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A Holonic Approach to Shakespeare:
The Digital Reference System (DRS)

Prefatory Remarks

When hypertext was made available on the Internet after 1994 it shaped the concepts of public domain and free access. The web server and browsing system that Tim Berners-Lee and Robert Cailliau designed, determined the future digital, editorial and cultural developments for traditional audiences and digital natives alike. They quickly became the generalized interface tools and thus contributed to today's editorial standards. As they helped to create this innovative environment called the Internet, they also helped to establish many standards such as URL, URI, HTTP, HTML or XML, which provided interoperability amongst different platforms and allowed internationalization.

Shakespeare's texts became part of the interoperable and open network environment which took off after Grady Ward compiled and distributed a public domain version of the *Complete Works of William Shakespeare*, the so called *Moby Shakespeare*, which has been credited as being the most widely distributed version of *Shakespeare's Works* in the world. The concepts such as *free use*, *fair use* and *worldwide distribution*, including many practical *any platform–applications* significantly increased the added value of the emergent digital environment, providing the opportunity to encode, transcode, clone and distribute the *best* Shakespearean file(s) in digital environment. Gary Taylor and Ian Lancashire have already discussed this issue from an ontological point of view, so we spare the reader a repetition of their arguments.

From a computational perspective, and after analyzing both the functionality and quality of the *Moby Project*, we can say that the main advantage of Grady Ward's proposal is that it allows Internet users to easily access the complete unabridged works of Shakespeare in a digital format (plain text or as TXT), which has produced many important technological advances since it was first published. The disadvantage is that, as David Greetham (348) pointed out, Grady Ward adds "nothing" to the editorial methodology because as a *would-be editor* he used as the most authoritative text the famous *Globe Edition* (1886) edited by W.G. Clark and W.A. Wright. This *ideal* out-of-copyright edition did not improve upon the computational *modern spelling edition* of the *Riverside* Shakespeare's *Complete Works* by Marvin Spevack (digitized with the IBM 7094 in 1969), nor Trevor Howard-Hill's *old spelling* concordances (generated with the English Electric KDF9 also in 1969), nor the *First Folio facsimile* published by Sir Sidney Lee in 1902, which continues to be the most used and popular digital text available for free downloading from the Internet.[1]

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[1] We can also use the *Plays of Shakespeare in XML* by the distinguished engineer John Bosak (in "XML"

In the context of this debate, we undertook an in-depth study of a series of different accessories (also called *para-textual* elements), which have been added throughout time in most of the standard editions, for example the main functional/dramatic characteristics of textual divisions, character headings, stage directions, etc. We compared the main elements of the *sequential line numbering* (SLN) system with the famous *through line numbering* (TLN) system. Having detected their most important inadequacies for today's digital use, which we discuss in the present paper, we developed our own system, which we called either the *key line numbering* (KLN) or the *digital reference system* (DRS)*,* depending on what aspect of the proposal we want to stress.

Standard Abbreviations for Play-Titles

Each time we want to cite, quote or even concord any verse, line or word of any of Shakespeare's plays we usually make use of traditional and accepted devices such as a *sigil* (commonly named abbreviation or textual identifier) for the plays' title (*Tit.* for *Titus Andronicus*; *HAM* for *Hamlet*), followed by act and scene division (I.i. or II.iii.) and line numbers (I.ii.124-127). We have studied exhaustively almost all existing Shakespearean editions to establish the abbreviation methods used throughout time and decided what could be improved to make these textual identifiers more standard, international, bibliographical and digital.[2]

We analyzed different authors and projects to establish how they refer to each of the Shakespearean plays' title and what abbreviations they use. Our study of the traditional and standard abbreviations of Shakespeare's works enabled us to establish the way these alphanumeric notations connect older/print and modern/digital traditions. Following the analysis of different evolutionary sequences of these abbreviations, we created a new method of abbreviating the play titles:

