CONSTANTS AND VARIANTS IN GENETIC CRITICISM

GENESIS BOLOGNA 2024

PROCEEDINGS OF GENESIS 2024 BOLOGNA 9TH-11TH MAY 2024

edited by
Ilaria Burattini, Beatrice Nava,
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Il volume è stato pubblicato con il contributo dell'Alma Mater Studiorum - Università di Bologna e del Dipartimento di Filologia Classica e Italianistica - FICLIT dello stesso Ateneo.

Fondazione Bologna University Press
Via Saragozza 10, 40123 Bologna
tel. (+39) 051 232 882

www.buponline.com
e-mail: info@buponline.com

ISBN 979-12-5477-693-3
ISBN online 979-12-5477-694-0
DOI 10.30682/9791254776940

Questo volume è stato realizzato a partire da un impaginato camera-ready in formato pdf fornito dai curatori

In copertina: logo Genesis Bologna 2024, ideato da Martina Dello Buono

Prima edizione: gennaio 2026

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I saggi qui raccolti costituiscono un'ampia selezione dei numerosi interventi tenutisi, nei giorni 9-11 maggio 2024, al Convegno Genesis Bologna 2024 (https://genesis-2024.github.io/conference/). Si ringraziano Martina Dello Buono per la grafica del sito e della copertina e tutte le studentesse e gli studenti dell'Università di Bologna che hanno preso parte all'organizzazione del Convegno.

I curatori

VEdition. A Critical Digital Edition of Goethe's Venetian Epigrams

Franz Fischer, Daniele Fusi, Claus Zittel, Matteo Zupancic

Part I – The VEdition

I. Introduction

Despite the notable expansion of scholarly interest in the *Venetian Epigrams* in recent years, the epigram cycle remains surprisingly underrepresented in the extensive and multifaceted corpus of Goethe scholarship. To date, there is only one comprehensive monograph on the subject (Oswald 2014), while the more recent specialized research contributions merely unearthed individual, limited aspects of the work in a pointillistic manner.[1] Philological research

[1] Regarding the topic of 'eroticism' in the VE see for example the recent contributions from Wilson (2012a; 2012b; 2015); Immer (2013); Rohde/Valk (2013); Zapperi (2016). For the topic 'Venice and urban experience': Mönig (2012); Osterloh (2016); Riedl (2021). On the so-called Bettine-complex: Ehling (2014); Schuster, (2020); Zupancic

has not gone beyond Jochen Golz's attempts to establish the possible criteria for a critical edition of the VE (Golz 1998), which is still lacking today, and his diplomatic edition of two extensive documents of the work (Golz/Gothe 1999). As a result, the image that can be derived from the scandal-ridden epigrams is still characterized by provisionality and fragmentation. The reasons for the scholarly reluctance to engage with the VE can be attributed to their intricate genesis. An examination of the series of circumstances that have culminated in this assessment reveals the following reasons for this:

1. A notable yet intermittently disrupted and fragmentary manuscript tradition (Schmidt 1991; Golz 1998, 1999), which exhibits the absence of any developmental coherence (Zittel 2023). Following Goethe's initial forays into the epigram genre, as witnessed by the sketches in his personal Martial edition, the poet proceeded to conceive the idea of a satirical collection of epigrams during his second sojourn in Venice (March/May 1790). The results of this both productive and contradictory period can be found within a small quarto (H 54, GSA 27/60), which includes at least 42 incomplete poems, and in a small selection of complete epigrams sent to Knebel (H 60). Furthermore, the Goethe- and Schiller-Archiv also contains individual pencil sketches of a further seven epigrams, the dating of which remains somewhat unclear. The first phase of his work culminates in a quarto notebook (H 56, GSA 25/W

(2023/24). On the composition of the VE as cycle see Klimek (2021)

61), which he wrote in ink in his own hand. The notebook contains 106 complete epigrams and demonstrates a high level of composition. It should be noted that this number can supplemented with a short notebook (H 61) from the later Silesian Journey (July 1970), in which 19 new epigrams came to light. Following this preparatory work, the most important and comprehensive documents of the VE emerged, namely a second quarto notebook (H 55, GSA 25/W62) containing the fair copy of 138 epigrams in Latin cursive, all written by Goethe in his own hand in ink after October 1790. It includes 6 epigrams from the Silesian notebook. The history of H 55's impact within the process of the VE's creation is extensive. This quarto notebook can be regarded not only as a stage of Goethe's meticulous work on the collection, but it also demonstrates the pivotal role played by his private circle of friends and colleagues. In the context of the later publication of the VE in Schiller's *Musenalmanach* (1796), the epigrams contained in H 55 underwent a heavy revision process by the hand of Goethe's friend and were subsequently published following numerous recommendations. It should be noted that the printer's copy of the *Musenalmanach* is missing, which means that the philological reconstruction relies, once again, on hypothetical conjectures. The final handwritten document that we must consider is a gift copy of the cycle (H 59, GSA 25/W 63), written down in an unknown hand and addressed by Goethe to Duchess Anna Amalia.

2. A network of self-censorship and external censorship that is challenging to reconstruct philologically, a process

that Goethe himself initiated from the initial drafts in Venice, and which continued at least until the intervention of Schiller and the subsequent harsh interpolations by the WA editors. The direct and biting attacks on certain personalities and institutions of Goethe's time, including Johann Caspar Lavater (Oswald 2014, 173ss) the Church (ivi, 243ss) and the monarchy, as well as the eroticism displayed in various epigrams (Wilson 2012a, 2012b and 2015; Immer 2013; Rohde/Valk 2013; Zapperi 2016), had a significant impact on the genesis and subsequent reception of the work as a whole. The most challenging aspect to reconstruct is the semi-private phase of the work's creation, namely the undocumented exchanges that occurred between Goethe and his circle of friends.

3. The manifest impossibility to establish a final version of the VE, which would serve as the basis for accepting a specific version of the work as the base-text and considering all other versions as variants. As might be expected, the history of the printed documents of the VE is also shrouded in controversy. Apart from the limited selection of epigrams from the *Sinngedichte* that appeared in Schiller's *Horen* in 1791, it is evident that the *Musenalmanach*-version of the VE, which was long regarded as the most authoritative version of the work, represents merely a preliminary stage in a lengthy writing process without end. The subsequent print documents include a variety of additional variants, some of which were introduced in accordance with Goethe's intentions, others without the poet's direct involvement. The latter is the case of the so-called *Ausgabe letzer Hand* ("last authoritative edi-

tion"), whose high degree of untrustworthiness was already noted by Ernst Grumach (1952) in his seminal *Aufgaben und Probleme der modernen Goetheedition*.

