Rebecca Fiebrink and Anna Zayaruznaya

Reimagining the facsimile: project report on 

The Future (and the Past) of the Facsimile

The Bodleian Library’s Ms. Canonici misc.213 is covered in greyish-beige cloth; the Chigi codex has a red binding. Both are printed in black-and-white. These are, of course, descriptions of the facsimiles, not the manuscripts. But it was in such guises that the majority of scholars and performers working today got to know these sources. Besides the improved resolution compared to the microfilms they replaced, printed facsimiles had the advantage of being tangible objects with pages that turned—they could be annotated, carried from place to place, and even owned, at a range of prices.

That model has now been partially superseded by the online digitized manuscript. Its advantages are obvious: it is in colour; it can be made available to many users at the same time; it can have high resolution. The costs are relatively modest compared to paper publication and it will not go out of print. There is no question that the increasing availability of a wide range of sources digitized and put online by a growing percentage of world’s libraries has had a positive impact on the field of medieval and Renaissance music studies. So much is gained by this move, indeed, that it is easy to forget what is lost. But something is always lost. In their new digital guises these collections of paper or animal skin have been dissociated into component images that float free of their original spatial contexts, usually suspended between a pair of arrows that allows the user to navigate between them.

While the placing of digital images of manuscripts online does make these sources more ‘accessible’ in the most literal sense, the barriers of understanding are as steep as they ever were with paper facsimiles—steeper, in fact, where inventories and bibliographies are not clearly linked to the images. Like more traditional cataloguing and inventoring, current trends in digitization result in small pieces of data that can be recombined infinitely. But the same technologies can also be used to create a whole which, though digital, foregrounds the integrity of the original. The Digital Fauvel project seeks to merge the categories of ‘facsimile’ and ‘edition’, moving beyond mere digitization in ways that can benefit scholars and students alike. As a synthetic rather than an analytical project, it points to new directions in digital approaches to medieval objects.

Our target source is the Roman de Fauvel, as preserved in the manuscript Paris, Bibliothèque Nationale, Ms. fr.146 (c.1317–20). It is a particularly good candidate for an innovative approach to the facsimile edition because its layout is both intricate and meaningful, intractably bringing together image, text and music. Editions have separated Fauvel into its component parts, dividing the text from the music and the music into separate volumes based on genre, texture and presumed authorship. In the face of such dismemberment, the eloquence of layout, which places different media in meaningful conversation, is silenced. On the other hand, without such editions Fauvel is a forbidding object, especially for students and non-specialists. To read it in the original requires a deep familiarity with Middle French, Latin, mensural notation and 14th-century iconographic conventions. The Digital Fauvel project seeks to retain some of the most important qualities of the manuscript object—its size, layout and extent—while generating
the power of digital data to lower the barriers of meaningful interaction.

The Digital Fauvel

Paris, Bibliothèque Nationale, Ms. fr.146 is a large manuscript—46 × 66cm when open. To allow this scale to speak for itself and encourage more natural human interaction and exploration, we created the first version of The Digital Fauvel for a large multitouch tabletop computer (the Samsung sur40, whose screen measures 92 × 54cm).3 The project is programmed in C#, and runs on any Windows 7 machine. Depending on the hardware available, it can be used with touch gestures (similar to those used on smartphones or tablets) on multitouch displays, or can be controlled with a mouse and keyboard and displayed on a large conventional monitor or projector, for example in a classroom.

The first version of The Digital Fauvel supports viewing and navigating high-resolution scans of the manuscript at nearly original scale, viewing text translations superimposed on the manuscript and aligned line-by-line with the original (illus.1), viewing modern editions of the musical interpolations side-by-side with the original, playing audio files while viewing the musical items (illus.2), and performing text-based search on poetry, lyrics and image metadata using terms in the original language or in translations (illus.3).

In its current state The Digital Fauvel allows for unprecedented depth of access to this complicated source. But our aims in this project go beyond merely creating a usable digital facsimile. We are also working to develop appropriate practices for designing such interactive digital objects, to create a technological foundation upon which other scholars and programmers can build new and different types of objects and interactions, and to explore the educational value of engaging students in the design and implementation of new tools. Below we briefly outline our work in these areas and report on the current state and next steps of the project.