1. Using the original *First Folio* title for each play.
2. Using the following notation:
    a. TN, WT and JC (*two-letter* abbreviations) widely used and unchanged since 1805.
    b. LLL, MND (*three-letter* abbreviations), established by the *New Variorum Shakespeare* (NVS) and used by most editors.
    c. Tmp, MfM, CoE, MoV, ToS, TaC, RaJ, ToA, AaC (*three-letter* abbreviations) and TGoV, MWoW, MAaN, AyLi, AwEw (*four-letter* abbreviations), used to help the reader identify easily the title of each play. Lower-case letters in the abbreviations mean they are pronouns, conjunctions or prepositions.
    d. COR, TIT, MAC, HAM, OTH, CYM *(three-letter* abbreviations for six character names, but all in upper-case.
    e. KJN, KR2, 1KH4, 2KH4, KH5, 1KH6, 2KH6, 3KH6, KR3, KH8 and KLR for all the *Histories* (where "K" stands for "King").
3. Using abbreviation PRE for *Prefatory Materials* (proposed by Stanley Wells, Gary Taylor).

Textual Division: Traditions and Editorial Standards

In the *First Folio* edition we observed the irregular editorial method in relation to the act and scene divisions that has maintained many editors so busy for so long. But only three differentiated variants exist:

- Variant A: 6 plays (2 Histories + 4 Tragedies) with *neither* Act *nor* scene divisions.
- Variant B: 10 plays (6 Comedies + 1 History + 3 Tragedies) with Act divisions *only*.
- Variant C: 20 plays (8 Comedies + 7 Histories + 5 Trag.) with *both* Act and scene divisions.
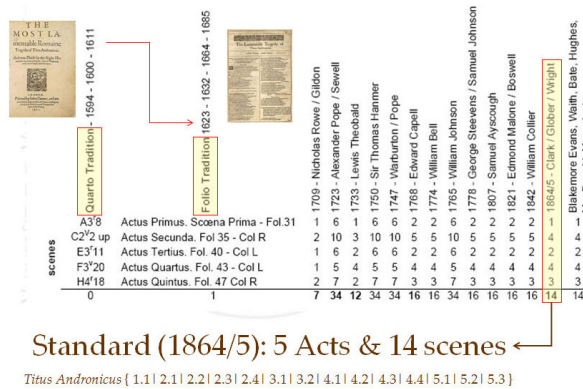
Figure 1: Standardizing the Textual Sequences

In the case of *Titus Andronicus* (see Figure 1),[3] the textual divisions changing through time range from a minimum of 7 scenes (by Nicholas Rowe, 1709) up to the maximum of 34 scenes (by Thomas Hanmer, 1750). The first attempt to establish a textual sequence in Shakespeare's *Plays* was undertaken by W.G. Clark and W.A. Wright in 1860/6 who divided the play into 5 Acts and 14 scenes. This division became the stable structure of *Titus Andronicus* and has remained almost unchanged since.

The *Sequential Line Numbering* (SLN)

Apart from creating the most authoritative textual divisions for each of Shakespeare's play and establishing a general Act and scene standard, W.G. Clark and W.A. Wright contributed also by editing their Shakespeare's *Complete Works* as a *conflated text,* which reads and mixes *Quarto, Folio* and other publishing traditions, trying to establish what is called the *ideal text*. Thus , they created what became the first *virtual text*. They also created a *Sequential Line Numbering* (SLN) system that:

1. Assigned a non-random and unique identifier to each line using a tabular system (they started counting the line numbers of the play at the beginning of the first character's speech, so e.g. the line in *Titus*: "Noble Patricians, Patrons of my right," spoken by *Saturninus* becomes Act I, scene i, line 1).
2. Automatically incremented numeric values that use textual divisions, e.g. in *Titus*: "Defend the iustice of my Cause with Armes," becomes Act I, scene i, line 2 and

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[3] We use *Titus Andronicus* as our copy text, since we worked on its translation while preparing this article.

Saturninus: "Be it so Titus, and Gramercy to." becomes Act I, scene i, the last line 495.

3. They repeat the same counting method every single scene, thus in *Titus*, Act I, scene ii, line 1 is: "Now climbeth Tamora Olympus toppe," said by Aaron.

