Graphic Sciences and Documentary Heritages. A Shared Experience in Trentino

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Abstract. This paper presents the first results of the project *Ecolture. Ecology for Culture*, an interdisciplinary research still underway at the University of Trento. The aim is to promote and disseminate knowledge of some documentary heritages preserved in archives, libraries, and museums in Trentino by means of visual communication based on open-source digital procedures. Biography is the tool used for selecting the materials to work on. Books, magazines, various kinds of manuscripts, drawings, and photographs, as well as objects and thematic collections, are linked to some characters who, from the sixteenth century onwards, have progressively built the cultural ecosystem of today's territory in the artistic, humanistic, social and scientific fields. The translation of places, people, works, stories, and ideas into images can use simple or complex digital products such as cartoon drawings, photomontages, infographics, diagrams, maps, 3D models, interactive images, animated pictures, and multimedia videos. Contemporary visual languages make it possible to offer engaging cultural experiences to an audience of specialists and non-specialists both in the exhibition venues and remotely.

Keywords: Historical-archival sources · Open science · Visual language

1 Introduction

Ecolture. Ecology for Culture is a running, interdisciplinary research project funded by the University of Trento (Italy), involving several knowledge fields transversally.

The main goal is to spread to the great audience some documentary heritages stored in archives, libraries, and museums starting from local ones. Books, magazines, manuscripts, drawings, pictures, historical documents, objects, and thematic collections are related to several characters who have gradually built the cultural ecosystem of the current territory from the sixteenth century on. The experimentation started with seven characters who were suggested to the academic working group by the local Institutions: Giacomo Bresadola, mycologist (1847–1929); Vittore Bona, soldier (1920–1943); Giacomo Gotifredo Ferrari, musician (1763–1842); Gianfrancesco Malfatti, mathematician (1731–1807); Luisa Anzoletti, poetess (1863–1925); Marco Anzoletti, musician (1866–1929), Bianca Laura Saibante, writer (1723–1797). The material heritage regarding arts, humanistic studies, society, and science refers to the intangible world of expressions, knowledge, representations, abilities, and practices that are integral parts of the heritage

of a community (UNESCO 2003) so that it deserves to be carefully stored and protected but also enhanced and made alive, imparted widely shared [1].

Such goals can be achieved in different ways strongly linked to various Information Technologies and mostly depend on the products to be created and more often are related to the use of images. The recent experiences, in constant growth, of study and promotion of cultural heritage through digital tools and environments, prove the crucial role of visual communication in our society. This project can be considered an opportunity to reflect on the value of digital works as heritage themselves, and not only as tools 'for' the physical heritage [2, 3].

In this frame, the *Ecolture* project aims at representing and reinterpreting both what exists and what can be imagined, by using contemporary languages to visually translate places, people, works, stories, concepts, and ideas. The objective is to underline the leverage of graphic-figurative communication, thanks to multimedia representation techniques, editing digital products with simple contents, immediately understandable, or complex, needing in-depth study.

As gestures of reception and production flow into the human experience of images, the fil rouge of virtual solutions can develop from 'the sources of knowledge to the user' but also in the reciprocal sense. The narration through images can be focused both on the character, recalling the documents and works that belong to him/her, and on the incitement at interaction generated using illustrated stories, in which citizens become actors and are encouraged to ask themselves general, specific, or intriguing queries depending on their interests and age.

2   The Research Framework and Firsts Results

Even though the *Ecolture* project[1] is still running, it is already possible to illustrate the first results and the methodology adopted to achieve them. In this report we mean to describe the structural frame of the global project (including all kinds of material, both produced and in progress) and to focus on some significant outcomes.

The research group is working on two parallel but intertwined tracks, one can be defined as theoretical-methodological and the other practical-applicative. In a first time, the aim was to identify and define the general set of critical and technical operations for achieving the objectives [4–7]. Then the procedures were selected and applied in relation to the type of biography and existing documents, in order to create and disseminate a new public narrative of the character.