As indicated by Jochen Golz and Claus Zittel, the ever-changing nature of each stage of the VE has thus far presented a significant challenge to philological work. Any attempt to reconstruct the Venetian Epigrams has been inherently arbitrary, aimed solely at overcoming the non-teleological autonomy of individual documents. It is therefore necessary to create a digital edition that allows the different versions to be presented not only in terms of their genetic relationships, but also in terms of the transitions between them. This will enable the reader to visualize the transformations and the respective pre-texts for each individual epigram, as well as all the new constellations into which it enters. A topological edition concept is favored, as it relegates the interpretative relevance of genesis to the background in favor of a constellative-spatial edition model. Starting from the photographic reproductions of each document (H 54, H 54a, H 56, H 61, H 55, H 57, H 59) a topographic-diplomatic transcription and a reconstruction of Goethe's workflow through the analysis of his intricate microgenetic process, our critical digital edition aims not only to offer a synoptic picture of the different versions of the whole collection as well as of every single epigram, but also to engage new ways to digitally represent a 'text in motion'. The user will be allowed to explore the epigrams by means of a vertical synoptic representation of each verse in its different compositional stages – with

regard to both the intradocument and the interdocument variations (Belorova/Van Hulle/Verhulst 2021), a horizontal synoptic constellation of every stage of a single poem, and finally a rendition of the text's metamorphosis (*textum mobile*). The flux of constants and variants will be made visible by the actual movement of the diplomatic transcription from one document to the other, with the possibility of color-coding autographic and allographic alterations in the process. The same rendition will be further extended to the collection in its entirety, allowing thus to display the constant movement of every epigram's collocation within the different documents.

II. Levels of the VEdition

1. Diplomatic representation (diplomatische Darstellung)

The first level of our edition is constituted by a fully computable diplomatic representation of the handwritten or printed document, that aims simultaneously at the topographic reproduction as well as the diachronic interpretation of the metamorphosis of the text. Reusing the terminology adopted by the editors of the interrupted *Akademie-Ausgabe*, we distinguish between a *base-layer* (*Grundschicht*) and the layers of *authorial alterations (Änderungsschicht)* on top of it. The base-layer is the "lowermost and continuous version of the text" (GGA 231)[2] that can be found on a text carrier. It's detectable through the disposition of the

[2] "Die unterste und durchlaufende Textfassung einer Handschrift ist die Grundschicht" (GGA 231).

verses, the ductus and the writing material. With *text carrier (Textträger)* we mean the physical support on which the *base-layer* of the text (*Grundschicht)* and its alterations are written. This can be a section of a numerated sheet within a *document (Dokument)*, a whole sheet, or also two sheets, if the epigram is segmented between two subsequent (or also not subsequent) sheets. The term *carrier* does not refer to the document per se, but only to the section of it on which a unitary epigram has been written, and it's able to relate to different material situations (portion of a sheet, one sheet, two or more sheets of a document).

Following the base-layer we have the *alterations-layer (Änderungsschicht)*. We use the term *alterations (Änderungen)* to define what the *Grundlagen der Goethe-Ausgabe* described as *'corrections' (Korrekturen)*, i.e. "all the alterations of the base-layer in form of deletions, additions, readjustments and their combination"[3] (GGA 1961, 231). Translating this formulation in the language of a digital edition, all alterations can be seen as operations that modify in different ways the stage of the text conveyed by the base-layer. Furthermore, since "all alterations of the corrections count as corrections as well" (*ibid.*)[4], we can imagine that in very complex scenarios those series of alterations upon alterations can be represented through a multinodal graph of operations, which stems from the base-layer and branches in connected sequences of alterations. In this way, it's possible

[3] "Alle Änderungen der Grundschicht in Form von Streichungen, Ergänzungen, Umstellungen und ihrer Kombination sind Korrekturen" (GGA 231).

[4] "Alle Änderungen der Korrekturen gelten ebenfalls als Korrekturen" (*ibidem*).

to visually represents the internal structure of the *layers of alterations (Änderungsschichten)* imagined by the editors of the *Akademie-Ausgabe*. As a sort of genetic apparatus, this graph aims to reconstruct the 'degree of kinship' of each alteration in order to render the diachrony of the textual metamorphosis.

2. Textual stages (Textfassungen)

As previously said, the first known stage (Textfassung) of an epigram is the one conveyed by the base-layer. Nonetheless, the editors of the *Akademie-Ausgabe* specify that the same document can contain "several stages of the text resulting from corrections in one stage of the text"[5] (GGA 1961, 224). From this sentence we can infer that each alteration or group of alterations produce a new version of the text, that differs from the previous one and unfolds diachronically. Representing such a process with pen and paper was an almost insurmountable task that the editors tried to manage through a very complex apparatus-system, but not without a loss of readability and user-friendliness of the edition as a whole. *Textfassungen*, evidently, are nothing more than the result of a philological hypothesis, which takes into account the basic ingredients on the page (the base-layer + the alterations) and the deductive process that leads to a hypothetical chronology of their transformations. As Beißner said, this process shows only the "ideal growth"

[5] "Zeugen bestehen entweder aus einer Textfassung oder aber aus mehreren Textfassungen, die durch Korrekturen in der einen Textfassung entstanden sind" (GGA 224).

of the text, not the real one, since "an absolute chronology cannot be obtained […]; the actual process cannot be reconstructed in all its phases" (Beißner 260). Since both the very deciphering of the alterations and the interpretation of the "the capricious and unpredictable line of microchronology of writing" (Biasi 54) are the result of a hermeneutical process from the editor, we call them *readings (Lesarten)*[6]. In this sense, the editor is, against her/his will, the "co-creative interpreter" (Beißner 254) of the manuscript. From a single text carrier can stem different, even competing *readings (Lesarten)* of the base-layer, its alterations as well as the interpretation of the author's workflow, the combination of which can lead to one or more *alternative stages (Alternativfassungen)* of the very same handwritten epigram. The multiple stages of an epigram that are based on different readings of a text written on the same text carrier are signalized through the identification mark of the document in which it is contained and numbered progressively. For the sake of the philological analysis, we can look synoptically at all the *Textfassungen* of an epigram (together with their *Alternativfassungen*) that stem from the alteration process on same text carrier, or we can confront, in traditional way, different Textfassungen of the same epi-

[6] Readings or *Lesarten* are akin to the classical notion of *lectio* as described by Rizzo ("il sostantivo *lectio*, già usato come termine tecnico-filologico nell'antichità […], è il modo di leggere un testo, la 'lezione' sia manoscritta sia congetturale", Rizzo 209) or Grésillon ("résultat d'une opération de déchiffrage ('il existe plusieurs leçons de ce mot') ou de classement génétique ('il fallait revenir à la leçon antérieure du texte pour comprendre la transmission textuelle' Grésillon 245), but further extends the uncertainty of the deciphering process.

gram across the various documents. The first one is a vertical synoptic comparison *(vertikaler Fassungsvergleich*), the second one is a horizontal synoptical comparison *(horizontaler Fassungsvergleich)*.

