

Editing Italian Madrigals in the Digital World: The Tasso in Music Project

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Abstract

Despite the interdisciplinary nature of the Italian madrigal—a genre in which poetry and music often stand on equal footing—critical editions of this repertoire tend to focus primarily on the *musical* text, devoting limited attention to the often-complex philological tradition of the poems set to music. Likewise, most critical editions are devoted to the works of a single composer—as opposed to settings of the same poetry by multiple composers—and thus offer a rather segmented perspective on the repertoire, which is not conducive to the study of musical traditions and to comparative analysis. This paper proposes a new model for critical editions of this repertoire, one in which musical *and* poetic texts are devoted equal attention. To do so, we will provide an overview of a digital project that follows this model, namely the Tasso in Music Project (www.tassomusic.org), showing how it draws on both musical (Humdrum, MEI) and textual (TEI) encoding systems to render the interdisciplinary nature of its repertoire.

Introduction

One of the distinctive features of the Italian madrigal is that it is as much about poetry as it is about music. Composers would often respond to the literary taste of their milieu by engaging in sophisticated renditions of poetry by notable authors, ranging from Petrarch to Marino. This poetry frequently had a distinguished textual tradition of its own, being widely disseminated through literary manuscripts and prints before it was set to music. This strong literary component is underrepresented in critical editions of the madrigal repertoire. These are typically devoted to the works of single composers—as opposed to settings of the same poetry by multiple composers—and feature critical apparatuses that rarely engage with the complex textual traditions of the poems set to music. This approach to making critical editions of Italian madrigals is a function also of the limitations of the printed medium, which typically does not allow for complex critical apparatuses encompassing both the musical and the literary tradition. Furthermore, the printed medium has historically been resistant to collaboration between musicologists and literary scholars, which would instead be desirable if one were to engage with the interdisciplinary nature of Italian madrigals.

Drawing on the possibilities afforded by digital encoding, the Tasso in Music Project¹—the first complete edition of the early modern musical settings of poetry by Torquato Tasso (1544–1595)—provides a different approach to editing Italian madrigals and related genres. Indeed, the project is poet-centered and devotes equal attention to the musical and poetic realms, thanks also to collaboration between music and literary scholars. The goal of this presentation is to provide an overview of the musical and poetic repertoire under consideration and, most importantly, to illustrate the digital features that allow users of the Tasso in Music Project fully to appreciate the interdisciplinary nature of its repertoire. These features include musical encodings and renderings in Humdrum and MEI/Verovio, TEI literary encodings, and tools for the analysis of music-text relations. In doing so, this presentation seeks to provide an alternative model for critical editions of Italian madrigals, one that could be adapted also to other vocal repertoires.

1 www.tassomusic.org

Repertoire

Torquato Tasso (1544-1595) was arguably the most prominent poet of late sixteenth-century Italy. His works, most notably the epic poem *Gerusalemme liberata* (Jerusalem Delivered), achieved tremendous fame in literary circles, shaping the poetic culture of the time. Tasso's influence extended also well beyond the literary realm. Indeed, his poems became a source of inspiration for visual artists and, most importantly, for composers, among whom they became true hits. From the 1570s through the 1630s, virtually all composers of secular vocal music in Italy and Europe, including notable ones like Luca Marenzio and Claudio Monteverdi, set one or more of his poems, producing a total of over 750 settings [1, 2]. Composers were especially drawn to Tasso's lyric poems, collectively known as *Rime*, whose conciseness and wit reflected the taste for *concettismo* typical of the time and offered opportunities for equally clever musical renditions [3], but also proved fond of Tasso's *Gerusalemme* and the pastoral drama *Aminta*, whose dramatic features resonated with a growing tendency toward quasi-operatic styles in secular vocal music around 1600. As is typical with repertoire from this period, however, the majority of these settings, over three quarters, have been unavailable in modern editions. As a result, this significant corpus of works has remained largely unexplored in both scholarship and performance, which has in turn hindered a serious assessment of Tasso's influence on early modern musical culture.

Funded by a three-year NEH Scholarly Editions and Translations Grant (2016–19) and scheduled for completion in 2020, the Tasso in Music Project fills this lacuna through a complete digital edition of the extant settings of Tasso's poetry. Carried out by a team of musicologists, literary scholars, and digital humanities experts from North America and Europe,² the project provides open online access to one of the largest digital editions of early modern music, complemented by a rich literary component and tools for analysis. Representing the work of over 200 composers, the project provides a snapshot of secular vocal music in an age in which it underwent profound transformations. Accordingly, it lends itself especially well to comparative analysis and to the study of emulation among composers. Likewise, this corpus provides fertile ground for the study of music-text relations.

Web infrastructure

The website is created using a static site generator, Jekyll,³ and is hosted on Github Pages.⁴ Unlike other site generators, Jekyll is integrated into Github Pages. Therefore, the compiling of the website from source files occurs transparently and behind the scenes, allowing non-technical developers to edit content without the need to know how to regenerate the website from the source files.

Dynamic content is rendered with Handlebars.⁵ This is a templating system that generates content on the fly within a user's web browser, as opposed to Jekyll, which can only prepare static textual content. Metadata is stored as text files in the ATON format,⁶ which is then converted into JSON data in the user's browser. This conversion provides lookup tables of the metadata used in template filling within Handlebars. An advantage of ATON over JSON is that there is less formatting structure, which allows for easier editing by non-technical users. In addition, it enables comments, so that internal documentation of the data can be contained within each metadata file. Use of Jekyll/Handlebars/ATON mimics the older, more centralized web architecture of PHP.⁷ However, it allows for a serverless implementation of the website, which enables better security, long-term stability, and rapid adaptation to faster generation of web pages, as dynamic content is created within a user's web browser, rather than on the remote web server.