The *T*hrough *L*ine *N*umbering (TLN)

The next step in developing editorial standards was the famous and now almost unique standard established by Charlton Hinman in *The Norton Facsimile of the First Folio (F1) of Shakespeare: Based on Folios in the Folger Library Collection*, published in 1968. He thought he had produced the best possible *F1 edition* as a result of collating all available copies of the *First Folio* texts kept in the library. The characteristics, but also the main problem of this edition is that it:

1. Idealizes the *First Folio* with the use of the *Collation Machine* with which Hinman generates an inexistent and therefore *virtual* First Folio.
2. Establishes the now famous *Through Line Numbering* (TLN), which is exclusive for each play, and includes stage directions, speech prefixes and any para-textual element of the text. (e.g. *Titus*, Act I, scene i, line 1: "Actus Primus. Scoena Prima" and *Saturninus*: "Noble Patricians, Patrons of my right." becomes Act 1, scene i, line 7.)

Hinman also created a cross-referencing[4] between TLN and SLN which allows both a linear and sequential approach between each part and the whole of the text (see Figure 2).
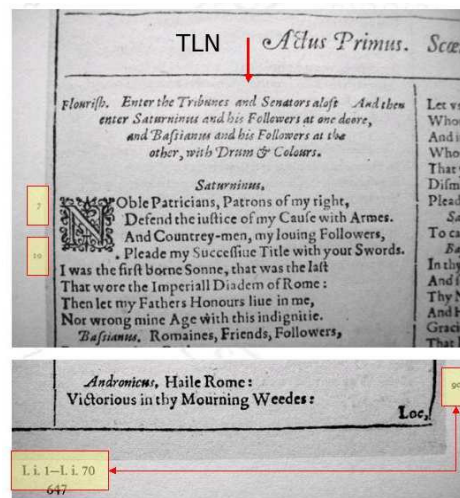

Figure 2: Cross-referencing TLN and SLN

The *F*ixed *L*ine *N*umbering (FLN)

What really helped us establish what we now call our own *Key Line Numbering (KLN)* system was the discovery of the *Lay-Out and Referential Method* introduced by Samuel Ayscough, in his concordance entitled *"An Index to the Remarkable Passages and Words Made Use of by Shakespeare; Calculated to Point out the Different Meanings to Which the Words are Applied"*, published by John Stockdale in 1790, which became the first

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[4] There are two other examples of this type of cross-referencing: the Shakespeare *in-Quarto* facsimiles by James Frederick Furnivall, William Greggs and Charles Praetorius in 1880 and the *First Folio* facsimile first published by Sir Sidney Lee in 1902.

computationally designed concordance. It helped because Ayscough included in his Fixed Line Numbering (FLN) system alphanumeric references to each "Play, Act, Scene, Page, Column and Line" using George Steevens' text (1778) to implement and develop his own edition and concordance. He also started counting by hand all lines of each two-columns page, and for that purpose he used the center space between both columns, which is the solution we followed in our digital system.

Figure 3: Samuel Ayscough's *Fixed Line Numbering* (FLN) system.

Current Problems with Retro-conversion (scanning of printed texts)

Neither the use of computers nor digitizing texts changed the textual or editorial traditions as much as it might have been expected in the late twentieth century. Basically, through the retro-conversion (scanning), the already published printed texts are simply reproduced and most of the times just spell- checked and corrected by hand for a later on-line edition without any major changes. Thus all the advantages that an on-line edition can provide being available and easily accessed by any user are wasted.
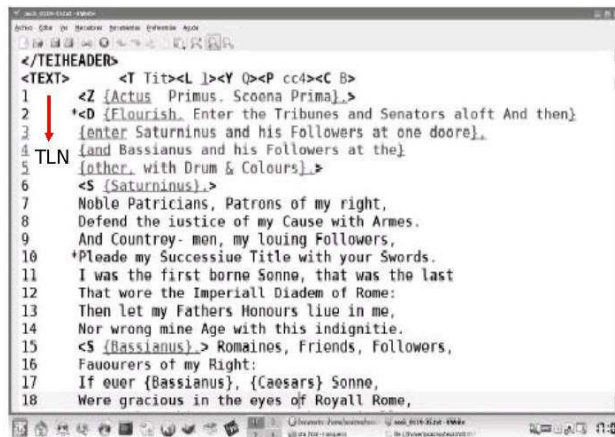