3. Epigrams (Epigramme)

The sums of all the intradocument (within the document) alterations, along with all the interdocument (between the documents) alterations are then collected under the umbrella term *'epigram' (Epigramm)*, which stands for the abstract entity that contains all stages *(Textfassungen)* that, besides their variability, can be group together in force of their constants[7].

4. Constellations (Konstellationen)

In the end we have the *constellations (Konstellationen)*, which are sets of epigrams. They can be either *material (materielle Konstellation)* or *immaterial (immaterielle Konstellation)*. The material constellations represent a succession of epigrams as they have been written on a text carrier. In other words, the material constellation coincides with the succession of epigrams of the document in its entirety. The immaterial constellations can represent all the sets that are the result of different subsequent ordering attempts from Goethe's hand (we can have up to three/four ordering attempts on a document) or of numerated lists that

[7] "Sie [Textauffassungen] sind durch Textidentität aufeinander beziehbar und durch Textvarianz unterscheidbar" (GGA 224)

for whatever reason never came into fruition/actualization. One example of the latter is a provisional list of epigrams (H58, GSA 25/W 67) that Goethe predisposed for the publication in Schiller's *Musenalmanach* and that has been discarded. Since the *Musenalmanach*-version is the result of collaborative effort between Goethe and Schiller, this kind of document is of utmost importance as it offers us a glimpse of Goethe's own conception of the work's shape in a given moment in time.

Part II - The Digital Model

The model summarized here has been designed to be reusable and generic enough to provide a concrete way of implementing digital genetic editions[8], as it represents the foundation of a set of open-source software tools being developed right for this purpose.

1. Autograph and Snapshot

The autograph text represents the VEdition starting point: for Goethe's epigrams, we effectively start from notebook sheets by the author's hand. There can be several versions of the same epigram in this form, whether they come from a single sheet with annotated variants, or from different sheets, or a mixture of both.

Whatever it is, we call "carrier" the physical support of an autograph text. For Goethe's workbooks, a portion of a sheet, one sheet, or even more sheets referring to every single composition represent a carrier[9].

The main challenge in modeling the content of these carriers is that they do not just represent a linear text; rather, they represent a sort of snapshot[10] of the creative

[8] The following discussion will often refer to the TEI draft encoding model for Genetic Editions and Genetic Editing with the abbreviation TCW19. This document was the product of a Workgroup on Genetic Editions chaired by Fotis Jannidis, a part of the TEI MS SIG, whose chairs are Elena Pierazzo, Malte Rehbein, and Amanda Galley.

[9] This essentially is what is called "document" by TCW19. In the context of a TEI proposal rooted on the encoding of manuscripts, and of generic XML terminology, this makes sense; but in our model we opted for a less generic and widely used term to avoid confusions.

[10] This term essentially corresponds to the layer of the interactive

process which, in the author's mind, would have led to the intended text. So, the carrier is the material support of the snapshot, which potentially contains many versions[11] of a text.

In fact, graphically the snapshot does not just represent a text, but it includes many corrections, rethinking, or refactoring of it, in the form of various types of annotations (deletions, insertions, transpositions, side notes, etc.). The snapshot is thus a sort of picture taken from the author's mind in relation to the text being composed at a given point in time.[12]

The snapshot is thus far from being the carrier of a plain, linear text; often, it's a chaotic bunch of text and annotations on some carrier. It is up to the reader to make sense of these annotations and try to deduce one or more versions of the text from his interpretation. Most annotations represent changes in the text; but there often is no way to know their relative order, or even their selection when

diplomatic rendering cited above and represents its counterpart model on the IT side. As such, it is constantly used in the code and its documentation, and in this more technical section of the paper.

11 In this section of the paper the term "version" is used in the broader sense of any change affecting an input text, during its progressive transformation defined by editing operations. In this context, starting from the base text versions are just the output of each operation, and usually the input for the next one. When following the path defined by such sequences of operations, we can plant a flag at some specific stop along it; in this case that version is marked as a "staged" version. This is what corresponds to the term *Fassung* as used in the first part of this paper.

12 Of course, this does not necessarily imply that the snapshot is the end stage of the creative process underlying the text. The process may well have continued after the state in time frozen by the snapshot.

they represent several competing versions of the text. It is like having all the ingredients (our text with annotations), when we have lost the recipe (how to select and order the annotations to generate the intended version(s)).

When an authoritative version of the final outcome of all these operations in the text is lacking, in a traditional (paper) edition usually we are forced to forge one, representing the best effort in interpreting our carrier's content.

In a digital edition instead, we have the power to handle all the rich and complex data preserved by our snapshot, without resorting to compromises.[13] We can represent all the ingredients (text with annotations), all the recipes (annotation selection and ordering), and all their outcomes (resulting versions), while keeping each as a separate layer, so that everyone can evaluate our text reconstruction, and even provide his own alternatives. This scenario is depicted in Figure 1.

[13] One of the practical criteria suggested for the definition of digital scholarly editions is right the fact that "it is not printable without a major loss of content and functionality" (Sahle 2016 p.38).