Participatory design methodology: process and outcomes

Because a fruitful and satisfying user experience was a first-order concern, our process of creating this

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1 The Digital Fauvel display of Paris, Bibliothèque Nationale, Ms. fr.146, end of index and f.1r with English translation overlay; toolbar at right
technology drew on practices in human–computer interaction. Specifically, we applied methodologies from participatory design, in which many potential

users of the technology are closely involved in its design, refinement and evaluation. At the onset of the project, we formed a Digital Fauvel Working

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Group at Princeton University, consisting of 21 students and researchers from departments including Computer Science, Music, and French and Italian, as well as researchers and staff from the Office of Information Technology and the university libraries. In two meetings, participants brainstormed ideas for how a digital version of the Roman de Fauvel might be useful in their own research, teaching, study or public outreach activities. We facilitated group discussions while taking notes. This initial phase also included weekly observations over one semester of students enrolled in a Music Department graduate seminar on Fauvel. While the second author led the seminar discussions, the first author took notes on the types of difficulties encountered by students when beginning study of the manuscript and its musicological significance, and on the ways that they employed facsimiles, editions and BnF’s Gallica site. Finally, we conducted brainstorming sessions with these students as well as Computer Science students enrolled in a graduate seminar on Interactive Music Systems.

This phase allowed us to prioritize development work and led to a first version of the interactive manuscript that could be immediately useful to a large and diverse audience of students, researchers and members of the public. We observed that finding translations, text and music editions, and musical audio, and coordinating these with their locations in the manuscript were among the most important and time-consuming tasks for graduate students learning about Fauvel. Along with navigation within the manuscript and search of poetry, lyrics and metadata, these were the features most often requested by both the students and members of the Working Group.

Best practices from human–computer interaction were also employed to design and refine the user interfaces for the interactive manuscript, Jakob Nielsen’s well-known user-interface design principles guided the basic design; for example, the interface borrows established interaction conventions familiar to users of smartphones, tablets or e-readers (for example, double-tap to zoom, swipe sideways to turn pages). Paper prototypes and low-fidelity digital mock-ups were used to elicit feedback from researchers and students early in the design process, ensuring (before any time was devoted to writing code) that the software would be easy to use and offer the appropriate functionality. Think-aloud walk-throughs (in which users verbalize their thoughts as they interact with a technology) were used to identify and fix problems with early versions of the software.

**The Digital Fauvel as platform**

The group discussion activities and our observations of seminars served to map out the enormous space of functionality that could potentially be built into a digital manuscript. Proposed functions ranged from those we had initially anticipated would appeal to students and scholars (for example, in-place English translation of text), to behaviours that would support very specialized types of scholarship (for example, the ability to apply computational image search and analysis techniques to study scribal hands), to fanciful interactions aimed at introducing Fauvel to general audiences (Fauvel the videogame). The breadth and promise of these many ideas led us to design The Digital Fauvel both as a user-facing technology—a manuscript that a student or scholar can interact with ‘out of the box’—and a platform on which many sorts of new technologies might be built. Just as an iPhone developer can build new apps using the phone functionality exposed through the iOS operating system, a ‘Fauvel developer’ should be able to build on our existing data encodings, search functions, display and zoom functionality and so on, to create new modes of interacting with the manuscript. Our development work has therefore included the design of a Digital Fauvel API (Application Programming Interface) to enable other programmers to easily develop new software on our platform.

At the moment we are finishing minor refinements to the code so that The Digital Fauvel software functions as a ‘container’ into which new translations, and even new manuscripts, could be dropped with little or no programming. The project employs Text Encoding Initiative (TEI) conventions for storing all manuscript content. Separate TEI files represent content and layout using Extensible Markup Language (XML), which has the advantage of being both human- and machine-readable. The layout XML (illus.4) stores information about where
each object (for example, blocks of poetry, musical interpolations) appears on each folio; this allows new translations to be displayed in the correct location without writing new code. The content XML files store texts and translations:

```
<xml>
  <text>
    <body>
      <lg id="Te_0001–5986">
        <l n="1"> Because of Fauvel, whom I see stroked so much—</l>
        <l n="2"> Sweetly, without flaying him—</l>
        <l n="3"> I have become melancholic,</l>
        <l n="4"> Often they see him in painting,</l>
        <l n="5"> Those who do not know if he stands for</l>
        <l n="6"> Mockery, wisdom or folly.</l>
      </lg>
    </body>
  </text>
</xml>
```

It will soon be possible to add new translations, for example, merely by adding an XML file with line information into the project.