The definition of the boundaries of our work was the first step leading to the choice of what we meant to communicate and how to do it. In other words, we have chosen how to use visuality and digital technologies among the countless possibilities in the elaboration of historical-archival documents. It seems clear how many aspects related to different research fields are involved in the design process. Nevertheless, since the core

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[1] Biennial project funded by the University of Trento (internal call for interdisciplinary and interdepartmental research projects on Covid-19 emergency). Proposing research team Marco Andreatta and Claudio Fontanari (Dept. of Mathematics), Carla Gubert (Dept. of Humanities), Giovanna A. Massari (Dept. of Civil, Environmental and Mechanical Engineering), Lucia Rodler (Dept. of Psychology and Cognitive Science, scientific coordinator).

of this project deals with accessibility, not intended only in terms of results' diffusion, but even in their achievement, we mean to focus mainly on the methodological and applicative ones, which have been addressed with the exclusive use of open-source or free-edition software.

2.1 The Global Research Structure

The first step was to figure out how to organize the two-year work period of the *Ecolture* project. The research meant to achieve the realization of an implementable network structure, in two possible acceptations. On one side, trying to relate transversally all the study cases through a common language, that could be readily recognized and allows to convey different levels of narrative detail, from the most generic to the most specific. On the other side in a practical way, involving as many as possible different local Institutions and University Departments, which means the extension of the investigated areas and consequently the necessity of a higher level of method's generalization.

One of the possible solutions identified to accomplish this kind of network is the design of both virtual and real exhibitions. The latter, which underline the relationship between cultural heritage and territory, are supposed to be indoor expositions, hosted in various locations, such as libraries, palaces, schools, and museums, or cultural paths between relevant sites outdoor. In this case, the final results are conceived in two terms: the first one dealing with the communication of the patrimony itself, through the selection and realization of expositive materials; the second more related to the communication of the event, through the design of posters, pamphlets, and signage.

Substantially, virtual exhibitions share the same aims and results whit physical ones and are conceived in the form of multimedia works organized and published on the project's own website and on the involved Institutions' websites. These multimedia works are digital drawings, photo-editing, and photo-compositing of original images (pictures, hand drawings, postcards, maps…), infographics, diagrams, 3D models, interactive images, animated pictures, and multimedia videos. Thanks to these products *Ecolture* is supposed to give large accessibility and visibility to existing documents and thus increase interest in our common goods (physical or intangible). For this reason, it is necessary to identify from time to time the narrative solutions best suited to the type of biography to be promoted [8–11].

The link between all these works is their most relevant attribute: they're aimed to communicate information through visual and iconographic language rather than through the written one; thus, they are supposed to be characterized by the 'eloquence' of the messages. The general criteria adopted for all study cases can be synthesized in the research and proposition of solutions that take into account two kinds of relations:

- between image's meaning and its perception, which implies attention to the process of translation of concepts in visual issues;
- between image's content and its support, in relation to the target audience.

The preliminary operations can be summarized as follows:

1. collection of the available materials for each case study; contents' reading and classification through useful categories for the project's purposes (e.g., published/unpublished, written by/written about the character, etc.) [12];
2. selection of the crucial topics to use for the realization of involving cultural experiences, for an audience of specialists, non-specialists, aged people, and young ones;
3. selection of the most interesting materials for the narration and their transformation in suitable digital format;
4. definition of a sharing channel (creation of a website, use of existing platforms and social media, organization of virtual or real tours) and the most effective tool for proposing to the public;
5. planning and realization of the works aimed at the figurative narration; preparation of the different parts of the 'visual biography' (processing of the existing documents and ad-hoc materials);
6. sharing of the selected, elaborated and/or created from scratch materials on the University library website through the Libguide online information tool and, on the occasion, on the websites of the partner Institutions;
7. advertising of the results through the dissemination of links and the organization of meetings/events.

2.2 An Overview of Specific Results

Image Construction from Scratch. The first result to highlight is the construction of the main project theme, the composition of a Cover for *Ecolture* (Fig. 1). The intent, according to the whole research goals, was to produce an image that could be declined in many ways, as required by the different possible ways to use it. The criteria for making the Cover are listed below.

- Scalability of the image, due to the aim to communicate and spread project results as much as possible through virtual and physical places, preserving readability. This implies that the image should fit both in a website homepage or in a small clickable icon; it is also conceived to be printed on different supports: bidimensional for pamphlets and posters, or tridimensional for informative pillars and various gadgets.
- Animation of the image, to exploit the multimedia potential offered by digital supports. This presupposes the necessity to create a dynamic composition, that could work as well as a single image or an entire video presentation. Animation has a significant role in the design of the project's Cover because it highlights the contrast between paper documents and digital images. The former are inaccessible, as they are written with ancient languages and codes, while the latter are lively and captivating thanks to the work of semiotic translation and dynamic representation.