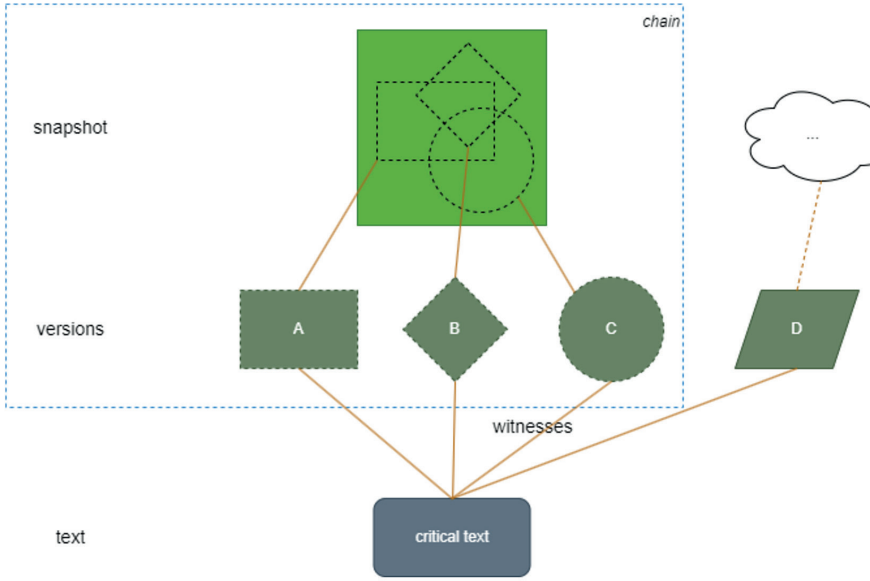

Figure 1 – Essential context of the snapshot model

At the top we find our carrier; its snapshot potentially defines many versions of the text, represented by various shapes inside its rectangle. These versions (A, B, C) are the product of our interpretation of the snapshot. Other versions of what we regard as the same text may come from other sources, whatever their type (D); at any rate, they rest on a second layer. In relation to the critical text, on the third all these versions work as witnesses towards a reconstructive hypothesis[14].

[14] This is not the case of VEdition, as there is no authoritative publication of the text where all these versions would converge. So, in this case we will end up with a collection of multiple versions we might

The scope of our autograph model encompasses the area defined by the bounding dashed rectangle in the diagram: a carrier with a snapshot, which potentially defines many versions of a text. The main requirements of this model are:

1. represent the snapshot itself in a computable way.[15]

2. preserve as distinct, structured data our ingredients (text and annotations), recipes (annotation selection and ordering) and outcomes (text versions).[16]

3. represent the snapshot annotations both in their textual and visual form.

2. Chain

At the core of this model is a general-purpose data structure called "chain"[17]. The task of this data structure is representing multiple linear combinations of a set of entities. We represent these entities as nodes of an acyclic directed graph.

In our specific case, entities are characters, and their linear combinations build a sequence representing a text. So, a chain has the power of representing multiple texts (i.e. multiple versions of what we regard as the 'same' text

name a "synopsis"; and such will be the level above our snapshot for this peculiar edition. Compare TCW19: "there may be more than one final state, e. g. in the case of multiple published texts or unpublished fragments".

[15] Emphasis here is on the process which produced the final version of the text, or multiple parallel versions of the texts, when we have no authoritative endpoint like in the case of VEdition. Compare TCW19: "the genetic approach [...] aims not only to identify 'what is on the page', but also to reconstruct the process necessary to produce <it>".

[16] Compare the distinction between fact and interpretation in TCW19: the record ("Befund") is distinct from its interpretation ("Deutung").

[17] With reference to the terminology defined in the first part of this paper, this data structure essentially provides the alterations layer.

during its composition) at the same time; and this is right what a snapshot on a carrier does.[18]

Consider a mock carrier like the one in Figure 2, created by first writing characters ARZDC, and then making some annotations on it, representing variations of the text.[19]

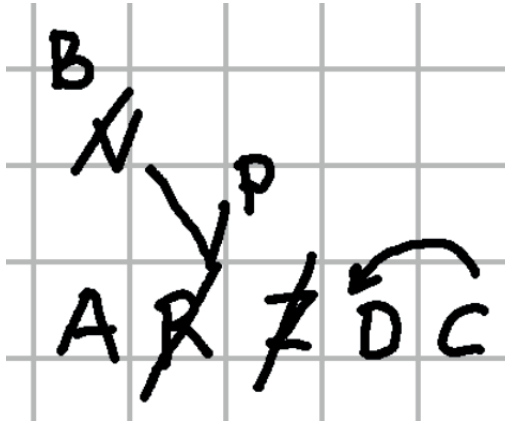

Figure 2 – Facsimile of an imaginary carrier

This snapshot provides annotations which can be interpreted as operations changing the "base text", which is just what happens to be the starting point of our digital representation. This term has no genetic or philological impli-

[18] In technical terms, we could describe this structure as a "tagged multigraph linked list": "linked list", because each node has at most one child in each version of the list; "multigraph", because it allows multiple edges (links) between nodes; and "tagged" because each version of the list (each set of links) has a unique tag.

[19] A text being a linear sequence of characters, we don't care creating a true text in a specific language here; we just deal with such abstract sequences, so that our examples are shorter and to the point.

cation; it is just a practical device. As our model represents multiple versions of what we consider the same text, this means that it represents a set of changes in it, from the first to the last version in the author's mind.[20]

Often, the base text will correspond to what in a relatively tidy snapshot looks like a line in the main flow of text, used as the anchor for annotations. In our diagram, this is the line where I wrote ARZDC. This does not necessarily imply that I first wrote ARZDC, and then all the rest; I might well have written AR, then some of the annotations above it, and then the rest of the letters in the same line (ZDC); or I might have followed any of the other order of actions I could ever imagine for writing the text photographed by our snapshot. This is not relevant here; all what we need is a sequence to start with, and on the grounds of both visual and textual representations (and optionally their meaning, sound, etc., when dealing with a real text) I happen to pick ARZDC.

Having defined our base text, let us now focus on its annotations. These clearly represent operations on the text, which in a visual way led to generating different versions of it:

- the slash on Z represents a deletion operation.
- the slash on R is part of a replacement operation.
- in turn, the slash on V is another replacement operation: here it gets replaced by B. Note that in this case we are

[20] Again, "first" and "last" here don't imply that these are the two edges of the line representing the whole creation process; rather, they are the two edges of the segment in this line which is covered by our snapshot.

nesting an operation on top of another one, which, in turn, happens to be on a branch representing two alternative operations. One branch stems from R, and goes across V up to E; the other one stems from R and goes up to P. It is our interpretation of these visuals which defines these operations, and in some cases even hints at their relative order.

- finally, the arrow on top of DC represents a movement operation.

So, all our annotations can be modeled in terms of operations affecting the chain. This model should be as near as possible to a human-friendly representation and interpretation of our snapshot. This is because operations here essentially belong to the layer of interpretation, and interpretation here is a human fact. Here, we are looking at our snapshot and inferring operations from its visuals.

In fact, what's on our carrier in most cases can be regarded as objective, empirical evidence: we take a photographic image of it, and we could even geometrically represent all its visuals. Conversely, operations are our interpretation of these visuals, and visuals define the ingredients of our lost recipe: the letters of our text, and the operations which change their combinations into sequences.

