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Paper for the conference 'PRINTING REVOLUTION'

Title: The use and reuse of printed illustrations in 15th-century Venetian editions

SLIDE 1 - MATILDE: This talk will be focussing on the 15cIllustration ('15cI'), a searchable database of 15th-century printed illustrations developed by the 15cBOOKTRADE Project in collaboration with the Visual Geometry Group (Department of Engineering Science of University of Oxford).
15cILLUSTRATION is the first comprehensive and systematic tool to track and investigate the production, use, circulation and copy of woodblocks, iconographic subjects, artistic styles within 15th-century printed illustrations.
In order to demonstrate some of its key features, and the theoretical work behind its development, Abhishek and I will focus today on a series of hypothetical research questions which can now be addressed by scholars more quickly and precisely.

SLIDE 2 - MATILDE: The subjects and considerations expressed in the previous papers show that the presence or absence of woodcut illustrations in a given edition ought to be considered as relevant and meaningful as other concepts such as 'author', 'title', 'place of printing', 'editor', 'year of printing', 'number of leaves', 'layout', 'type', and all the other standard references which we rely upon in defining the bibliographical identity of a book.
This idea was the basis for the 15cBOOKTRADE work on printed illustrations in incunables, a work that began in 2012 with a Master thesis by Clementina Piazza, focussing on an in-depth investigation on the use of printed illustrations in Iohannes Hamman's *Books of Hours.*
Since the beginning of the project in 2014, we have kept working on the topic, developing a series of research questions such as:
1) How did printed images circulate in incunables?
2) How did printers use images?
3) Questions about the iconographic tradition.

SLIDE 3 - MATILDE: When we started thinking about these questions, the main issue we came across was not necessarily the lack of data but more the lack of a systematic approach to the existing data.
In fact, several repertoires were published in the last 150 years, which focus specifically on the production of early printed book illustrations in a certain geographic area, such as Essling, Kristeller, Schramm&Schreiber, Kok.
The aim of the 15cBOOKTRADE Project has always been to develop a methodological approach and digital technologies which could support this research beyond specific geographical areas, bring together information of different kind and from different sources,

and to combine them with the data contained in the main tools for bibliographic cataloguing, such as the ISTC.

Over the last four years, we have created a consistent tool which allows scholars to search early-printed images not only through their visual features, but also in combination with text associated to them.

SLIDE 4 - MATILDE:
The combination of these two technologies and two ways of considering images (as visual and textual words), brought us to the creation of 15cILLUSTRATION.

For the time being, 15cI allows for three different searching options, which Abhishek and I will now illustrate starting from samples taken from my personal research within the 15cBOOKTRADE.

SLIDE 5 - MATILDE: This is a copy of the *Historia della Regina Oliva,* a poem in eight-line stanzas in *ottava rima*, composed towards the end of 15th century by the Italian poet Francesco Corna da Soncino. The story tells about the adventures of the Roman emperor's daughter, trying to escape from her father who loves her.

Four incunable editions of this work survive from the 15th century, all printed in Venice; out of them, only this one is illustrated, printed in Venice by Iohannes Baptista Sessa in 1500.

If we look at the illustrations contained, one of them is a border surrounding the frontispiece page.

SLIDE 6 - MATILDE: The second one, placed on the last leaf, below the colophon, portrays a group of men in the act of discussing something.

One of them is sitting on a throne, wearing a crown and holding a sceptre. The one standing on his right side looks deformed in his face, and touches his breast. On the right side of the image, a second scene is visible: a man is standing next to a coffin, holding a sword. A second man is sitting inside the coffin, with half of his bust emerging and visible in profile. The details of the scene depicted do not correspond to any of those narrated in the book, so one might start asking who these characters actually are and where was this woodblock taken from.

SLIDE 7 - ABHISHEK: The upload and search feature allows a researcher to check if an unidentified illustration appears in the 15cILLUSTRATION database and to track its repeated occurrences in different 15th-century printed editions.

If a match is found, the scholar can view all the matches and their associated metadata (ISTC and manually annotated regions). This can help track all the occurrences of that illustration in 15th-century printed edition.

SLIDE 8 - ABHISHEK: When we upload this unidentified image in 15cILLUSTRATION and search the database, the search results shows all the other instances where the same woodblock has been used, relying solely on the visual features of the image itself. In this case, we have three matches.

SLIDE 9 - ABHISHEK: You must be curious about how this software is able to match a user uploaded illustration with hundreds of other illustrations in the 15cILLUSTRATION database.

Here is a quick description of how this is done. On the bottom left hand side of this slide is the query image and the bottom right hand side shows the matched illustration.

For each image in the 15cILLUSTRATION database, this image matching software detects a set of image regions that can be useful for matching. In the image above, the red elliptical lines show the detected regions in both the query and matched image.

