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On German Comics Traditions: An Explorative Approach to Digital Comics Historiography

1. Introduction

A recurring topos in the historiography of national comic traditions is the question of the independence of existing styles, even to the point of claiming that comics were invented in a single country, whether in the United States, Germany or France. However, transnational distribution channels, such as the fact that American or Japanese Comics are read globally in their original language, and collaborations across borders complicate such accounts of specific characteristics or alleged origins (cf. Mazur 2014). Against this backdrop, the chapter that follows will approach the question of style by using a distant-reading approach, a term first introduced by the literary scholar Franco Moretti, which has come to be closely associated with the digital humanities (cf. Moretti 2000). This approach refers to the intersection of computational analysis and the study of literature and culture. The research results presented below will serve as the basis for a research project that aims to create a digital corpus of German comics productions from 1945-1970, adapts selected methods from the digital humanities – from digital annotation to automatic image recognition – to these serial pictorial texts, and demonstrates their potential for comic research through selected pilot studies.

For more than a decade, comics research has been one of the fastest growing fields in the humanities. However, as we argue below, comics historiography in the German-speaking world has so far remained limited. As a consequence, the lack of representative corpora not only prevents the sort of quantitative research that characterizes much of the digital humanities but, as we will demonstrate, also stifles ambitions to arrive at a more comprehensive historiography of German comics production. Although computer-assisted methods are beginning to find their way into comic research (cf. Dunst et. al. *Empirical Comics Research*), carefully constructed corpora and medium-specific modes of analysis are needed to fully benefit from these approaches.

The chosen period of study – the years 1945 to 1970 – represents a first productive period of German-language comics, which were able to estab-

lish themselves as a popular medium in the aftermath of World War II with the aid of translations as well as domestic titles (cf. Dolle-Weinkauff, *Comics.*). In particular, the 1950s and early 1960s represent an initial heyday of comics in Germany (cf. Faulstich; see also Rosenfeld 2016). With the cultural transformation initiated by the generation of 1968, significant upheavals also took place in the comics market (cf. Dolle-Weinkauff 1990, Mazur 2014). In the following decade, these changes led to a diversification of comics production and an increase in comics specifically aimed at adult readers (cf. Dolle-Weinkauff *Comics made in Germany*; Giesa). The changes in comics production in the 1970s towards a significantly older audience (cf. Kaps) represent a clear caesura for the classification of the corpus under investigation. Therefore, this research project aims to fill a gap in previous historiography, as the early decades of German-language comics in particular have remained understudied so far (cf. Giesa). In addition, we want to increase the visibility and accessibility of the comic archive of the Institute for Children's and Young Adult Literature at Goethe-University Frankfurt, which has a substantial collection for the chosen period (cf. Dolle-Weinkauff 2005; Giesa 2021), and from whose holdings a sufficient research corpus can be formed.

Making these holdings accessible is a central prerequisite for our project: Since 1990, the holdings of the Frankfurt Comics Archive had been recorded in a local database using the library software BISMAS. For some time now, this database no longer met the technical and security requirements of such a system. Together with the Frankfurt University Library and the Hessian Library Information System *hebis*, a migration solution was developed and implemented in spring 2020. However, the current indexing system only consists of basic information, including title, author, publisher, and location, and inconsistently records additional details such as language, publication series, or unit post title (Giesa 2021).

In what follows, we will first give a brief overview of historical research on German-language comics to date. This section will be followed by an overview of the state of the art in digital comics research, which provides the foundation for the pilot study conducted for this chapter. After discussing its results, we end on a short outlook on future research.

2. Historical Research on German Comics

In the 1980s, collectors began to publish bibliographical records on the subject of comics. Peter Skodzik's *Deutsche Comicbibliographie* (German Comics Bibliography) represents an important cornerstone in the systematic recording of German-language comics and continues to be published as *Allgemeiner Deutscher Comic Preiskatalog* (cf. Skodzik). Much more limited in access but attempting to provide information beyond bibliographic data is the multi-volume *Illustrierte Deutsche Comic Geschichte* (1986-2002; altogether 19 volumes), edited by Siegmar Wansel. In addition to bibliographic data, illustrations of covers and, in some cases, content are included. These function as important (re-)sources for the construction of a sample corpus for our research project, for instance, when estimating the total number of titles for each year under investigation. At the same time, the annotation of the title records and digitized comics with metadata would enable more complex access to the holdings.