So far, we have modeled our snapshot and its ingredients: we have letters, and operations on them. Our next challenge is representing a recipe. In our sample snapshot, our ingredients are the base text, and the various editing operations in it.

As we have seen, these operations already imply a level of interpretation; but in most cases this is trivial. The main

issue for interpretation is rather selecting and ordering our ingredients, that is, building a recipe for handling them in a way leading to a final outcome, which in our case is a version of our base text. Of course, recipes are constrained by the number and type of available ingredients; but within these limits, any combination is possible. It is up to the scholar's judgement to consider all the complex factors behind a recipe, and define it, thus generating one or more versions of a text.

At any rate, our model will always include all the ingredients, as we want to fully represent our data at the snapshot level. We do not want any of our interpretations to have destructive effects on our data: just like the snapshot presents all the ingredients mixed together, we want to collect and preserve all of them as distinct entities.

So, we need a model which allows scholars to define a recipe for combining ingredients to get any number of distinct text versions, while still containing all the ingredients in the same box. This is provided by the chain data structure, consisting of a set of text nodes, and a set of edges (links) connecting them. Notice that none of these sets is ordered; it is the link which defines the order of a node in a sequence.

To allow for multiple sequences in the same set, each link has a version tag, which adds the dimension of time to this structure. So, essentially any change on the texts represented by the chain is made by adding new layers of links, where each layer is just defined by the link's tag.

For instance, let us start from our base text, ARZDC: if we represent nodes inside square brackets, and links with

the two characters they connect separated by a colon, the base text (let's call it v0) is:

```
-:A [A] A:R [R] R:Z [Z] Z:D [D] D:C
[C] C:-
```

This means that our chain contains 5 nodes (A, R, Z, D, C) and 6 links (from the left edge to A, from A to R, from R to Z, etc.). All these links are tagged with version v0. Once we have filled the chain's sets, we can generate any of the text versions by just following all the links tagged for that version, starting from the first one.

If now we want to represent another version of the text, as resulting from the deletion of Z, we just add a new set of links for the next version (let's call it v1). This set will be equal to v0, except for the replacement of `R:Z` and `Z:D` with just `R:D`. The effect is bypassing the Z node, short-circuiting the link between R and D, thus 'deleting' Z from the resulting text.

Other operation types, like additions or replacements, also imply the addition of nodes; but for the rest they work the same. A demo UI for this data structure can let you play with operations on it[21], showing among other data also a diagram representing nodes and links in the chain. For instance, Figure 3 shows the set of nodes selected and ordered by v0 links[22].

[21] See gve-demo.fusi-soft.com.

[22] For clarity purposes, the diagram also shows start and end edges as nodes (with left and right triangles), even though these do not really exist in the set.

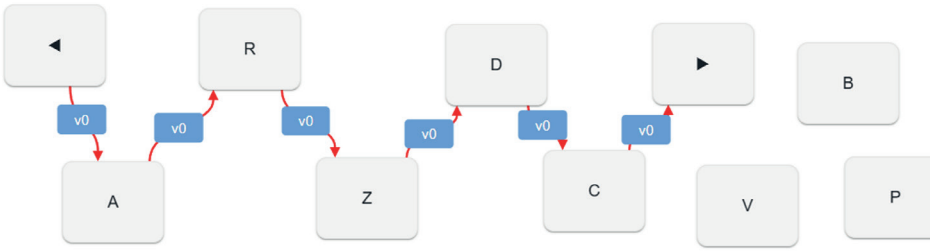

Figure 3 – Graphical representation of v0 nodes and links

Note that some of the nodes are left out from the sequence; they still belong to the nodes set, but they happen not to be used for building the text of v0. This is because they were effectively added later by replacements.

Figure 4 instead shows the last version (v6) produced after all the operations have been executed. To avoid overcrowding the diagram, here we have filtered out links not belonging to v0 or v6.

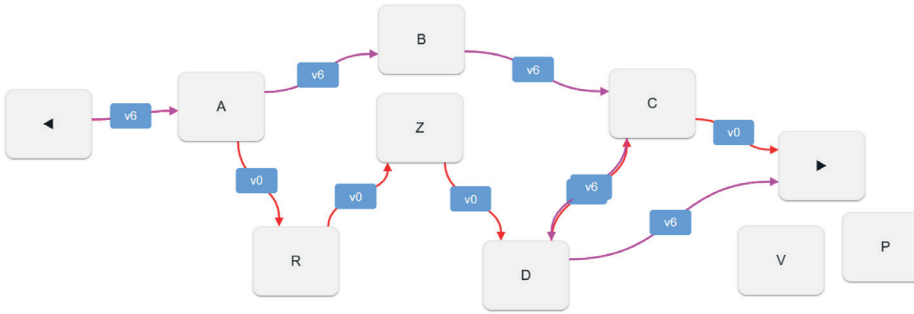

Figure 4 – Graphical representation of v6 nodes and links

If we follow v1 links, we traverse nodes A R Z D C; if instead we follow v6 links, we traverse A B C D. While the nodes set stays the same, our links define the recipe: they tell which nodes to pick from the set, and in which order. If we look at all the versions from v0 to v6 at once, the result appears like in Figure 5.