Figure 4: An example of retro-conversion with TLN

The diachronical development of editorial standards that we are discussing here consists of the following stages:

1. Creation of machine readable formats, beginning in 1976 (formats generated in ASCII, TXT, later HTML, etc.).
2. Introduction of mark-up languages (COCOA, SGML, HTML, XML, etc.).
3. The ongoing public debate between what people call *General Editor* of Shakespeare's *Works* (e.g. Stanley Wells, Gary Taylor) vs. *Digital Editor* as they are called (e.g. Lou Burnard, John Lavagnino).
4. Old spelling transcription of the First Folio (e.g. by Sidney Lee) or a modern spelling transcription (e.g. by Jonathan Bate and Eric Rasmussen).
5. Application of different *Line Numbering* systems (TLN and SLN).

The *1623 First Folio object*

We decided to use the 1623 First Folio edition of Shakespeare's *Complete Works* with which, as we assumed, it should have been rather simple to come up with a line numbering method that could work as a digital reference system, which later would allow us to adjust automatically all other reference systems. Besides, everybody agrees that the First Folio is a unique, easy to access and very popular edition of Shakespeare's Works (at least on the Internet). We decided that we only needed to treat the First Folio as an object and not as a text. Until today most of the editors have looked at the First Folio as a transcript of the plays, examining the text only instead of considering also the book and printing conditions of the time. Since we have been editing in an on-line digital media, the fact that the book shall never change has played a fundamental role in establishing our Digital Reference System (DRS).

The first decision was to establish a *Key Line Numbering* of all lines in any given single page. In the case of the *First Folio* **all** the pages are always 66 lines long (if you exclude top play headers, signatures and catchwords, with which we will deal later). There are also always two columns and one rule line. Bearing this in mind, you can refer to any typographic/linguistic item (e.g. verses, ornaments, play titles and *finis*, stage directions, null lines, etc.) with a high-degree of precision. The idea of such a fixed *lay-out* is what allows us to count all the items contained in any single page using just three elements as a single unit, i.e. the left column (L)+ rule line + the right column (R). Figure 5 should help to better visualize what we propose. It presents page A and page B, and on each page a left column (L) and a right column (R). (L) pages carry page numbers justified to the left (we call them *Key*, as each one is a unique page number throughout all of the *First Folio*) and the *Title of the Play* is centered on both pages. At the bottom of the left page there is a *catchword* justified to the right; it is used to link with the first word of the next page, as happens with the *catchword* of the right page.
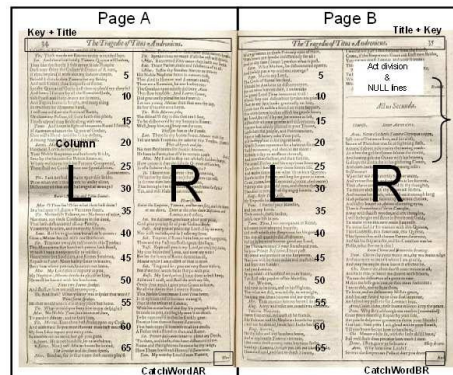