The raw files are stored in a Github repository,⁸ and metadata is collected into a single directory/folder for ease of curation and long-term maintenance as a set of text files.⁹ Metadata for musical settings of each liter-

2 <https://www.tassomusic.org/about/participants>

3 <https://www.jekyllrb.com>

4 <https://pages.github.com>

5 <https://handlebarsjs.com>

6 <http://aton.sapp.org>

7 <https://www.php.net>

8 <https://github.com/TassolnMusicProject/tasso-website>

9 <https://github.com/TassolnMusicProject/tasso-website/tree/gh-pages/data/indexes>

ary genre is stored in separate files,¹⁰ and separate lookup tables are provided to minimize metadata redundancy in the data files, such as the composer index file¹¹ and the RISM sources list.¹² Initial entry of metadata is usually done using Google Spreadsheets, and smaller ATON metadata files such as the composer and RISM indexes are generated automatically from the spreadsheet files.¹³ Spreadsheet files could be directly loaded into web browsers, bypassing storage in ATON files, by using the TSV export functionality from Google Spreadsheets.¹⁴ This would simplify metadata management for non-technical developers, but loading data this way is slightly slower and is less stable for long-term management of the website, since metadata content would be dependent on an external source from the website.

Musical editions

The Tasso in Music Project provides newly made critical editions of the extant early modern settings of Tasso's poetry, for a total of over 750 scores. A detailed description of the editorial policies (source choice, editorial accidentals, formatting of the text underlay, etc.) is available on the website.¹⁵ The musical scores are initially entered in a graphical music editor (either Finale or Sibelius, depending on the preference of the editors). Data is then saved in MusicXML and converted in Humdrum, which is the project's main music encoding system. There are bugs and complications when exporting from both Finale and Sibelius. For instance, Finale does not correctly export elision characters, which need to be replaced with underscores. Sibelius does not correctly encode visual accidentals on recurrent pitches within a measure, which requires post-processing editing.

MusicXML files are converted either individually using Verovio Humdrum Viewer,¹⁶ or converted in batches on the command line with *musicxml2hum*¹⁷ and then with *tassoize*¹⁸ to refine the music representation. Certain musical features such as figured bass are edited manually in the conversions. Figured bass is entered as lyrics in the graphical notation editors, and then transformed from lyrics to figured bass data within the final Humdrum encoding. Metadata from the ATON files on the website as well as original clefs and mensuration information are added in the final processing.¹⁹ Although the critical editions are encoded in Humdrum, the project's primary and archival encoding system, they are available for consultation and download in a variety of electronic encodings and renderings, such as MEI, MusicXML, Musedata, MIDI, PDF and MP3 for use in various software systems and applications.

The final scores are rendered into graphical music notation using Verovio²⁰ and displayed on work pages.²¹ Music notation is generated dynamically within the webpage, allowing for interactive notational features such as part extraction, highlighted notes for dynamic playback and searches, switching to original clefs/mensurations, removing lyrics, and collapsing the full score to an incipit. The graphical scores are rendered online with the JavaScript version of Verovio and displayed directly within the webpage as an SVG image, with additional conversion to PDF for downloading. Data links to Verovio Humdrum Viewer²² are also provided for online editing of the scores, such as preparation for performance, with exports of Humdrum data as MEI or PDF files [4].²³

10 <https://github.com/TassoInMusicProject/tasso-website/blob/gh-pages/data/indexes/rime-settings.aton>, <https://github.com/TassoInMusicProject/tasso-website/blob/gh-pages/data/indexes/gerusalemme-settings.aton>, <https://github.com/TassoInMusicProject/tasso-website/blob/gh-pages/data/indexes/aminta-settings.aton>, and <https://github.com/TassoInMusicProject/tasso-website/blob/gh-pages/data/indexes/other-settings.aton>.

11 <https://github.com/TassoInMusicProject/tasso-website/blob/gh-pages/data/indexes/composers.aton>

12 <https://github.com/TassoInMusicProject/tasso-website/blob/gh-pages/data/indexes/sources.aton>

13 <https://docs.google.com/spreadsheets/d/1YcaAQc-mxFFDWyOst7H0lwZkEqB4rPEuOzXCMTKprMc/edit#gid=2068334514>

14 docs.google.com/spreadsheets/d/1YcaAQc-mxFFDWyOst7H0lwZkEqB4rPEuOzXCMTKprMc/export?gid=2068334514&format=tsv

15 <http://www.tassomusic.org/about/policies>

16 <http://doc.verovio.humdrum.org>

17 <https://github.com/craigsapp/humlib/blob/master/src/tool-musicxml2hum.cpp>

18 <https://github.com/craigsapp/humlib/blob/master/src/tool-tassoize.cpp>

19 <https://github.com/TassoInMusicProject/tasso-scores/blob/master/bin/fillinrefinfo> for inserting metadata, and <https://github.com/TassoInMusicProject/tasso-scores/blob/master/bin/addoriginal> for inserting original clefs and mensuration signs.