Therefore, the final image of the Cover is the conclusive frame of a video clip that synthetizes the whole project. The short movie shows sheets, representing the original documents, that fill and accumulate; subsequently, the camera frames piles of sheets entering in folders, that get closed and ready to be stored. Thereafter the *Ecolture* logo falls into the scene and makes the folders explode, letting sheets scatter around.

The Cover represents the whole process, for this reason, it is inscribed into a circle since it indicates a virtuous, replicable cycle that starts from archival materials with the aim of stimulating curiosity and the desire to investigate the contents. The original pictures out of the circle, are in black and white, characterized by a low definition and a blur filter. Inside the circle, the high-definition images produced by *Ecolture* are characterized by true and clear colors.

The inscription representing the name of the research (*Ecoltura* in Italian) was also studied. The first letter, 'e' in italics, due to the reference to the 'electronic' (digital) nature of the project; the first syllable, 'eco' in bold, highlights the ecological vocation of the project (to diffuse and reuse what we already have); the last part of the Italian word, *cultura* (culture) in capital letters, to mean the consistency of the topic and underline its relevance.


Fig. 1. Steps of the image construction, from hand drawing (courtesy of Roberto de Rubertis) to digital composition (Blender 2.93.0, Gimp 2.10.22 and Inkscape 1.1.2).

Vectorial Drawing Up of Historical Images. One of the key objectives of the project is to create a common visual language and identity, valid for the various case studies. This objective was achieved above all by working on the portraits of the characters from Trentino chosen for the first phase of the research; their biographies offer the opportunity to enhance the ancient documentary heritages. So, it was decided to give all the characters the same visual identity through portraits of the same style. Carrying out this purpose, a problem emerged: original characters' portraits are distinguished by different sizes, realization techniques (picture, painting, serigraphy, etc.) and therefore from different levels of realism, shade of color, contrast, resolution.

Since the necessity of uniformity and recognizability under a single register is an important goal of the research, it was chosen to converse all these pictures in vectorial portraits. Lines were traced in a non-realistic way, preferring the symbolization of features rather than the reproduction of shadows, to avoid the emergence of differences

depending only on the lighting conditions. The stylization of the faces is the contemporary communication tool chosen to renew the public's interest in the characters, their stories and cultural legacy (Fig. 2).
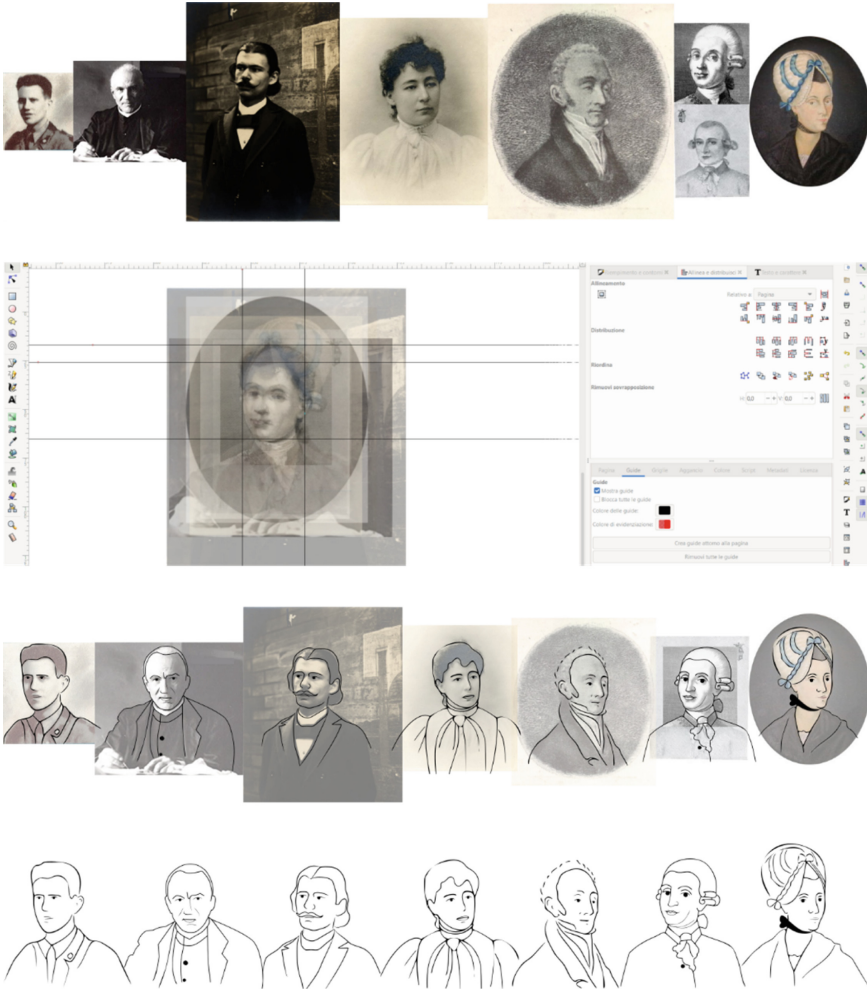