Figure 5: Fixed lay-out for our *Key Line Numbering*

To illustrate our *Key Line Numbering* system we now will apply it to page 31 of *Titus Andronicus* (which is the title page of the play). We know that *Titus* occupies pages from 31 to 52 of the *First Folio* edition (pages 647 to 668 in Charlton Hinman's *facsimile*). The total number of pages is 21, and thus the total numer of columns is 42 (21 left / 21 right columns). The line numbering, if we follow the first line in the *Sequential Line Numbering* (SLN), starts with the first verse line of the first character who speaks (*Saturninus*) and thus W.G. Clark and W.A. Wright counted a total number of 70 lines for this page. Charlton Hinman, follows Ronald B. McKerrow's proposal and, using the *Through Line Numbering* (TLN) system, starts counting at the stage direction *Actus Primus [...]* and from there to the last verse line of the page there is a total of 91 lines. As here we are dealing with a title page, to be accurate we have to count from bottom to top, because through that change/inversion we can maintain the exact line account independently of how many printed lines the play header, play title, act and scene or stage directions occupy in each single play (as, of course, it varies from play to play). Therefore, in our *Key Line Numbering* (KLN) we start on this page counting from the bottom to the top of the page, obtaining a total of 48 lines per column (48 L / 48 R), with a total number of 96 lines on the page. The line numbering of page 30 can be counted in a regular way as it is the page of the end of *The Tragedy of Coriolanus*. The word *FINIS* occupies 11 lines but we still count 66 lines for the whole page.
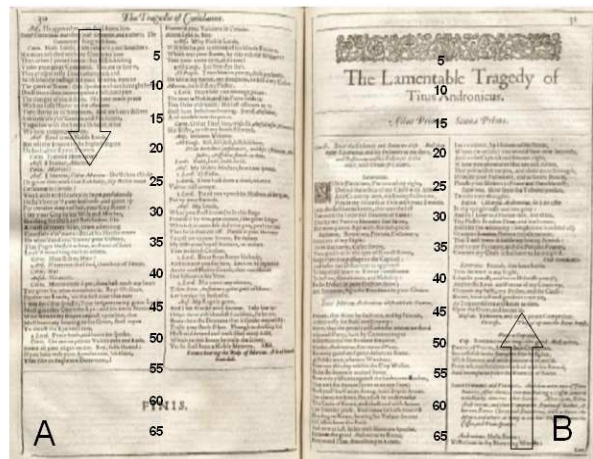

Figure 6: First reading of the *First Folio* as a digital reference frame

Another difference between our system and Hinman's and Ronald B. McKerrow's system is presented on the example of page 35 of *Titus* (see Figure 5). In his *facsimile* Hinman included both data sets: the *SLN* and the *TLN*. With the *SLN* the count goes from I.i.1 to I.i.429 and II.i.1 to II.i.46 (counting each Act and scene independently) and with the TLN the page 35 is reproduced by the text counted as lines 478 to 602. If you subtract: 602 - 478 = 124 lines, which is the extension of the second textual division (Act II, scene i).[5]

According to our *KLN* proposal, we count a total number of 132 lines (66 lines in column L and 66 in column R) on page 35. On this page we find 20 speech headings (10 in column L and 10 in column R), 4 stage directions and we count 6 null lines (0 in column L and 6 in R). Null lines, in this case, appear due to the textual division of the "Actus Secunda" of the *First Folio*. The pages that follow the fixed layout of 66 lines per page represent 97% of the pages contained in the *First Folio* edition and therefore can be easily referenced with our proposed method. However, the question remains how many pages do

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[5] In the case of the SLN, we cannot determine the total number of lines unless we see the physical edition, as the lay-out of the page determines the final quantity of lines, which varies depending on each page and depending on the place the textual division was included.

not follow this fixed layout or how many are different in their layout so that our system could not be applied? In the case of Charlton Hinman's *First Folio* edition, for example, except for 17 pages with *Prefatory Materials*, and 3 pages of *Actors' Names*, 2 pages for the *Prologve*, 2 for the *Epilogve* and 4 empty pages, which amounts to 28 pages of a total of 908 pages. As these 28 pages represent only 3% of the total, where our proposal could not be easily applied we follow Charlton Hinman's method only for these pages.

Another surprising feature of our method occurs when we look at the 36 title pages. We explained already (see Figure 6) that these 36 pages are receiving a special treatment due to their peculiarities and variations in line extension. We cannot start counting at the top line of the page, therefore we just reverse the counting method and we use the rule lines that have been printed to determine the length of the page, thus we can count all items in any given title page counting from bottom to top. *Titles*, *act and scene divisions*, *text ornaments* and the *blank spaces* could be translated into regular lines or, alternatively, be counted as *null* lines depending on our needs, but in any case, they do not alter the global line count of the method.

Our Digital Reference System

What we want to achieve with our proposal of a *digital reference system* (DRS) is to integrate all existing line numbering and reference systems, adding all options and advantages that the hypertextual and linkable environment of the Internet provides. Samuel Ayscough's *Fixed Line Numbering* (FLN) provides a method to link and retrieve any line of his edition, but he did not follow the original *Folio* lines. Charlton Hinman did follow the *Folio* text with his *Trough Line Numbering* (TLN) method, included a cross-referencing method to the *Sequential Line Numbering* (SLN) proposed by W.G. Clarck and W.A.Wright (see Figure 2), but ignored the *Folio* as object with a fixed and unchangeable layout[6].