20 <https://www.verovio.org>

21 <https://www.tassomusic.org/work/?id=Trm0047m>

22 <https://verovio.humdrum.org>

23 A sample edition can be viewed at <http://www.tassomusic.org/work/?id=Trm0862a>

Musical scores are stored in an independent repository from the website,²⁴ which allows for a more stable long-term maintenance of the scores (for example, the website could be reimplemented in the future). Individual scores are stored by literary genre, with a separate digital score in each file.²⁵ Filenames start with the Tasso in Music Project catalog number for automatic processing of the scores. The catalog number is then followed by title, composer, and publication data for readability and ease of data management. For example, Ruggiero Giovannelli's 1588 setting of "Non è questa la mano" (*Rime* 47) is catalogued as follows:

Trm0047m-Non_e_questa_la_mano--Giovannelli_1588.krn. Scores are archived in the Humdrum file format, with metadata pulled automatically from the ATON files into the scores and stored in reference records:²⁶

```
!!!COM: Giovannelli, Ruggiero
!!!CDT: ~1560-1625/01/07
!!!OTL: Non è questa la mano
!!!PTL: Fiori musicali, libro secondo
!!!PPP: Venice
!!!PPR: Vincenzi & Amadino
!!!PDT: 1588
!!!PUB-format: anthology
!!!AGN: Madrigal
!!!SCT: Trm0047m
!!!SCA: Trm0047m
!!!rime: 47
!!!original-voices: 3
!!!extant-voices: 3
!!!complete: Y
!!!final: G
```

Literary variants

In addition to musical editions, the Tasso in Music Project features quasi-diplomatic TEI transcriptions of the poetic texts as they appear in the musical sources and in contemporaneous literary sources, both manuscript and printed. Variants in the poetic texts are marked-up and rendered online, facilitating a real-time assessment of the textual tradition. This apparatus caters to the research interests not only of music historians, but also of literary scholars and linguists. For instance, music historians may use it to assess possible relationships (or lack thereof) between settings of the same poem. A case in point is the *madrigale libero* "Tarquinia, se rimiri" (*Rime* 560), which was set by seventeen composers.²⁷ Sixteen composers set a version of the poem in which the opening line reads "Mentre, mia stella, miri," found also in two literary manuscripts (**A3**, **E7**) and in all literary prints, attesting to the extensive lineage of this *lectio*. In a setting published in 1571, however, Ferrarese composer Luzzasco Luzzaschi set a substantially different version of the poem, whose opening line diverges from both the musical and the literary tradition, as it reads "Mentre l'ardenti stelle." This case is particularly interesting because of Luzzaschi's proximity to Tasso, who had joined the Ferrarese court in 1565. As Newcomb and Piperno have suggested, Luzzaschi may have had access to an early version of the poem that did not find its way into the later literary tradition [5, 6].

24 <https://github.com/TassoInMusicProject/tasso-scores>

25 https://github.com/TassoInMusicProject/tasso-scores/blob/master/Trm/kern/Trm0047m-Non_e_questa_la_mano--Giovannelli_1588.krn.

26 <https://www.humdrum.org/reference-records>

27 <http://www.tassomusic.org/variants/?id=Trm0560>

Literary Variants

Tarquinia, se rimiri (*Rime* 560)

<p>Literary Manuscripts</p> <p>A3</p> <p>C</p> <p>E7</p> <p>F2</p> <p>E1</p> <p>Literary Prints</p> <p>S8</p> <p>S9</p> <p>S11</p> <p>S12</p> <p>S13</p> <p>S15</p> <p>S20</p> <p>S24</p> <p>S33</p> <p>S67</p> <p>S141</p> <p>S145</p> <p>S166</p> <p>S169</p>	<p>Luzzasco Luzzaschi</p> <p><i>Il primo libro de' madrigali a cinque voci</i></p> <p>Ferrara: De' Rossi, 1571</p> <p>RISM: L 3122</p> <p>p. 34</p> <p>Mentre l'ardenti stelle</p> <p>Con due più chiare e belle Tarquinia contemplate, Il ciel esser vorrei Per poter la beltate, Che tutta non appare, Ahi deboli occhi miei Con mille altri in un sol sguardo mirare.</p>	<p>Concordances</p> <p>Trm0560a:TQ</p> <p>Mentre l'ardenti stelle</p> <hr/> <p>Variants</p> <p>A3, E7, S145, S8, S9, S11, S12, S13, S15, S20, S24, S141, S166, S33, S67, S169, Trm0560b:CATBQ, Trm0560c:CATBQ, Trm0560d:CATBQS, Trm0560e:CAB, Trm0560f:CABQ, Trm0560g:CATQ, Trm0560h:CATBQ, Trm0560i:ATQ, Trm0560j:CATBQ, Trm0560k:CAT, Trm0560l:T, Trm0560m:CB, Trm0560n:CATB, Trm0560o:CATBQ, Trm0560p:CATBQ, Trm0560q:AB</p> <p>Mentre mia stella miri Mentre mia stella, miri Mentre, mia stella, miri</p> <hr/> <p>C</p> <p>TaTarquinia mentre miri</p> <hr/> <p>E1, F2</p> <p>Tarquinia se rimiri</p> <hr/> <p>Trm0560g:B</p> <p>Mentre mia stella [TACET]</p> <hr/> <p>Trm0560k:B</p> <p>[TACET]</p>
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Figure 1: Literary variants for “Tarquinia, se rimiri” (*Rime* 560)

This tool for the study of literary variants can also point to possible manipulations of literary texts by composers. A notable example is that of Monteverdi’s rendition of the *madrigale libero* “Al lume delle stelle” (*Rime* 246), which, as Tim Carter has pointed out, features two additional lines that do not appear in any of the extant literary and musical sources [7].²⁸

28 <http://www.tassomusic.org/variants/?id=Trm0246>

Literary Variants

Al lume delle stelle (*Rime* 246)

Literary Manuscripts	Claudio Monteverdi <i>Il settimo libro de madrigali a 1, 2, 3, 4 e 6 voci</i> Venice: Magni, 1619 RISM: M 3494 p. 19	Concordances Trm0246d:Q luci care e serene
Literary Prints		Variants S28, S49, S141, S166, S169, Trm0246a:CATBQS, Trm0246b:CATB, Trm0246c:CTBQS
S28		[OMITTED]
S49		Trm0246d:TB
S141	<i>A 4. Doi Soprani Tenore & Basso</i>	[TACET]
S166	[TACET] [TACET] Si dolea lagrimando in questi accenti.	
S169	[TACET] [TACET] [TACET] luci care e serene sento gl'affanni hoime sento le pene luci serene e liete Sento le Fiamme lor mentre splendetete.	
Musical Sources		
Trm0246b >		
Trm0246c >		
Trm0246a >		
Trm0246d >		
Canto		
Tenore		
Basso		
Quinto		