In the next stage of the project, we will work to ensure that our software can be used to create digital versions of other manuscripts simply by supplying layout XML, text and translation XML, and high-resolution image files. We will also release our user-facing tools for creating layout XML by visually annotating high-resolution images with bounding boxes for each element.

**Design and development as educational activities**

The design and implementation of this project have been undertaken as undergraduate research projects by students in music, computer science...
and engineering from Princeton, Harvard and Columbia, supervised by both authors of this article. Such activities have proven useful for teaching engineering and computer science students about creating new technologies for real-world use, and for allowing them to explore technical research questions (for example, applying computer vision techniques to accurately find locations of text and music elements on a scanned page). In our experience, though, students also learned to engage with humanistic questions. Is the column a property of the page or opening, or do pages consist of aggregate columns? How is it best to describe the way columns interact with musical objects that span several openings? Should drop-caps be encoded as aspects of content or layout? Such questions must be answered during the implementation of the software, but they have implications beyond the code. For example, sophomore computer science student Alison Y. Chang wrote that ‘many answers to these questions [about drop caps] depend on underlying classifications of drop caps as art versus text, categories that are easy for us to comprehend and negotiate in a humanities sense but harder to reconcile when we are forced to draw clear-cut lines for technology’. In fact the distinction between art and text, though perhaps intuitively clear, is no easier to make from a humanities perspective than it is from an engineering one. Thus the very acts of encoding and deciding on an underlying representation structure led our students—and us—to ponder fundamental and often overlooked aspects of manuscript production and textual culture.

Project state and vision

The Digital Fauvel software is open source and available for public download at https://code.google.com/p/digitalfauve/. It currently supports the display and navigation of the manuscript, the translation of text into modern French and English, display of the music in score, playback of musical audio, and textual search of poetry, lyrics and metadata in the original Middle French and in French and English translations. We hope to put this version of The Digital Fauvel, running on large-format multitouch hardware, to use in universities and public libraries. We are currently refining the software so that it can be more easily applied to new manuscripts. Further, our vision is to provide an extensible software platform with a usable API, enabling future software developers to build new interactive applications—for teaching, specialized research, public outreach or other purposes—on top of digitized manuscripts.

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1. DIAMM, the Digital Image Archive of Medieval Music, www.diamm.ac.uk, is an obvious example of a resource that does connect images to research aids.
In earlier editions the texts of the manuscript were separated based on whether they were part of the original poem by Gervès du Bus, the poetic interpolations by Chaillou de Pesstain or the texts of songs. The recent edition by Armand Strubel, *Le roman de Fauvel* (Paris, 2012), brings these together, but the music is still to be found in a variety of places depending whether it is polyphonic or monophonic, its genre and whether it has ever been attributed to Philippe de Vitry. For full bibliography, see M. Bent and A. Wathey (eds.), *Fauvel studies: chronicle, music, and image in Paris, Bibliothèque Nationale de France, MS français 146* (Oxford, 1998).

More information about this technology, officially referred to as the Samsung sur40 with Microsoft Pixelsense technology, can be found at www.samsung.com/uk/business/business-products/large-format-display/specialised-display/LH40SFWTG/EN.


5 http://gallica.bnf.fr/ark:/12148/btv1b8454675g.


9 www.tei-c.org/.

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The Digital Fauvel is an interactive facsimile edition of the Roman de Fauvel as preserved in the manuscript Paris, Bibliothèque Nationale, Ms. fr.146. It enables a variety of user interactions with the manuscript using a large multitouch tabletop computer, including viewing and navigating high-resolution scans, viewing superimposed translations of the text, searching manuscript text and metadata, viewing modern editions of musical items, and listening to musical audio. These modes of interaction synthesize information traditionally available in different places (editions, facsimiles, translations, editorial commentary) to create new modes of interaction with digital manuscripts for students, scholars and the general public. The project has been developed using standard design practices from human–computer interaction, mindful of the implications of adapting such practices for a digital humanities domain. Engaging students in the design and implementation of these new tools has also created unique educational opportunities by raising fundamental questions about encoding practices and manuscript culture alike. Work currently in progress involves the creation of an ‘application programming interface’ for Fauvel and other digital manuscripts, which will enable other scholars and programmers to build new and different types of interactions on top of our existing project infrastructure.

Keywords: Roman de Fauvel; digital facsimile; human–computer interaction; digitized manuscript; education and outreach