Fig. 2. Process of homogenization of *Ecolture*'s characters portraits through their vectorialization (Inkscape 1.1.2).

Digital Processing of Original Pictures and Documents. There are many digital graphics solutions that make it possible to enhance the ancient documents preserved in the archives and make them accessible to the public. We present three as examples.

From Two Dimensions to the Third. The study of the figure of Giacomo Bresadola (1847–1929), world-famous mycologist and clergyman, is based on the narration of

the places he lived in, by means of a short film made with a descriptive but synthetic language. The reconstruction of the original environment was possible thanks to the collection and selection of coeval photographs and postcards, and their consequent animation. In the first clip, the video shows the land where the protagonist was born and grown; to underline his relationship with nature, the choice was oriented towards landscape photos. Photographs of schools and churches were used for the second clip, to convey the idea of transition to education and then work periods.

All the chosen pictures were digitally processed to be decomposed in different levels of depth. The first step was the separation of each level in different layers, through the individuation of their contours; in a second moment, for all the layers except for the foreground one, it has been necessary to re-draw the portion of the image that lays under the upper level, to make every layer works as an autonomous image and avoid the disturbing apparition of the same details in more than one layer as a repeated pattern (Fig. 3). Once all pictures were decomposed as explained, it was possible to re-compose them dynamically using keyframe-animation. The relative movement between each level simulates the change of perspective of a virtual camera and consequentially gives the illusion of traveling through view in a tridimensional landscape.
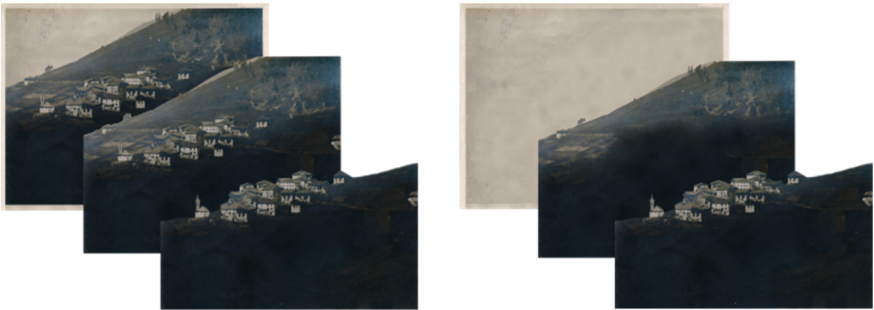
Fig. 3. On the left-hand side are the original pictures after the definition of boundaries; on the right, the final layers after the digital 'reconstruction' of the background levels (image editing: Gimp 2.10.22; animation: DaVinci Resolve 17.1).

Paper Portraits. An interesting collection related to the same character (G. Bresadola) is a huge archive of letters (more than 3,500) he received from all over the world, inventoried by the Science Museum of Trento. These documents were an occasion to pursue simultaneously two goals: the enhancement of the character biography (thanks to the possibility of discovering new information) and the diffusion of original papers.