Figure 2: Literary variants for “Al lume delle stelle” (*Rime* 246)

The diplomatic transcriptions of the poetic texts and the marked-up variants are encoded in TEI, using a schema developed specifically for the Tasso in Music Project by Raffaele Vigiante (Maryland Institute for Technology in the Humanities, University of Maryland). Like the musical data, the content for textual variants, too, is stored in ATON files.²⁹ These are arranged by poem, with metadata and diplomatic transcriptions drawn from each literary and musical source for that poem.³⁰ Below, for example, is data from the literary manuscript **A3** for the poem “Tarquinia, se rimiri” (*Rime* 560):

```

@@BEGIN: VARIORUM
@CATALOGNUM: Trm0560
@ID: A3
@TYPE: manuscript
@SMSIGLUM: A<sub>3</sub>
@PAGE: 263v-264r
@PARATEXT:
@VERSE:
    {Mentre mia stella miri}
    {l bei celesti giri}
    {Il ciel esser vorrei}

```

²⁹ <https://github.com/TassoInMusicProject/tasso-website/tree/gh-pages/data/variorum>

³⁰ For a sample ATON file (“Tarquinia, se rimiri,” *Rime* 560), see <https://github.com/TassoInMusicProject/tasso-website/blob/gh-pages/data/variorum/Trm0560.aton>

```

{Perche ne gl'occhi miei}
{Fiso tu rivolgessi}
{Le tue dolci faville}
{lo vaghegiar potessi}
{Mille bellezze tue con luci mille}.
@@END: VARIORUM

```

The @VERSE section of the entry contains the lines of poetry with analytic markup. The curly braces ({} indicate variants regions across sources. All poem entries must contain the same variant markup structure. The entries are then compiled automatically into TEI files, with a separate file for each source entry in the originating ATON file,³¹ with each directory of TEI files representing one of the source ATON files.³²

```

<?xml version="1.0" encoding="UTF-8"?>
<?xml-model href="tassotei.rng" type="application/xml" schematypens="http://relaxng.orgns/structure/1.0"?>
<TEI xmlns="http://www.tei-c.org/ns/1.0">
  <teiHeader>
    <fileDesc>
      <titleStmt>
        <title>Tarquinia, se rimiri</title>
      </titleStmt>
      <publicationStmt>
        <publisher></publisher>
        <availability status=""></availability>
        <idno type="local">A3</idno>
      </publicationStmt>
      <sourceDesc>
        <msDesc xml:id="A3">
          <msIdentifier>
            <region>Italy</region>
            <settlement>Milan</settlement>
            <repository>Biblioteca Ambrosiana</repository>
            <idno>I.149 inf.</idno>
          </msIdentifier>
          <msContents>
            <msItem>
              <locus>f. 263v-264r</locus>
              <p>miscellaneous codex, containing copies of 21 lyric poems by Tasso</p>
            </msItem>
          </msContents>
          <history>
            <origin>
              <origDate>16th&#x2013;17th centuries</origDate>
            </origin>
          </history>
        </msDesc>
      </sourceDesc>
    </fileDesc>
  </teiHeader>

```

31 Such as <https://github.com/TassoInMusicProject/variorum/tree/master/data/Trm0560>.

32 Such as <https://github.com/TassoInMusicProject/variorum/edit/master/data/Trm0560/A3.xml>.


```

<text>
  <body xml:space="preserve">
    <div type="dedication">
      <p xml:id="p1"></p>
    </div>
  </div>
  <lg>
    <l xml:id="l1"><seg xml:id="l1v1">Mentre mia stella miri</seg></l>
    <l xml:id="l2"><seg xml:id="l2v1">l bei celesti giri</seg></l>
    <l xml:id="l3"><seg xml:id="l3v1">Il ciel esser vorrei</seg></l>
    <l xml:id="l4"><seg xml:id="l4v1">Perche ne gl'occhi miei</seg></l>
    <l xml:id="l5"><seg xml:id="l5v1">Fiso tu rivolgessi</seg></l>
    <l xml:id="l6"><seg xml:id="l6v1">Le tue dolci faville</seg></l>
    <l xml:id="l7"><seg xml:id="l7v1">Io vaghegiar potessi</seg></l>
    <l xml:id="l8"><seg xml:id="l8v1">Mille bellezze tue con luci mille</
    seg>.</l>
  </lg>
</div>
</body>
</text>
</TEI>

```

The ATON and TEI encodings contain the same information, although additional information about the manuscripts is inserted from separate ATON metadata files based on the manuscript ID. Note that line breaks in the @VERSE content are significant, and they are mapped to <l xml:id="l1"> elements that contain each line in the TEI encodings. The variant markup, represented through curly braces, is mapped to <seg xml:id="l1v1"> elements. TEI elements such as <l> and <seg> are automatically assigned IDs based on the line and variant number on the line, which are automatically calculated from the sequence of lines and variants within the source ATON data. TEI markup that cannot be automatically generated is embedded directly within the verse lines, such as the use of to indicate deleted (crossed-out) text in the manuscript source. For example, the ATON line from the **C** manuscript source for "Tarquinia, se rimiri" (*Rime* 560)

```
{<del>Ta</del>Tarquinia mentre miri}
```

Is converted into the TEI content:

```
<l xml:id="l1"><seg xml:id="l1v1"><del>Ta</del>Tarquinia mentre miri</seg></l>
```