In his PhD thesis, Joachim Kaps describes *Erwachsenen-Comics in der Bundesrepublik Deutschland* [transl.: *Adult Comics in the Federal Republic of Germany*] als *Das Spiel mit der Realität* [transl.: Playing with Reality] (1990), while Gerd Lettkemann and Michael F. Scholz initiate East German comics research with *"Schuldig ist schließlich jeder ..." Comics in der DDR. Die Geschichte eines ungeliebten Mediums* [transl.: "After all, everyone is guilty ..." Comics in the GDR. The history of an unloved medium] (1994). These bibliographic-historiographic works contain a wealth of relevant material. In addition to providing an overview of historical periods, they represent individual case studies. However, their approach proves to be circular, since the scholarship is not hypothesis-driven but rather relies on its own founding assumptions – comics increasingly address adults from the 1980s on (Kaps), or the political and artistic dependencies of comics creators in the unjust regime of the GDR – as a prerequisite for the selection of the research material. Even though the proposed project will conduct research on earlier periods, we also aim to establish methodologies that may prove useful for further research by establishing empirically valid procedures for historical corpus construction and analysis.

In addition to the publications initiated by Skodzik and Wansel, *Jahrbuch Deutsche Comicforschung* (Yearbook of German Comic Research) has been published since 2005 and analyzes German visual culture from a historical perspective and in a more popular vein. The contributions to the yearbook usually amount to a purely descriptive treatment of indi-

vidual phenomena. This approach is characterized by the limited access to historical comics production that scholars of German comics must currently rely on. However, the contributions do not usually reflect on the ensuing bias and are also characterized by their focus on German comics traditions alone. A transnational comics historiography, aware of processes of exchange and mutual development, therefore still remains a desideratum. As a consequence, our approach aims to show how or if German comics traditions have developed in comparison with comics that appeared in translation during the same period. As we argue in the next section, digital research methods represent an opportunity to identify previously unrecognized aspects of comics style with the help of large comics corpora.

3. Digital Comics Research to Date

After a rather hesitant start, computer-aided approaches have increasingly found their way into comics research in recent years. This is evidenced not only by the first book publications and overviews, but also by a number of externally funded projects in Europe and North America, as well as existing research networks (Dunst et al. *Empirical Comics Research*; Laubrock & Dunst 2020). Nevertheless, it could be argued that the fruitfulness of digital research methods for comics history is only just beginning. There are several reasons for this assessment: As a multimodal medium that combines writing and images, comics pose complex challenges for computational recognition and analysis that require domain adaptation of existing solutions from computer science. In many cases, this adaptation is complicated by the lack of high-quality datasets. In addition to the amount of data required, the key issue is to ensure that the diversity of cultural production is represented in digital corpora. Although progress has been made in this area as well, no data collection exists to date that maps German-language comics of the twentieth century. As a result, historical research in this field mostly refers to individual titles. Due to the limited availability of data, these cannot be examined for their representativeness: Historical developments potentially remain unrecognized, or their significance cannot be correctly assessed (cf. Dunst ,"How We Read Comics").

Our approach to digital comics historiography is based on another pilot project in computational comics research, the early-career research group "Hybrid Narrativity" at the universities of Paderborn and Potsdam,