After an accurate selection of significant letters that could be used as an example, we wanted to give visual evidence to the faces of the correspondents to emphasize the attention to their correspondence with the illustrious scholar. The intent was to return a profile to these characters, otherwise described only through their own words. To achieve this goal, we decided to over-impress a schematic vectorial portrait of the senders on

one of their letters, used as a cover of each group of letters. While for the profile picture of all characters we chose to use lines for tracing the figure's features, in this case, the use of thin lines could have made them less readable and confused since they lay on an already written background. Thus, we decided to use a mixed technique, melting thick lines with solid shadow spots to define features. The relevant letter's contents were then synthetized in a table, also reporting their collocation, date and place, sender and addressee; the portraits were impressed as background of tables as well, in order to identify the collection at first sight and to give back a human identity to this bulky literary production.

As final steps, each letter quoted in the table was connected through a clickable link with the digital version of the original letter, and each collection was then uploaded on the University library website as a navigable PDF (Fig. 4).
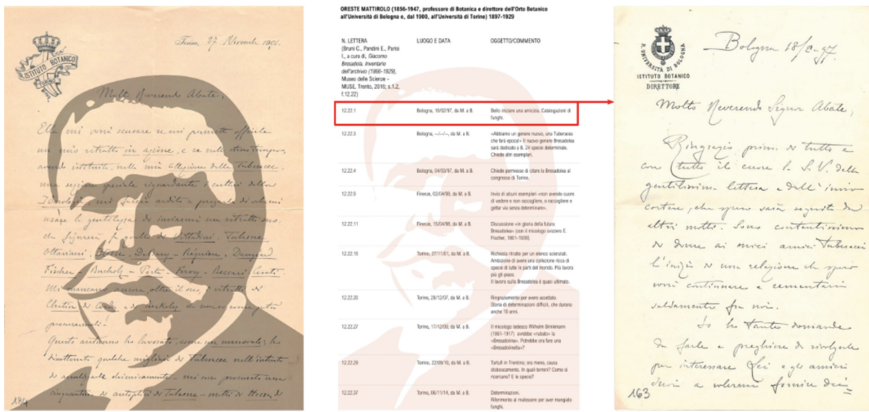
Fig. 4. Example of *paper portrait*; from the left to the right: cover of the collection of letters, synthetic table of letters' contents linked to the original letter (images editing: Gimp 2.10.22, Inkscape 1.1.2; page layout: Scribus 1.5.6.1).

Learning Geometry in the XXVIII Century. Another remarkable result of the research we wish to illustrate is the valorization of an original, unedited manuscript preserved at the Municipal Library of Ala, one of the project's partner. It is a treatise written by Gianfrancesco Malfatti, one of the most important Italian mathematicians of the 18th century, deeply involved in the cultural renovation of our country.

The manuscript deals with the teaching of geometry and especially conic sections and it is supposed to be published on the open-access platform of Wikimedia[2]. It seemed relevant that every digital page should be similar to the others, and not different for size,

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[2] Publication on Wikimedia is also possible thanks to an existing typed transcription, part of a thesis in Mathematical Sciences (University of Trento): 'The treatise on conic sections by Gianfrancesco Malfatti', written in 1984 by Dr. Fabiola Fedrizzi, under the supervision of Prof. Italo Tamanini.

perspective, colors, shadows, and lighting as are the original scans made by the Library (.tiff high-quality images).

We assumed that in the real volume the height was constant and that each page should have fit in a 22 × 30 cm grid. The length is larger than the real page's one for two reasons: firstly, compared to height, it is a variable dimension in the real volume; then it is necessary to allow the perception of volume even through the bidimensional support of a screen; therefore, it is important to keep the binding and part of the pages that protrude behind the foreground one. The original scans were scaled, rotated and, when necessary, prospectively deformed to align as much as possible text horizontality and to avoid unnatural perspectives.