In principle, variant markup could be automatically generated. In practice, however, this could never become a closed system, since exceptions cannot be enumerated. Therefore, for the project, we decided on manual markup of the variants. The lines as they appear in each source are collated adjacently, enabling quick reference and efficient variant markup.¹ Below is the ATON file collation of the opening line of "Tarquinia, se rimiri" (*Rime* 560):

ID:A3	L9	V1:	{Mentre mia stella miri}
ID:C	L28	V1:	{TaTarquinia mentre miri}
ID:E1	L47	V1:	{Tarquinia se rimiri}
ID:E7	L65	V1:	{Mentre mia stella miri}
ID:F2	L84	V1:	{Tarquinia se rimiri}
ID:S8	L136	V1:	{Mentre, mia stella, miri}

¹ For each line of *Rime* 560, see: <https://github.com/TassoInMusicProject/tasso-website/blob/gh-pages/data/variorum/diff-input/Trm0560.txt>

ID:S9	L155	V1:	{Mentre, mia stella, miri}
ID:S11	L174	V1:	{Mentre, mia stella, miri}
ID:S12	L193	V1:	{Mentre, mia stella, miri}
ID:S13	L212	V1:	{Mentre, mia stella, miri}
ID:S15	L231	V1:	{Mentre, mia stella, miri}
ID:S20	L250	V1:	{Mentre, mia stella, miri}
ID:S24	L269	V1:	{Mentre, mia stella, miri}
ID:S33	L287	V1:	{Mentre mia stella, miri}
ID:S67	L305	V1:	{Mentre mia stella, miri}
ID:S141	L324	V1:	{Mentre, mia stella, miri}
ID:S145	L343	V1:	{Mentre mia stella miri}
ID:S166	L362	V1:	{Mentre, mia stella, miri}
ID:S169	L380	V1:	{Mentre mia stella, miri}
ID:Trm0560a-Alto	L398	V1:	{Mentre l'ardenti stelle}
ID:Trm0560a-Tenore	L417	V1:	{Mentre l'ardenti stelle}
ID:Trm0560a-Quinto	L436	V1:	{Mentre l'ardenti stelle}
ID:Trm0560b-Canto	L455	V1:	{Mentre mia stella miri}
ID:Trm0560b-Alto	L474	V1:	{Mentre mia stella miri}
ID:Trm0560b-Tenore	L493	V1:	{Mentre mia stella miri}
ID:Trm0560b-Basso	L512	V1:	{Mentre mia stella miri}
ID:Trm0560b-Quinto	L531	V1:	{Mentre mia stella miri}
ID:Trm0560c-Canto	L550	V1:	{Mentre mia stella miri}
ID:Trm0560c-Alto	L569	V1:	{Mentre mia stella miri}
ID:Trm0560c-Tenore	L588	V1:	{Mentre mia stella miri}
ID:Trm0560c-Basso	L607	V1:	{Mentre mia stella miri}
ID:Trm0560c-Quinto	L626	V1:	{Mentre mia stella miri}
ID:Trm0560d-Canto	L645	V1:	{Mentre mia stella miri}
ID:Trm0560d-Alto	L664	V1:	{Mentre mia stella miri}
ID:Trm0560d-Tenore	L683	V1:	{Mentre mia stella miri}
ID:Trm0560d-Basso	L702	V1:	{Mentre mia stella miri}
ID:Trm0560d-Quinto	L721	V1:	{Mentre mia stella miri}
ID:Trm0560d-Sesto	L740	V1:	{Mentre mia stella miri}
ID:Trm0560e-Canto	L759	V1:	{Mentre mia stella miri}
ID:Trm0560e-Alto	L778	V1:	{Mentre mia stella miri}
ID:Trm0560e-Basso	L797	V1:	{Mentre mia stella miri}
ID:Trm0560f-Canto	L816	V1:	{Mentre mia stella miri}
ID:Trm0560f-Alto	L835	V1:	{Mentre mia stella miri}
ID:Trm0560f-Basso	L854	V1:	{Mentre mia stella miri}
ID:Trm0560f-Quinto	L873	V1:	{Mentre mia stella miri}
ID:Trm0560g-Canto	L892	V1:	{Mentre mia stella miri}
ID:Trm0560g-Alto	L911	V1:	{Mentre mia stella miri}
ID:Trm0560g-Tenore	L930	V1:	{Mentre mia stella miri}
ID:Trm0560g-Basso	L949	V1:	{Mentre mia stella [TACET]}
ID:Trm0560g-Quinto	L968	V1:	{Mentre mia stella miri}
ID:Trm0560h-Canto	L987	V1:	{Mentre mia stella miri}
ID:Trm0560h-Alto	L1006	V1:	{Mentre mia stella miri}
ID:Trm0560h-Tenore	L1025	V1:	{Mentre mia stella miri}
ID:Trm0560h-Basso	L1044	V1:	{Mentre mia stella miri}
ID:Trm0560h-Quinto	L1063	V1:	{Mentre mia stella miri}
ID:Trm0560i-Alto	L1082	V1:	{Mentre mia stella miri}
ID:Trm0560i-Tenore	L1101	V1:	{Mentre mia stella miri}