which was funded by the German Federal Ministry of Education and Research (BMBF) from 2015-2020. Within this group, digital methods were developed and evaluated to automatically recognize and analyze the content and structure of graphic novels, i.e., comic narratives in book form, which have received increased attention since the 1970s and have helped comics to gain cultural recognition. In the first project phase more than 250 graphic novels, representing a total of more than 55,000 pages, were retro-digitized.
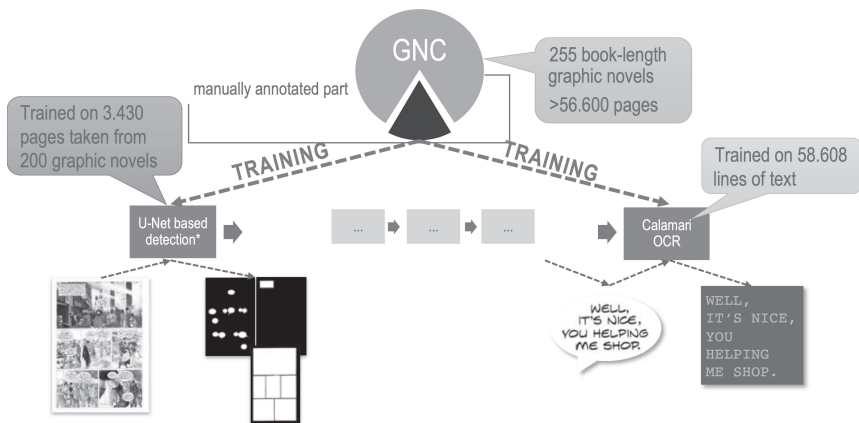
Fig. 1: AI models trained and training data and process within the early-career research group "Hybrid Narrativity"

A sample of these pages – complete graphic novels as well as excerpts – was annotated manually. These annotations include comics panels, characters, speech bubbles, and text captions, including their textual content. Annotations were then used to train AI models, which make it possible to find the outlines of panels, speech bubbles, and text captions or to recognize text content, which remains a non-trivial task due to the handwritten or quasi-handwritten fonts used in comics. This process is visualized in Figure 1. One outcome of this research was the M3 editor (Dunst et. al., "Graphic Narrative Corpus"), a tool for the semi-automatic annotation of comics, pre-trained on AI-based models for text and object recognition in comics (see Hartel and Dunst, "An OCR Pipeline"; Dunst and Hartel, "Computing"; Dubray and Laubrock) as well as historical studies on the stylistic and narrative development of comics (Dunst, "How We Read Comics"; Dunst, *The Rise of the Graphic Novel*). In the following section,

we present a pilot study that builds on this existing research to envision a digital historiography of German comics.

4. Pilot Study

The Institute of Children's and Young Adult Literature at Goethe-University Frankfurt currently owns a collection of around 70,000 comics, of which approximately 60,000 are indexed by title records. The department thus has the largest holdings of German-language comics in public ownership. For the period 1945-1970, publication figures of approximately 30,000 comics can be assumed by extrapolation from the catalogue, of which a non-representative cross-section of 3,260 can be found in the Frankfurt comics archive. The holdings are divided into 3,200 issues and 60 albums and paperbacks. These figures were calculated as follows: in the catalogue, issues, albums, and paperbacks can be distinguished by local classification. The numbers for albums and paperbacks were unambiguous but needed to be established manually for magazine issues. The information given in the catalogue does not specify how many issues of a specific comics series are available in the library. Therefore, a random sample of ten comics series was selected to calculate the average number of individual issues. Since the existing database is not very granular, comics in German as well as in several foreign languages in the collection (the most common are English and French) were included in the sample.

In a next step, we sought to evaluate how well the methods developed for the "Hybrid Narrativity" research group work on comics in the Frankfurt archive. For this purpose, we digitized a test sample from the collection. 74 comic books were chosen at random. Student helpers then digitized the first 10-15 pages (depending on the number of bibliographical pages among them) with a book scanner. Comic books that did not include a majority of pages with a panel layout were excluded from the test sample. Once these pages had been scanned and saved, the sample included 1,723 pages. We used the AI-based software developed as part of the aforementioned research group to run automated panel, balloon, and caption recognition on the scanned pages. While the model had been trained on book-length graphic novels, most of the pages for our current approach were rather short comic books. As we might assume more variation between than within texts, it was a reasonable assumption that the models would not perform as well on the comics book as they did on the

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graphic novels. To estimate the automated recognition rates on the fresh data, we therefore performed two different evaluations. On the one hand, we printed so called overlays that fill the area of the detected objects with half-transparent color, so that a quick glance can establish whether the objects had been detected correctly. In addition, the student helpers counted the number of panels, balloons, and captions for each scanned page as a target value. This calculation made it possible to compare the target value to the actual number of objects that were detected automatically.