For Ronald B. McKerrow the *absolute line numbering* (ASL) is a referential method to organize an "ideal" *Folio* line numbering system. He took

> the typographical lines of the *First Folio* as our standard and print opposite to every tenth line of our text the number of the line of the First Folio, we should get a numbering of the lines which can be used by any other editor or commentator and may reasonable be regarded as permanent. (60-62)

Our proposal provides a unique identifier both for a textual database as well as for a fixed method to use the *First Folio* as a referential object. In our system we are integrating our *Key Line Numbering*, by cross-referencing with Hinmann's *Through Line Numbering (TLN)*, which also includes the *Sequential Line Numbering* (SLN). In a practical example of our DRS, the notation for page 35 of the *Folio* edition of *Titus Andronicus* translates the first text line into six database domains, where three are optional and three (bold) enough to establish a unique identifier of any line of any play.

- *TIT.* + p.35 + I.i + **647** + **L** + **25** = *Noble Patricians, Patrons of my right,* *(Abbreviation of the play) + (Folio page number) + (Standard Textual Division) +* ***Charlton Hinman's F1 page number* + *column* + *line***. Comparatively it equals: *Tit I.i.1* (in SLN) or *Tit I.i.7* (in TLN).

The previous line in the *Folio* (*Saturninus' speech heading*) has no reference in the SLN method and becomes line number 6 in the TLN, while in our method it would be **647 + L + 24**. The stage direction from **647 + L + 20** to **647 + L + 23** has no reference in the SLN system

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[6] Modern variorum editors, following H.H. Furness' methods, use a dual model and include both line numbering systems in their archives: SLN (W.G. Clark and W.A. Wright) and TLN (Charlton Hinman).

and equals I.i. 2-5 in the TLN.

Conclusions

Having analyzed the existing reference systems, which are widely accepted and used, we established our own proposal. Although international standards such as the *Modern Language Association* (J. Gibaldi, 222 and Abbreviations 6.7.2) or the *New Variorum Shakespeare* (R. Knowles, 133-134) try to establish a regular and coherent abbreviation system, the results still depend on the editorial policies and/or textual resources of each publishing house or editorial team.

Regarding the textual division, the first proposal by W.G. Clark and W.A. Wright is still considered standard today, though through the retro-conversion to the digital media it is being maintained without providing rationalization of the system as such. In our case this textual division is optional; it provides us with the possibility of linking our method with previously established and standardized reference systems. The *First Folio* can be read as a whole or split into conventional parts (Acts and scenes), thus following the SLN method.

Verbal indexers, lexicographers and concordance builders were the first who established the relations between the play (*whole*) and the verse line (*part*), and exploited the interrelation and feedback between the whole and the part to better understand each play (*part*) in relation to the complete works (*whole*). This gave birth to an alphanumeric analytical approach in textual scholarship and facilitated the innovative literary criticism based on statistical and computational methods.

Our *Key Line Numbering* (KLN) system develops out of and is based on the previous *Fixed Line Numbering* (FLN) system, but due to the *First Folio* object layout, it allows us to combine the typographic/linguistic codes with the bibliographic codes, thus overcoming the limitations that we detected in both the SLN and the TLN systems. In both systems the physical reality of the *First Folio* is ignored. The *Folio* can be described as consisting of a text printed in an unalterable and unchangeable format which consists of 66 lines per page divided into two columns.

With our method we try to materialize Ronald B. McKerrow's abstract *Absolute Line Numbering* (ALN), which can be now, thanks to the digitalization process, made into a reality. Owing to the digital environment our typographical/editorial possibilities have become infinite, precise, programmable and versatile. Our artificial intelligence, like a counting method, comes very close to R.B. McKerrows permanent and absolute requirement. Thanks to its flexible application we can account for ALL elements (words, lines, speeches, etc.), including ALL ornaments, rule lines, null lines and play titles.

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