ID:Trm0560i-Quinto	L1120	V1:	{Mentre mia stella miri}
ID:Trm0560j-Canto	L1139	V1:	{Mentre mia stella miri}
ID:Trm0560j-Alto	L1158	V1:	{Mentre mia stella miri}
ID:Trm0560j-Tenore	L1177	V1:	{Mentre mia stella miri}
ID:Trm0560j-Basso	L1196	V1:	{Mentre mia stella miri}
ID:Trm0560j-Quinto	L1215	V1:	{Mentre mia stella miri}
ID:Trm0560k-Canto	L1234	V1:	{Mentre mia stella miri}
ID:Trm0560k-Alto	L1253	V1:	{Mentre mia stella miri}
ID:Trm0560k-Tenore	L1272	V1:	{Mentre mia stella miri}
ID:Trm0560k-Basso	L1291	V1:	{[TACET]}
ID:Trm0560l-Tenore	L1310	V1:	{Mentre mia stella miri}
ID:Trm0560m-Canto	L1329	V1:	{Mentre mia stella miri}
ID:Trm0560m-Basso	L1348	V1:	{Mentre mia stella miri}
ID:Trm0560n-Canto	L1367	V1:	{Mentre mia stella miri}
ID:Trm0560n-Alto	L1386	V1:	{Mentre mia stella miri}
ID:Trm0560n-Tenore	L1405	V1:	{Mentre mia stella miri}
ID:Trm0560n-Basso	L1424	V1:	{Mentre mia stella miri}
ID:Trm0560o-Canto	L1443	V1:	{Mentre mia stella miri}
ID:Trm0560o-Alto	L1462	V1:	{Mentre mia stella miri}
ID:Trm0560o-Tenore	L1481	V1:	{Mentre mia stella miri}
ID:Trm0560o-Basso	L1500	V1:	{Mentre mia stella miri}
ID:Trm0560o-Quinto	L1519	V1:	{Mentre mia stella miri}
ID:Trm0560p-Canto	L1538	V1:	{Mentre mia stella miri}
ID:Trm0560p-Alto	L1557	V1:	{Mentre mia stella miri}
ID:Trm0560p-Tenore	L1576	V1:	{Mentre mia stella miri}
ID:Trm0560p-Basso	L1595	V1:	{Mentre mia stella miri}
ID:Trm0560p-Quinto	L1614	V1:	{Mentre mia stella miri}
ID:Trm0560q-Alto	L1633	V1:	{Mentre mia stella miri}
ID:Trm0560q-Basso	L1652	V1:	{Mentre mia stella miri}

Since this poetic line reads differently across sources, the entire line is marked as a variant. Each line of the variant editing file contains four fields: the ID of the source, a line number in the ATON file for the poem that the verse line occurs on, the line number in the poem, and then the transcription of the line as it appears in the source. The line information is used to re-insert the edited variant text for the line back into the primary source file for the variants of the poem.

In the final display of variants, as illustrated in Figure 1, hortographical and punctuation variants are automatically grouped together and counted as concordances:

Mentre mia stella miri
Mentre mia stella, miri
Mentre, mia, stella, miri

By mousing over a source in the right column, however, users are still able to trace the concordant readings of the text exactly as they appear in their respective sources, as shown in the figure below for literary print **S20**.

Concordances

E7, S145, S8, S9, S11, S12, S13, S15,
[S20](#), S24, S141, S166, S33, S67, S169,
 Trm0560j:CATBQ, Trm0560k:CATBQ,
 Trm0560l:T, Trm0560m:CB,
 Trm0560n:CATB, Trm0560o:CATBQ,
 Trm0560p:CATBQ, Trm0560q:AB

S20: Rime, et prose del S. Torquato Tasso.
 Parte prima. Di nuovo reviste, et corrette, con
 aggiunta di quanto manca nell'altre edittioni,
 Giulio Vasalini, Ferrara, 1583. Variant text:
 Mentre, mia stella, miri

Mentre mia stella miri
 Mentre mia stella, miri
 Mentre, mia stella, miri

Figure 3: Display of concordant readings by source

Search tools

Enabled by Humdrum, a music encoding system that is especially conducive to computational analysis [8], musical and textual searches can be run both at the level of the individual work and across the repertoire.¹ The latter type can be especially useful for corpus studies, given the breadth and diversity of the project's repertoire. The results of the repertoire-wide searches can be ranked in a variety of ways, with links to the individual works in which the searched musical patterns (pitch, interval, rhythm) or text are automatically highlighted.

¹ <http://www.tassomusic.org/search>

Music search
Text search

Repertory: Rime ⌵

search ? 🔄

GABCDE
Enter interval
Enter rhythm

146 matches in 79 works:

Count	Composer	Title
12	Pallavicino, B.	Passa la nave tua che porta il core (Rime 1245)
5	Agostini, L.	Picciola verga e bella (Rime 202)
4	Pallavicino, B.	Io non posso gioire (Rime 23)
4	Vittori, L.	Geloso amante apro mill'occhi e giro (Rime 99)
4	Virchi, P.	Non fonte o fiume od aura (Rime 137)
4	Bozi, P.	Amatemi, ben mio (Rime 288)
4	Vignali, F.	Bella e vaga brunetta (Rime 373)
4	Marenzio, L.	Sul carro de la mente auriga siedì (Rime 553)
4	Felis, S.	Voi sete bella, ma fugage e presta (Rime 1022)
3	Veggio, G. A.	D'aria un tempo nudrimmi, e cibo e vita (Rime 159)
3	Nielsen, H.	Mentre i dipinti augelli (Rime 241)
3	Gastoldi, G. G.	Occhi leggiadri e belli,/Nel vostro dolce nero (Rime 272)
3	Bonini, P. A.	Già tu volasti quattro volte e sei (Rime 289)
3	Marenzio, L.	O verdi selve, o dolci fonti, o rivi (Rime 309)
3	Marenzio, L.	Là dove sono i pargoletti Amori (Rime 1021)
2	Marenzio, L.	Su l'ampia fronte il crespò oro lucente (Rime 3)
2	Giovannelli R	Non à questa la mano (Rime 47)

Figure 4: Results of a repertoire-wide pitch search

Benedetto Pallavicino Passa la nave tua che porta il core (Rime 1245)

▶ 🔍 t o | C A T V B
Transpose (none) ⌵ GABCDE text search... ?

Prima parte.