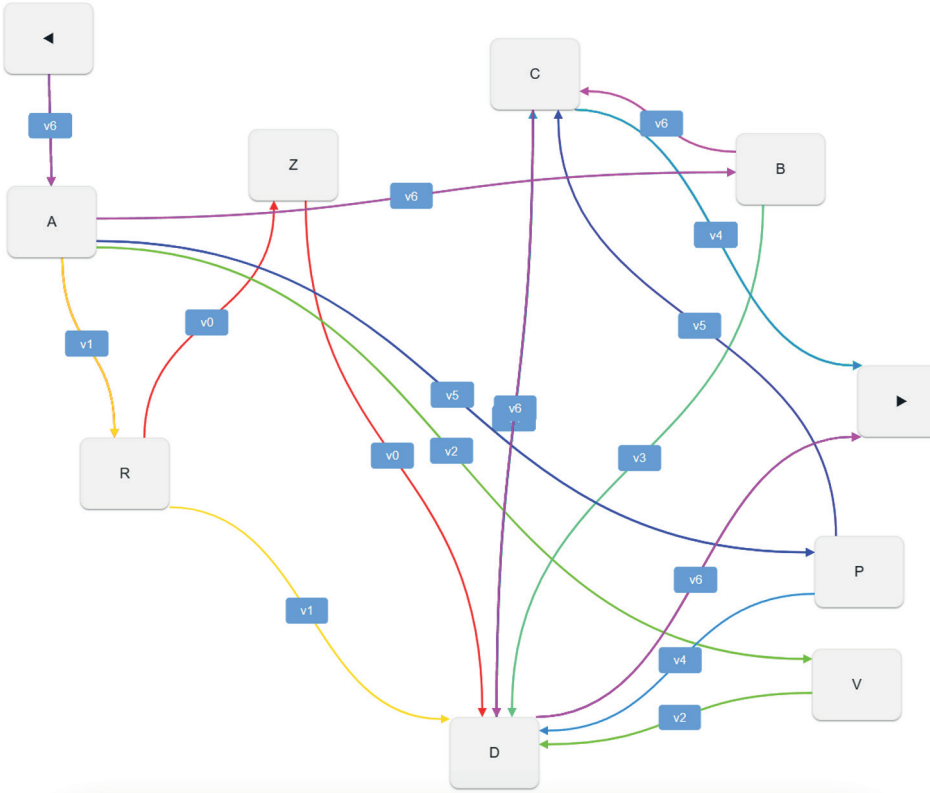

Figure 5 – All the versions in the sample chain

The links now define 7 different versions of our text: v0: ARZDC; v1: ARDC; v2: AVDC; v3: ABDC; v4: APDC; v5: APCD; v6: ABCD.

Whenever we apply an operation to our chain, we get a new version (or step towards a version) out; so, we have the fully detailed text generation process, step by step, as defined by our interpretation. Of course, not all the steps output by this detailed process are eligible for representing what we want to define as a text "staged version"; in our interpretation we extract some stages, while discarding others as just steps between them.[23]

Of course, a graph-based structure applied to text is far from being new[24], and relates to the visualization of aligned segments of texts derived from collation, as well as with the representation of text variants[25]. An interesting example of

[23] Compare TCW19: "When talking about alterations on a textual level, it is the stages of the text which are of major interest. These stages are the results of various alterations applied to the draft; each addition, deletion, substitution etc. is viewed from the perspective of the possibly new text state it yields."

[24] In fact, it could be traced back to Colwell and Tune 1964, as pointed out by Elisa Nury during an exchange with Paolo Monella, to whom I owe this suggestion.

[25] As an example of the former type we can quote TRAViz, a visualization technique providing a set of design rules for representing collated texts, typically stemming from tools like CollateX, aiming at a better and more readable data presentation. To this end, it is based on a direct acyclic graph where nodes are the segments defined by collation, and links represent how they are connected in each witness. Being related to collation often focusing beyond mere graphical variants, TRAViz mostly works with token level segments, while the VEdition chain, aiming at maximum granularity for a diplomatic representation, works with single characters. At any rate, the chain is a generic structure where you can replace its unit with any other object. Rather, the VEdition scenario is different mainly because the

a graph applied to text variants (with a strong technical background) is provided by Schmidt and Fiormonte (2010 and other previous papers). To represent multiple text versions as a generalized problem of representing overlapping structures, a graph is used where nodes are just the void points across which arcs (=links) are drawn. The links carry a text segment, and the identifiers of all the versions presenting it. This fits a scenario focused on a linear text with multiple, parallel segments (Figure 6).

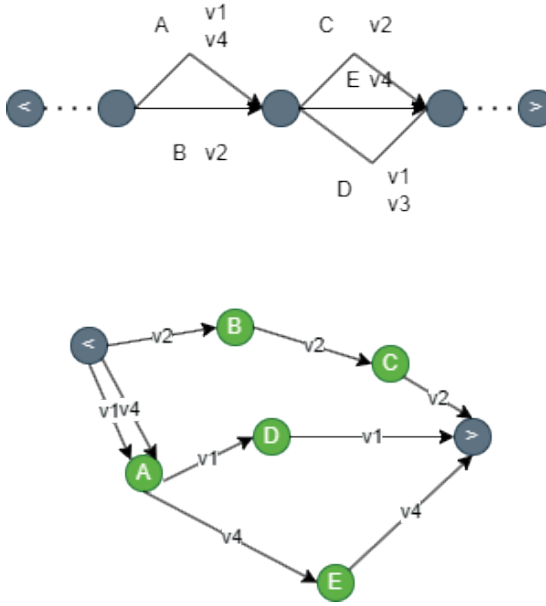

Figure 6 – Comparison of Schmidt & al. and the VEdition chain

focus isn't on visualizing the outcome of collation of various witnesses, but on describing an autograph in operational terms to produce many versions of a text which does not even exist as such, together with all the textual and diplomatic metadata.

In our autograph scenario instead, we focus on distinguishing the interpretation (the version recipe conveyed by links) from the objective representation of its ingredients, represented by nodes and operations. Nodes here are no longer void points on the same line; rather, they are text, as it appears on the carrier, in a set without any predefined order; links are only used to connect them in different ways.

Additionally, in VEdition there is a one-to-one relationship between links and versions: a link cannot refer to many versions and does not contain any text; it just connects text segments[26]. This separation of concerns allows us to decouple the text from its occurrence in variants. By having variant tags in links and text in nodes, we preserve the separation between representation and interpretation. The link belongs to interpretation, our reading of the snapshot. Links build the path connecting any of the nodes in the set, and the text is built by following this path. We introduce links in the chain via edit operations, thus mimicking what we read from carriers in a natural and intuitive way, as the description of the actions supposedly taken by the author in our interpretations.

So, until now we have met the first two requirements of our model: represent the snapshot itself in a computable model, and preserve as distinct, structured data our ingredients, recipes and outcomes (text versions). Yet, we still must address the last one: represent the snapshot annotations both in their textual and visual form.

[26] Text in nodes instead of links is also the approach followed by the CollateX team itself.

3. Metadata

As we have seen, the chain structure is a container of any number of versions of a text, and operations target it by adding new links and optionally new nodes to its set. So, chain operations are abstractions on top of the chain structure.

As operations are the first act of interpretation of our snapshot, we don't limit ourselves to the basic insertion and deletion, but we allow for many higher order operations, which best fit the nuances of our descriptive model, like replace, delete, add or move before or after, swap, etc.

Given that each operation affects the chain producing a different version of the text, we might also need to attach specific metadata to either that version as a whole, or to the nodes affected by it. So, operations can also carry metadata to be attached to their output. For instance, a single operation might be attributed to another person (e.g. a suggestion from Schiller about some change in an epigram), or it might be written using different ink, or receive some additional editorial note about its interpretation.

All the operations thus share a common set of metadata, represented by:

- generic features, an open-ended set modeled as generic name=value pairs. For instance, the ink color of an operation might be represented as a name of color, and a value of red.