Our previous work had shown that the confidence ratio of the automated text recognition (ATR) correlates quite well with the precision of the text recognition itself. Thus, we chose to take this confidence ratio as a quality estimate. If text is recognized with a confidence ratio of more than 90 percent, this text can usually be read quite well as it only contains a few characters that deviate from the original (often these deviations are missing blank spaces between two words). The results of the pilot study tests showed that among the different objects, panels and speech balloons can be detected most successfully, reaching a recognition rate of 93.7 and 90.4 percent, respectively. In these cases, 89 percent of pages reach a recognition ratio of more than 90 percent for the panels, and 80 percent of the pages achieve a recognition ratio of more than 90 percent for balloons. Automated detection of captions still works quite well, with an average recognition rate of 77.4 percent. Here, 64 percent of pages have a recognition ratio of more than 90 percent for the captions. The average confidence of the automated text recognition was even higher, at a ratio of 94.2. These particular results came as something of a surprise. The original training material, the graphic novels, were mostly written in English, whereas the comics pages also contained French and German text. 88 percent of the pages achieve a confidence rate of more than 90 percent.

A detailed overview of these figures is presented in Figure 2. The figure shows a histogram of the detection quality of the different objects. The dashed lines visualize the mean quality for each of the objects.
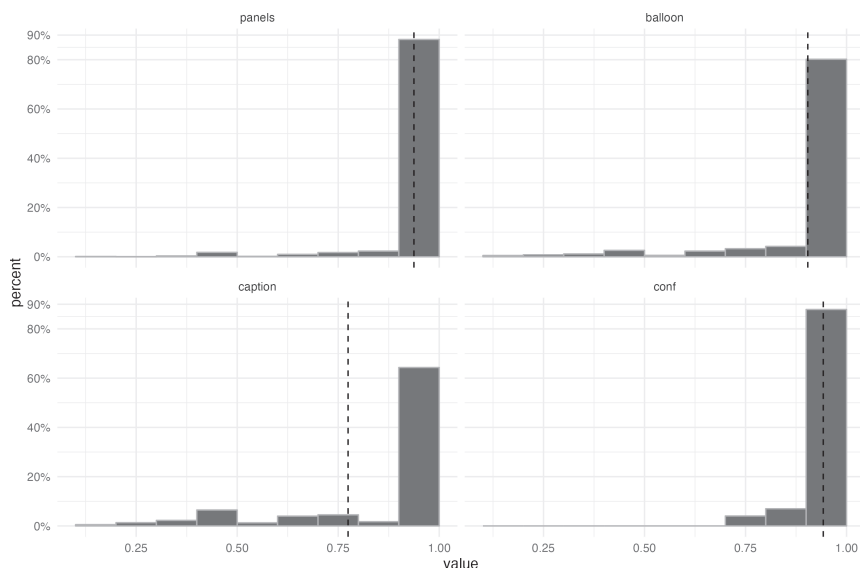
Fig. 2: Frequency distribution and mean value for the quality of the automated detection of panels, balloons, captions, and texts.

Table 1 shows examples of original pages, the speech balloons that were detected on this page, one of the speech balloons, and its recognized text. The first line shows a page of the German comic "Ulf der edle Ritter" (transl.: Ulf the noble knight) that reached a confidence rate of 99 percent. All balloons have been detected correctly, and the single error in the text detection is the missing umlaut (which was to be expected, as the AI was trained on English training data, which does not contain umlauts). The second line shows a page of "Slow Death", which has a confidence rate of 93 percent. Nearly all balloons have been detected correctly – but with a lower confidence rating, demonstrated by the gray speckles within the speech balloons – only the small balloon in the top right panel was mistakenly identified as a caption. Although the text lines are a bit crooked and the font is quite irregular, the text contains only a few errors: "F" instead of if "iF", "APDEAR" instead of "APPEAR", "EFTFECTS" instead of "EFFECTS", and "GREENE" instead of "GREENIE". In this case, an automatic spell-check would eliminate two of these four errors. It should be noted that the confidence rating of this comic is lower than that of 75 percent of the comics that we processed in the preliminary tests. In