Many pages have low readability, due to the visible background text in transparency. We tried to reduce background signs and to make highly resalts the foreground ones, isolating them in separated layers. To achieve this result, the following steps have been applied to all of manuscript pages: creation of a copy of the size/perspective corrected picture; selection of an unrefined shape including all the foreground text, excluding as much as possible other dark portions of the page, such as corners, folds, and all the blemish that must not be underlined; adjustment of contrast and lighting until foreground text became as dark as possible and all elements in background as white as possible; application of total transparency to all the white pixels of the layer (color to alpha); the layer obtained this way should contains only the text we meant to highlight (Fig. 5).
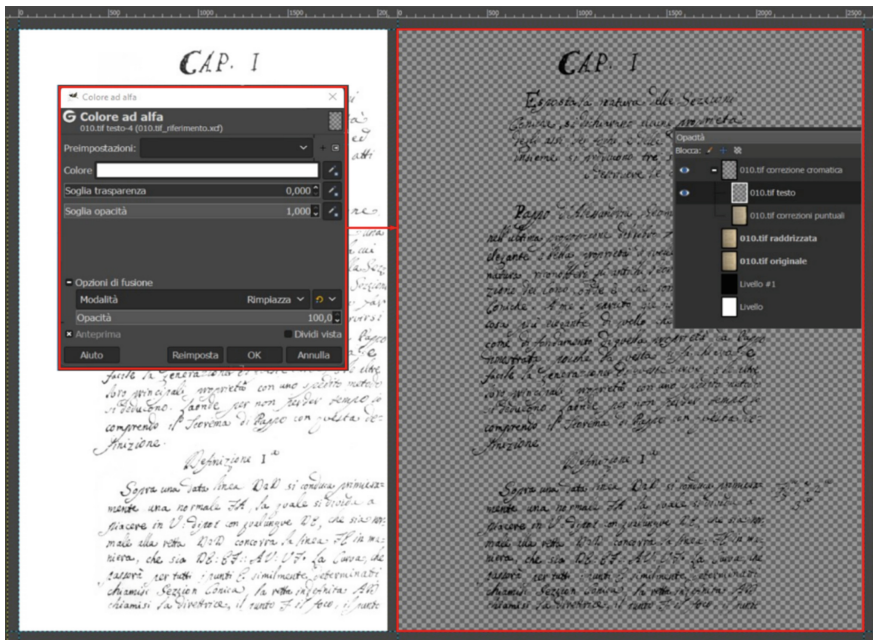
Fig. 5. Step of image processing showing the way to isolate the foreground text that we meant to highlight in a separate layer than the background pages (image editing: Gimp 2.10.22).
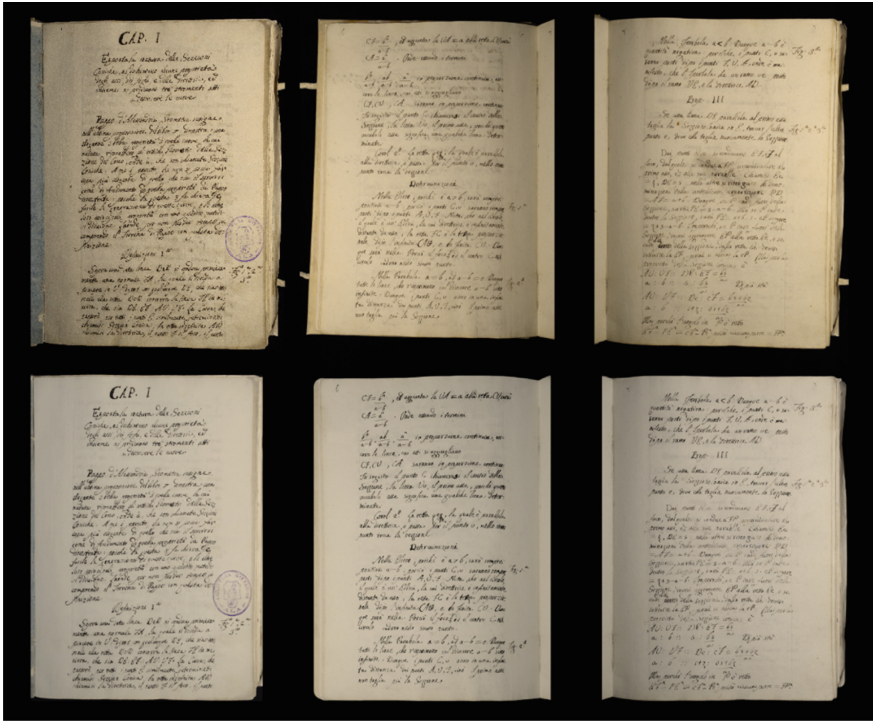
Fig. 6. Comparison of the original pictures from the library (on the top) and the corrected (dimension and perspective, colors…) images.