- source metadata, specialized to represent the source for the variant implied by a specific operation.

- diplomatic metadata, specialized to represent the visual aspects of an operation on the snapshot's carrier.

Thus, each of the text versions has its set of features, as derived by accumulating them from the various operations which generated it.

4. Diplomatic Data

On the diplomatic side, our model should provide some surrogate graphical representation of the snapshot. Note that this is not a requirement for the textual side of the model; we could just implement this without its graphical counterpart, which might be less relevant or too costly.

The core of the textual model is represented by the chain structure, and by operations acting on it. Each operation is an act executed on the text, in most cases having some graphical representation in the snapshot.

For instance, consider our usual mock snapshot (Figure 7).

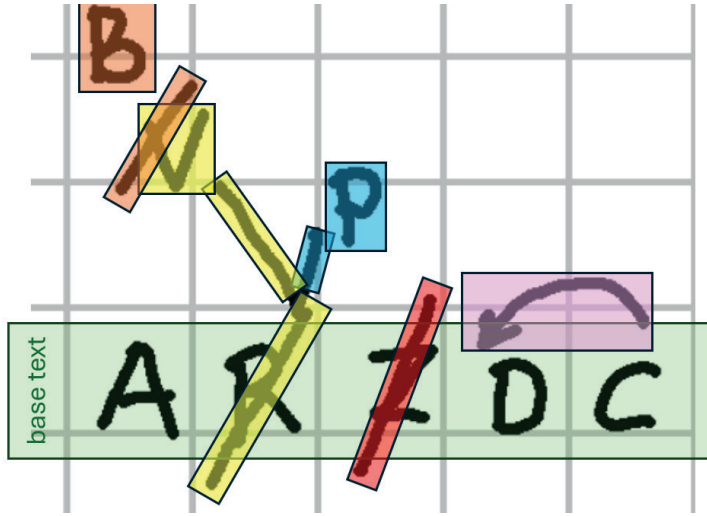

Figure 7 – Visuals for each operation in the example snapshot

Here I have highlighted each portion of visuals with a different color, corresponding to the operations represented by the snapshot:

- the bar on top of Z represents its deletion.
- the bar on top of R, continued to the left up to a V, represents a replacement.
- the bar on top of V and B drawn above it are the visuals corresponding to another replacement.
- the arrow on top of DC represents a movement operation.

At this level of abstraction, any annotation in our snapshot can be graphically represented by a set of visuals, corresponding to any mixture of geometric shapes and/or text, whatever its complexity. As annotations are modeled as operations, this means that we can add the graphical representation of each operation as a set of visuals linked to it. This is essentially what is done by the diplomatic portion of the model, which adds these metadata to operations:

- an SVG g element[27] including all the visuals representing the operation this diplomatic information is attached to. SVG here is the ideal candidate for this graphical representation, because it's a W3C standard for vector and interactive graphics in HTML. As an XML dialect, SVG can represent any geometrical form or text, with all its visual features, just with some text; and this is compatible with both HTML and XML, including of course TEI. Also, it

[27] An SVG g element is a group, which may contain any type and number of shapes or texts, or even other groups. So, a single g element for each operation can represent any complex visuals for it, as a single unit.

can be made interactive and animated by controlling each of its elements via JavaScript.

- an optional set of generic features attached to the operation as a whole and related to its diplomatic aspects. For instance, we might want to add information about ink, size, etc.

- optional features sets specific to any of the SVG elements.

So, this model not only links visuals to each operation, but also attaches optional metadata on the diplomatic side, both to the operation as a whole and to any parts of its visuals.

5. Animation

Additionally, this bidimensional, geometric model can be further extended by adding the dimension of time in the form of animations.

In depicting our interpretations of a snapshot, tracing back text versions to the actions performed by its author, animations can play a significant semantic role. Of course, they belong to the same realm of interpretation we have already distinguished in that model.

Animations can target any visuals, even when they are a subset of the visuals attached to a single operation. In an autograph, visuals accumulate on the snapshot as they get added to it step by step. Once added, unless we aim for some more abstract visualization their place no longer changes. So, introducing animation here is just a matter of animating the transition between a step with existing visuals to another one with additional visuals. A snapshot is a

set of graphical signs on a material support, and once these signs are traced, there is no way of undoing this action. The author can change his mind and graphically represent this by e.g. drawing a stroke on them, or even overwriting them; but once a visual is there, the very fact of its presence cannot be deleted.

At any rate, animations are an optional feature. A snapshot without animations is just a sequence of still frames; whereas one with animations provides transitions between these stills, by means of value interpolation. Metaphorically, this allows moving from a gallery of single shots to a movie. When properly used, such animations convey more meaning rather than just being a fancy addition: they can help in leading the reader's attention to the crucial stages of a transformation happening right before his eyes, thus helping in understanding the evolution of a text along the time axis by using time for this purpose.

User Experience

In the end, the core of the snapshot model described here (Figure 8) is the chain structure, with its character nodes and their links. Links, and optionally new nodes, are injected by editing operations.