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other words, the quality of most other texts included in this sample was significantly better.
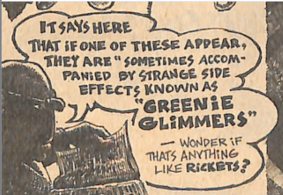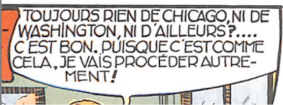
Original Page	Detected Balloons	Example balloon	Detected Text
		FAHRT DEN WAGEN VOR UNSER VER-STECK UND VERSTAUT DIE WAREN ! DANN SCHIEBT DEN WAGEN ÜBER DIE KLIPPE! DIE PFERDE VERKAUFEN WIR. HINZ UND ICH KOMMEN NACH WIR HABEN NOCH EINE ARBEIT ZU ERLEDIGEN !	FAHRT DEN WAGEN VOR UNSER VER STECK UND VERSTAUT DIE WAREN! D SCHIEBT DEN WAGEN UBER DIE KLIPI PFERDE VERKAUFEN WIR. HINZ UND KOMMEN NACH WIR HABEN NOCH EINE ARBEIT ZU ERLEDIGEN!
		IT SAYS HERE THAT IF ONE OF THESE APDEAR, THEY ARE " SOMETIMES ACCOM-PANIED BY STRANGE SIDE EFFECTS KNOWN AS "GREENIE GLIMMERS" — WONDER IF THATS ANYTHING LIKE RICKETS?	IT SAYS HERE THAT F ONE OF THESE APDEAR, THEY ARE '' SOMETIMES ACCOM-PANIED BY STRANGE SIDE EFTFECTS KNOWN AS ''GREENE GLEMMERS'' -WONDER IF THATS ANYTHING LIKE RICKETS?
		TOUJOURS RIEN DE CHICAGO, NI DE WASHINGTON, NI D'AILLEURS?.... C'EST BON. PUISQUE C'EST COMME CELA, JE VAIS PROCÉDER AUTRE-MENT!	TOUOURS RIEN DE CHICAGO,NIDE WASHINGTON, NI D AILLEURS?.... C'ESTBON. PUISQUECESTCOMME CELA, JE VAISPROCEDER AUTRE-MENT!

Table 1: Original Pages, detected balloons, and the automatically detected texts for different confidence rates.

In comparison, the third line shows an example of a comic, for which the automatic text recognition did not work as well, with a confidence rate of 85 percent (95 percent of the comics had a better confidence rate). The page is taken from the French comic "Kon Tiki." In this example, there are more errors within the detected text. However, the errors are all missing blank spaces, missing apostrophes, and a missing accent. As we mentioned before, our model was trained on English texts, whereas the detected text is in French. So, we are confident that we can increase the quality of the text detection significantly if we adapt our training process to the comics corpus of the Frankfurt Comics Archive.

5. Conclusion and Outlook

To summarize the evaluation based on our preliminary sample: Although the models were trained on substantially different data, our first tests show promising results. A set of training data based on the Frankfurt comics archive should help to improve the models further and yield even better results for automated recognition. With improved recognition, we can establish a semi-automated annotation process that detects panels, speech balloons, and captions including the texts of the latter two. This will result in annotations that only require a final round of quality control and minor corrections – a process that we expect to be a lot less time-consuming than fully manual annotation. This semi-automated process will provide high-quality data for different types of text and image analysis and allow for comparison between the Frankfurt comics archive, the Graphic Narrative Corpus (GNC), and other datasets.

Of course, automated recognition of the fundamental graphic and semantic components of comics does not, in itself, constitute scholarly insight. Yet, as other historical research that build on digital humanities methods has shown, large-scale data may build the foundation for new perspectives on cultural production. Thus, a quantitative analysis of comics text has the potential to reveal changing vocabularies, as the medium sought to address a new readership during the 1970s. Comparison between translated comics from the Francophone or English-speaking world with German-language comics may highlight specific themes that have escaped more anecdotal studies. Long-term trends in the amount of text per page could indicate a shift towards greater visual focus in comics, as Neil Cohn, Ryan Taylor, and Kaitlin Pederson have argued for serial comics in the United States (2017), which increasingly sought to tell their stories with the help of narrative drawings rather than linguistic explanation. A focus on the number, placement, and sizes of panels may similarly demonstrate stylistic shifts. Further insight will be gained from combining visual and textual measures in comics and drawing on information regarding authorship, genre, and place of publication. In all these cases, the combination of qualitative and quantitative research, rather than the rejection of one approach for another, promises to advance comics scholarship in the years to come.

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