For each detected region, a compact vector of features is computed. This compact feature vector is a summary of the visual pattern present in the detected region.

To find the illustration matching the query image, the image matching software finds correspondences between regions in the query image and the regions extracted from all the images present in the 15cILLUSTRATION database. This search for correspondence is based on compact vector of features of each region and is nearly instantaneous because these features are transformed and stored in a data structure designed for fast comparison and retrieval.

In the image above, the green lines show correspondences between the regions detected in query (show in top left) and match (show in top right) image.

The search results can also be viewed as a list -- shown here on the right hand side -- which shows the metadata associated with each search result, on which Matilde will now tell you more.

Thanks to the 15cI, we have discovered that the image which closes the *Historia della Regina Oliva* was extracted by the printer from a cycle of woodblocks devised in the early 1490s by Manfredus Bonellis to illustrate the twenty-three episodes of the *Life of Aesop.* In particular, the episode depicted here is that of the meeting between Aesopus and Lycurgus, and the scene portrayed on the side of the woodblock is that where Aesopus is hidden in a coffin by his friend and ally Hermippon, after having been unjustly sentenced to death by Lycurgus himself.
Now if we look at one of the images by Bonellis, which were already included in the database, we see that it is marked with a **unique identifier** and associated with two different sorts of metadata. The unique identifier is an alphanumeric sequence which brings together three elements:
-ISTC number;
-MEI number of the copy portrayed in the picture;
-foliation.
From this very simple sequence of numbers, it becomes immediately clear in which edition this image is found, in which copy of the edition and where exactly in the copy.
The metadata that you see here are of two different sorts: there are **bibliographic metadata,** automatically extracted from ISTC and concerning aspects such as author, title, format, place of printing, printer and date of printing. Then there are **descriptive metadata**, which are assigned manually by scholars, and describe the figurative and iconographic content, using ICONCLASS language and keywords, as well as the artistic style, the type of

woodcut (whether it is a border, a center or a decorated initial), and transcribe the text cut in the image, if there is any.

SLIDE 14 - ABHISHEK: 15cILLUSTRATION allows to search for illustrations using text keywords that match the bibliographic metadata associated with the ISTC number included in the unique identifier. For example, the following text search keywords (shown in the screenshot above) will show all the illustrations used in editions of Aesop and printed in Venice. The ISTC fields involved in this case are 'author' and 'place of printing'.

SLIDE 15 - ABHISHEK: There are 445 illustrations matching this metadata search criteria and this screenshot shows the first eight matching illustrations.

SLIDE 16 - ABHISHEK: Using the same interface, it is possible to specify a more complex text metadata search criteria. For example, we can search for all the printed illustrations containing "angel" and printed in Venice between year 1491 and 1500. Such searches are possible because regions in the illustrations were manually annotated by scholars involved in this project.

SLIDE 17 - ABHISHEK: This text metadata search results in 38 matches and this screenshot shows the first 10 matches.

SLIDE 18 - MATILDE: But one's research can also start from a single edition, and I might want to know where else the illustrations of that edition have been used, and to illustrate which texts.
ABHISHEK: In this case, one can search the database for the ISTC number of the selected edition (CLICK)

SLIDE 19 - ABHISHEK: The 15cI will then present all the illustrations included in the edition grouped per gathering. To ascertain whether the images appear in other editions as well, one should just select one of them (CLICK)

SLIDE 20 - ABHISHEK: Define a query region (brighter in this picture), and search the database for it (CLICK).

SLIDE 21 - ABHISHEK: Searching for this image region results in four matches as shown in this screenshot. The query image region and its associated ISTC metadata is shown on the top. The four matching regions are shown in the bottom. Clicking on one of these matches shows all the metadata associated with the image containing the matched region.

SLIDE 22 - ABHISHEK: The 15cILLUSTRATION online database is created solely using open source softwares. The visual search feature is based VGG Image Search Engine (VISE) which is an open source software created by the Visual Geometry Group. The open source license of this software entails the freedom to use and distribute this software for any purpose. The manual annotations of image regions used in 15cILLUSTRATION is created using VGG Image Annotator (VISE) which is also an open source software and can be used for any other image annotation task.

SLIDE 23 - MATILDE: The 15cILLUSTRATION can be publicly accessed using the website address shown here. This is an ongoing project and we welcome contributions in the form of images and metadata, but also feedbacks and suggestions on how to improve it and make it always more useful to scholars.

The 15cBOOKTRADE Project would like to thank all the libraries who have digitized their collections and made them publicly available online, or who have allowed members of the team to take photographs of illustrations which were not already available through digitised copies, and whose images have been used to test and implement the database: a list of them can be found on http://zeus.robots.ox.ac.uk/15cillustration/contribution.