At this point, by correcting contrast and lighting in the original layer, background signs can be reduced without fading foreground text. Even though applicable to the whole manuscript it is important to underline that the adopted method keeps being a case-by-case procedure, since in each page contrast problems were more or less accentuated.

Moreover, the selection of what signs could be removed wasn't systematic but needed a valuation, to avoid the alteration of meanings or the loss of each kind of information, not only strictly dealing whit geometry but also with writing techniques, for example (Fig. 6).

Interactive Construction: Old Concepts, New Ways of Visualization. The interesting issue in the manuscript is that it can be seen as a meta-project study-case, since one of the intentions of the author was to demonstrate how analytic geometry could be explained in a synthetic way, using accurate descriptions and graphic representations supporting them. Nevertheless, all construction figures are attached in a conclusive chapter at the end of the volume, separated from the related text, and not always very clearly drawn. In this case, the goal was to give value to the graphic constructions explained in the treatise, associating them with their own definition and showing how images make concepts radically clearer and more significant.

Moreover, to give a captivating feature to the relevant content of the draws in the original manuscript, it was decided to link the definitions not only to their original static representation but also to an interactive construction realized through GeoGebra application (https://www.geogebra.org/m/xdf62xfh, Fig. 7). The construction step-by-step of some selected images starting from the definition scattered in the text shows how graphic codes are still helpful in translating and understanding complex subjects, such as they used to be three centuries ago when the treatise was written [7].
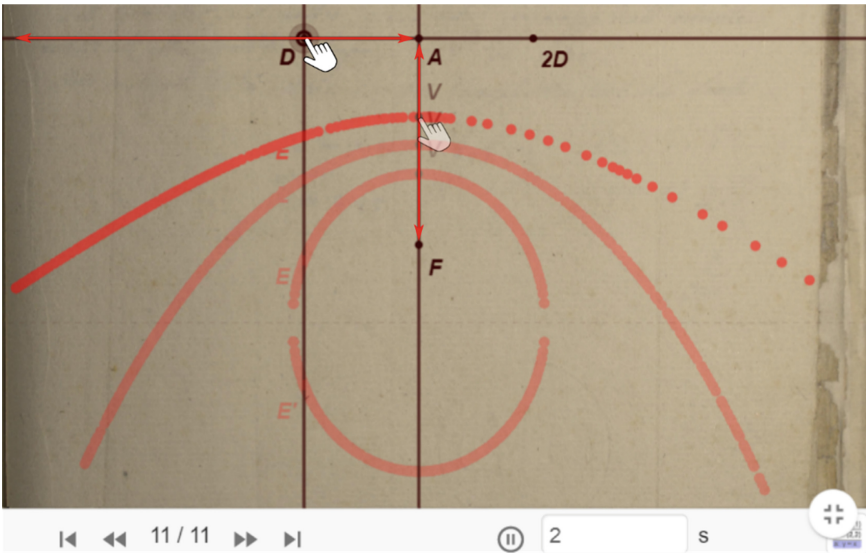
Fig. 7. Link between definitions and relative graphic construction in the treatise through the interactive construction with GeoGebra application (courtesy of Vittoria Martinelli).

3 Possible Future Developments

The research project is open to future developments. Many other methods and procedures of visual communication can be added to those outlined in these pages, but above all it will be possible to promote the network of collaborations in the area in order to expand the number of characters to be studied. Because of the special attention due to open source procedures, it is expected that they could be a useful background appliable in other subject, other scale, and different situations. This is why we intend to add new figures in order to strengthen the links already established between the characters proposed and the proposing institution, with the aim of involving even the most isolated areas of the Province.

Besides the expansion of the network, another goal is large scale communication and promotion of the results of the research. Although all the results obtained are gradually shared through the University Libguides website and the websites of the partner organizations, the realization of a dedicated website will be decisively influential in terms of infiltration both into the web and into the territory.

It is expected that approaching documentary heritages through the application of visual transcription could have a considerable impact in strengthening the mutual relationship between citizenship and the institutional and physical places of heritage conservation, with an important spin-off both in terms of cultural dissemination and in terms of awareness and appreciation of the territory.

The interest triggered towards the hidden heritage and its original valorization will also have the consequence of widening the tourist offer, which would also result in the creation of new opportunities for the small cultural realities scattered throughout the Province.

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