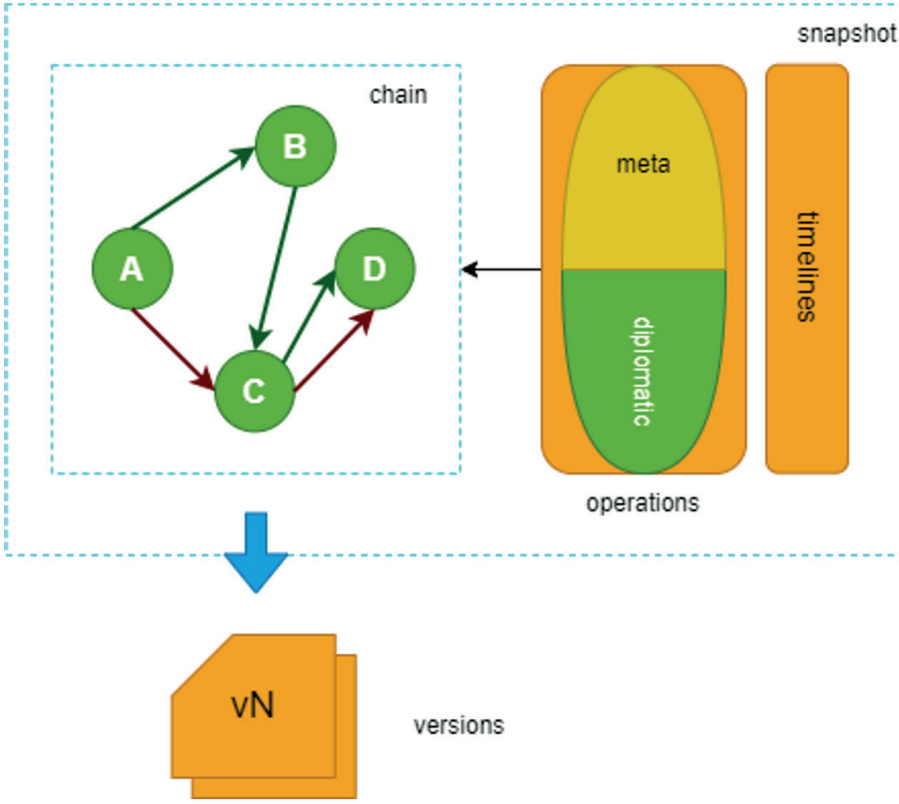

Figure 8 – The snapshot model

Operations are the main interpretative device underlying the generative process, providing recipes to mix our ingredients so that they generate any number of text variants with their annotations. Operations not only alter the text, but also carry metadata about themselves and their effects. Such metadata may also include their visual

representation on the diplomatic side, providing the base for a facsimile with a variable degree of similarity to the image of the carrier. Finally, we can add animations as part of our representation of the generative process leading from one step to another.

On user's end, all what is required to encode autographs in this model is defining a base text and adding as many operations as needed to represent all the variants one might deduce from the observation of the carrier. These ultimately depend on the scholar's judgement, so that here we are adding an interpretative layer on top of a descriptive one. In general, the 'objective' level here is mostly represented by nodes and diplomatic metadata, while the 'subjective' one belongs to operations. Of course, one might argue that in some cases even the descriptive layer may require a level of interpretation, especially when its reading is not clear. This is certainly true, but in most cases the description is trivial enough, and its main purpose is providing the ingredients; it is the recipe which introduces most of the interpretation.[28] At any rate, in our model, metadata also can represent varying levels of uncertainty.

So, in the end the data entry mechanism implemented for this model is a simple UI where users edit opera-

[28] As remarked also in TCW19, "at some possibly simplistic level, everything we say about a text is based on interpretation [...] At the same time, there is an obvious difference between the interpretation that some trace of ink is indeed a specific letter and the assumption that a change in one line of a manuscript must have been made at the same time as a change in another line [...]". Therefore, the proposal focuses talks about differing levels of interpretation, thus differentiating between 'what's there' (document / fact) and 'how does it relate' (text / interpretation)".

tions and all their metadata, including SVG and animation timelines. Once this is done, text versions are generated automatically with all their metadata. This is a rather intuitive process, as users just focus on describing and interpreting the autograph in front of them; all the rest follows automatically.

The user experience in creating such content is thus very simple, thanks to the higher level of abstraction which focuses on a purely logical model, rather than having to deal with intricacies and limitations imposed by a specific physical model, like XML for TEI.[29] This of course does not mean that we are dropping it; but simply that TEI will be an output rather than a starting point. In a sense, here we are reversing the process envisaged in the TEI genetic markup proposal: rather than creating many documents, each with its specialized markup, and later infer the underlying relations by indexing them, we focus on describing the process which automatically generates them.

Once this description has been modeled and stored in the database used for its creation (in our case, via a web application), the TEI output links the generated content to well-established flows for scholarly digital editions, in-

[29] Our model being logical, it does not need to deal with the issues arising from fitting the traditional TEI text-centric perspective to a more document-focused one. In fact, this adds to the markup such a level of complexity that the TEI proposal rightly predicts that "it is highly unlikely that editors will construct and encode genetic graphs by hand". Rather, the proposed process is cyclic, where each carrier gets transcribed in a separate TEI document, annotated with genetic-specific tags, later used to build a partial graph, and then this process is repeated up to the point where the graph is complete.

cluding their publication for end-users, whatever the tool of choice[30].

Looking at Figure 8 again, we can see how the main parts of this model relate to the TEI proposal about genetic editions: in a sense, this is just a higher abstraction model capable of generating the resources defined for it:

- the graph model proposed for TEI for intra-document[31] features is represented by the graph at the core of the chain, as far as annotations to portions of a text version are generated together with the links connecting nodes in different ways.

- the generated staged text versions correspond to multiple TEI "text stages", each typically encoded in a document, using a combination of existing TEI elements and

30 For instance, a recent evolution of the EVT tool has been incorporating features to deal with genetic editions and their visualization, already available to the public in a remarkable installation about Saba's *Canzoniere* at the LETS museum in Trieste. Of course, this implies a solid model for its TEI-based encoding, and I am grateful to Roberto Rosselli Del Turco for sharing the draft of their documentation at the time of finalizing this paper. Ideally, this and other projects aiming to provide reusable tools and flows for publishing digital editions could be easily merged with systems like the one illustrated in this paper, which focuses on facilitating the creation of highly structured content to be later exported and used in well-established production flows. To this end, the full software system behind this model, which for space reasons is not possible to illustrate here, has been designed with a modular and reusable architecture, even in its UI layer, right to foster reuse and integration.

31 For economy reasons, this paper focuses on the snapshot model only. Intra-document relations purposely are outside the scope of the snapshot model, which is kept within the boundaries of the carrier. Comparing text versions arising from each snapshot belongs to an upper layer, and essentially is no different from comparing two witnesses, whatever their origin.

newly proposed ones, probably in stand-off notation.

- the diplomatic metadata of each operation combines to build a full surrogate representation of the "document", representing the TEI "facsimile". Additionally, the use of SVG, not yet elaborated in the original TEI proposal, is here a well-defined part of operation diplomatic metadata.

In our model anyway, users just focus on describing the autograph and the editing operations and annotations read on it, connecting them with the glue of their interpretation. The generation of the resulting text version is then automatic, including their annotations, whatever their physical implementation; and the resulting data is very compact, as it contains the instructions for building all the versions, rather than directly collecting each of them with all their annotations.

Nonetheless, the TEI proposal together with other more recent applications represent the foundation for defining a procedure which will allow the VEdition model to be automatically exported into TEI, which rather becomes any of the potentially unlimited outputs we can generate. Given that many specific targets are still proposals, an additional benefit of this approach is that we can defer TEI encoding to a later stage, while still creating full detailed content. At any point we can generate all the TEI documents at once, either fit any of the encoding practices desired for the representation of the edition's content, in the effort of taking advantage of any specific project to provide reusable and generic solutions and tools for the scholarly community.

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Finito di stampare nel mese di gennaio 2026
per i tipi di Bologna University Press