como el Análisis de Redes Sociales, nos pueden permitir acceder a explicaciones más completas y contextualizadas de lo que los estudios tradicionales, generalmente disciplinares, pueden ofrecer.

The Search for Entropy: Latin America's Contribution to Digital Art Practice

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Introduction

What, we may ask, is Latin America's contribution to global art? The answer assumes special importance in the context of the twentieth century when pioneers in the intersection of art and technology were creating new precepts, like in the works of the 'Fluxus' group in USA. If abstraction and penetration through formal stasis were acknowledged as the basic style in the art world, then pioneers in Latin America were also in pursuit of a set of most innovative possibilities for their art. We may say that Latin American artists through the sixties and seventies created such kinetic artworks that no group of artists, joined together either by contiguity or ideology, had yet achieved anywhere else in the world. What Latin American artists did were to reinvent kinetic possibilities in their most entropic and unprognosticated formats, denying subjectivity and creating opportunities of looking at movement in art, not movement as a vector but as a function with an unknown trajectory. Our ongoing archival project on Digital Art in Latin America is especially oriented toward a perception of a digital art prototypes that evolved as a response to infiltrations of technology into Latin America.

Thematic Content

We should first emphasize on the rise of pre-electronic art in the middle of the twentieth century, which was initially represented in structural invariances of optical and sometimes pre-digital templates. Julio Le Parc's metallic illuminations, and Martinoya and Joel's Abstratoscopio