Canto: Pas - sa la na - ve tua che por - - - - -

Alto: Pas - sa la na - ve tua che por -

Tenore: Pas - sa la na - ve tua che por -

Quinto: Pas - sa

Basso: Pas - sa

Figure 5: Results of the above pitch search highlighted in the Verovio score

Tools for analysis

The project features several Humdrum-enabled tools that facilitate analysis of the repertoire, with an emphasis on music-text relationships. For instance, a text-extraction tool allows users to visualize the text as it appears in the underlay of the settings, with automatic counting of the occurrences of words.² This tool highlights the importance of word repetition in this repertoire and allows users to quickly identify key words.

Canto

La bella e vagha man, <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man> che le **sonore** Corde, <che le **sonore** Corde,> hor leggiera e presta, e prest'hor tarda e grave Percuote e son ne trahe, <e son ne trahe> vario e soave, soave, E'l dolce canto tuo che form'amore, E'l dolce canto tuo, <E'l dolce canto tuo> che form'amore, <che form'amore,> Percuote e son ne trahe, <e son ne trahe vario e soave, soave, E'l dolce canto tuo che form'amore, E'l dolce canto tuo, <E'l dolce canto tuo> che form'amore, che form'amore.

Alto

La bella e vagha man, <La bella e vagha man,> <La bella e vaga man,> La bella e vagha man, <La bella e vagha man,> <La bella e vagha man,> La bella e vagha man, che le **sonore** Corde, che le **sonore** Corde, <che le **sonore** Corde, hor leggiera e presta, <e presta,> presta, presta, prest'hor tarda e grave, tardda e grave Percuote e son, Percuote e son ne trahe vario e soave, Percuote e son ne trahe vario e soave, E'l dolce canto tuo che form'amore, E'l dolce canto tuo, E'l dolce canto tuo che forma, che form'amore, Percuote e son, Percuote e son ne trahe vario e soave, Percuote e son ne trahe vario e soave, E'l dolce canto tuo che form'amore, E'l dolce canto tuo, <E'l dolce canto tuo> che form'amore, che form'amore.

Tenore

La bella e vagha man, <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> La bella e vagha, La bella e vagha man che le **sonore** Corde, <che le **sonore** Corde,> <che le **sonore** Corde> e preta, presta, <presta, prest'hor tarde e grave, tarda e grave Percuote e son ne trahe vario e soave, Percuote e son ne trahe vario e soave, E'l dolce canto tuo, E'l dolce canto tuo che form'amore, che form'amore, Percuote e son ne trahe vario e soave, Percuote e son ne trahe vario e soave, E'l dolce canto tuo, <E'l dolce canto tuo> che form'amore, che form'amore.

Quinto

La bella e vagha man, <La bella e vagha man,> La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man> che le **sonore** Corde, che le **sonore** Corde, <che le **sonore** Corde> e presta, presta, prest'hor tarda e grave, tarda e grave Percuote e son ne trahe, <e son ne trahe> vario e soave, soave, E'l dolce canto tuo, <E'l dolce canto tuo> che form'amore, che forma, che form'amore, Percuote e son ne trahe, <Percuote e son ne trahe> vario e soave, soave, E'l dolce canto tuo, <E'l dolce canto tuo> che form'amore, che forma, che form'amore.

Basso

La bella e vagha man, <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man,> <La bella e vagha man> che le **sonore** Corde, <che le **sonore** Corde,> Hor leggiera e presta, presta, prest'hor tarda e grave vario e soave, Percuote e son ne trahe vario e soave, E'l dolce canto tuo che form'amore, E'l dolce canto tuo che forma, che form'amore, vario e soave, Percuote e son ne trahe vario e soave, E'l dolce canto tuo che form'amore, E'l dolce canto tuo che forma, che form'amore.

Word frequencies

sort numerically data

Count	Word	Count	Word	Count	Word	Count	Word	Count	Word	Count	Word
23	amore	24	e'	31	la	5	prest'	13	sonore	24	tuo
32	bella	23	form'	14	le	11	presta	6	tarda	1	vaga
24	canto	5	forma	3	leggiera	1	preta	1	tardda	31	vagha
41	che	8	grave	31	man	20	soave	1	tarde	16	vario
13	corde	8	hor	18	ne	20	son	18	trahe		
24	dolce	24	l	17	percuote						

Figure 6: Text extraction for Sebastiano Raval's "La bella e vaga man che le sonore" (*Rime* 862)

Likewise, a melisma tool allows users to study the occurrence of melismatic writing across the repertoire, ranked by composer or melisma score and with links to the dynamic scores in which the melismas are automatically highlighted.³

² <http://www.tassomusic.org/lyrics/?id=Trm0862a>

³ <http://www.tassomusic.org/analysis/melisma/>

Melisma analysis

► Description

Sort by:

Trm0202a

Composer: Agostini, Lodovico / 1582

Title: *Picciola verga e bella* (rime 202)

Score: 20.9% of notes are in a melisma, C (C I): 25.2%, VI (C II): 25.2%, A (C III): 21.1%, V: 22.5%, T: 19.9%, B: 10.2%

View: [2+ notes](#), [3+ notes](#), [4+ notes](#), [5+ notes](#)

Words: C (C I): [verga](#), [trionfale](#), [cresci](#), [rinverde](#), [novella](#), [errori](#), [dolci](#), [amori](#)

VI (C II): [bella](#), [cresci](#), [rinverde](#), [verde](#), [errori](#), [errori](#), [amori](#)

A (C III): [bella](#), [d'alloro](#), [cresci](#), [pianta](#), [verde](#), [errori](#), [amori](#)

V: [cresci](#), [pianta](#), [verde](#), [errori](#), [amori](#), [errori](#), [pargoletti](#), [amori](#)

T: [verga](#), [cresci](#), [eguale](#), [amori](#)

B: [bella](#), [bella](#), [onde](#), [rinverde](#), [pargoletti](#)

Figure 7: Melismatic analysis of Lodovico Agostini's "Picciola verga e bella" (Rime 202)

The figure shows a musical score for six vocal parts: C (C I), VI (C II), A (C III), V, T, and B. The lyrics are: "le, Cre - sci_a la pian - ta, on - de sei svel - ta_e - le, Cre - sci_a la pian - ta_on - de sei svel - ta_e - le, Cre - sci_a la pian - ta, <Cre - sci_a la pian - ta, Cre - sci_a la pian - ta_on - de sei svel - ta_e - gua - le, Cre - sci_a la pian - ta_on - de sei svel - ta_e -". Red highlights indicate melismas in the vocal lines.

Figure 8: Highlighted melismas in the Verovio score of Agostini's "Picciola verga e bella" (Rime 202)

Equally useful for the statistical study of music-text relations is the ranking of the settings by their music/text ratio, that is, a comparison of the length of the musical settings expressed in minims (half-notes) versus length of the poems expressed in number of syllables. This allows users to determine how rapidly composers move through a poetic text, or, conversely, how much they indulge in setting it to music.⁴ The example below points to a composer whose music-text ratio is consistently low, namely Filippo di Monte, whose Tasso settings stand out for their musical compactness, achieved by eschewing textual/musical repetition and extensive word painting.

4 <http://www.tassomusic.org/analysis/syllable>

1.17	104	89	Trm0047o	Monte	1591	4/2	<i>Non è questa la mano</i>
1.16	108	93	Trm0048e	Monte	1590	4/4	<i>Amor l'anima m'allaccia</i>
1.49	128	86	Trm0075d	Monte	1591	4/2	<i>Poiché madonna sdegna</i>
0.85	76	89	Trm0090b	Monte	1588	4/2	<i>Mentre nubi di sdegno</i>
0.88	120	137	Trm0093b	Monte	1591	4/2	<i>Disdegno e gelosia</i>
1.65	124	75	Trm0165e	Monte	1591	4/2	<i>Vorrei lagnarmi a pieno</i>
1.49	112	75	Trm0166f	Monte	1591	4/2	<i>Se taccio, il duol s'avanza</i>
1.14	176	154	Trm0183d	Monte	1591	4/2	<i>Di nettare amoroso ebro la mente</i>
0.96	100	104	Trm0257a	Monte	1588	4/2	<i>Ardi, Amor, se ti piace</i>
1.27	100	79	Trm0279a	Monte	1591	4/2	<i>Al discioglier d'un groppo</i>
1.56	100	64	Trm0284e	Monte	1591	4/2	<i>Questa vostra pietate</i>
1.31	80	61	Trm0333g	Monte	1590	4/2	<i>Gelo ha Madonna il seno</i>
1.35	92	68	Trm0342e	Monte	1591	4/2	<i>Già fu dolce mia speme</i>
1.25	192	154	Trm0366a	Monte	1586	4/2	<i>Odi, Filli, che tuona; odi che 'n gelo</i>
1.32	204	154	Trm0380a	Monte	1591	4/2	<i>Viviamo, amianci, o mia gradita Jelle</i>
0.96	148	154	Trm0389b	Monte	1586	4/2	<i>Donna, se ben le chiome ho già ripiene</i>
1.4	216	154	Trm0395c	Monte	1586	4/2	<i>In un bel bosco leggiadre fronde</i>
1.54	88	57	Trm0418g	Monte	1586	4/2	<i>Ardi e gela a tua voglia</i>
1.8	108	60	Trm0560h	Monte	1591	4/2	<i>Tarquinia, se rimiri</i>
0.78	120	154	Trm0592a	Monte	1588	4/2	<i>Negli anni acerbi tua purpurea rosa</i>
1.05	108	103	Trm0602c	Monte	1590	4/2	<i>Caro amoroso neo</i>
1.2	120	100	Trm0611n	Monte	1591	4/2	<i>La bella pargoletta</i>
1.16	92	79	Trm0614h	Monte	1590	4/2	<i>Al vostro dolce azzurro</i>
1.32	104	79	Trm0615b	Monte	1586	4/2	<i>Al tuo vago pallore</i>
2.16	332	154	Trm0865a	Monte	1590	2/1	<i>Deh! perché amar chi voi con pari affetto</i>
0.99	152	154	Trm1688d	Monte	1589	4/2	<i>Padre del cielo, or ch'atra nube il calle</i>

Figure 9: Filippo di Monte's music-text ratio

Due to limitations of processing all scores in a timely manner, the raw data for analysis pages is typically processed offline and can be seen on the website's Github repository.⁵ This raw data is then transformed into more readable results on the analysis webpages.⁶

Conclusions

Through its content, as well as through its digital features, the Tasso in Music Project benefits a wide audience encompassing music historians and theorists, literary scholars, linguists, performers, and more generally anyone with an interest in the intersection of music and poetry. In addition, the project provides a new model for editions of Italian madrigals, one that restores the centrality of poetry in this repertoire. The project also offers a model for the possible integration of music and textual encoding in a single platform, which could be adopted for editions and repositories of other vocal repertoires, ranging from opera to Lied. Our future plans for the project will focus on the expansion of its interdisciplinary scope through the development of additional tools for the study of music-text relations. These will include tools for the study of the relationship between the prosody of the poetic texts (accented and unaccented syllables, primary and secondary accents) and rhythmic durations, as well as the relationship between literary and musical syntax (e.g., the musical treatment of enjambments).

⁵ <https://github.com/TassoInMusicProject/tasso-website/tree/gh-pages/analysis>

⁶ <https://www.tassomusic.org/analysis>

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