Rehearsal Encodings with a Social Life

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Introduction

MEI-encoded scores are versatile music information resources representing musical meaning within a finely addressable XML structure. The Verovio MEI engraver reflects the hierarchy and identifiers of these encodings into its generated SVG output, supporting presentation of digital scores as richly interactive Web applications [1].

Typical MEI workflows initially involve scholarly or editorial activities to generate an encoding, followed by its subsequent publication and use. Further iterations may derive new encodings from precedents; but the suitability of MEI to interactive applications also offers more dynamic alternatives, in which the encoding provides a framework connecting data that is generated and consumed simultaneously in real-time. Exemplars include compositions which self-modify according to external contextual parameters, such as the current weather at time of performance [2], or which are assembled by user-imposed external semantics, such as a performer's explicit choices and implicit performative success at playing musical triggers within a composition [3].

When captured, these external semantic signals (interlinked with the MEI structure) themselves encode the evolution of a dynamic score during a particular performance. They have value beyond the immediate performance context; when archived, they allow audiences to revisit and compare different performances [4].

Reviewing rehearsal renditions

This capacity for capturing dynamic interactions with musical score supports reflection and introspection on the music rehearsal process. To demonstrate, we have built a Companion for Long-term Analyses of Rehearsal Attempts (CLARA),[26] a web application allowing users to track performances as real-time MIDI streams. These are aligned with MEI encodings [5, 6] associating temporal positions along the performance timeline with corresponding note identifiers in the MEI. Repeats and expansions introduce some additional complexity, as the alignment process requires the score to be fully expanded. We have modified Verovio for this purpose to facilitate dynamic rendering of different expansions encoded within the MEI.[27]

Close alignment of performance timeline and score allows musicians to revisit and review their rehearsal renditions, simultaneously navigating a score and a corresponding MIDI stream. Notes highlight corresponding to the current playback position; clicking on a note seeks playback to the corresponding instant; and, changing playback position flips to and highlights the appropriate place in the score.

This alignment of timeline and score further allows particular performance features (e.g. tempo curves) to be visualised, providing immediate feedback regarding corresponding stylistic and technical aspects of the musician's rehearsal rendition (Figure 1). CLARA feature visualisations, like Verovio engravings, are generated as semantically structured SVGs, supporting in-browser interactions such as highlighting visualisation regions during playback, and clicking on regions to seek to the appropriate playback position. Beyond review of a single rendition, this enables systematic comparison of multiple rehearsals, e.g. by clicking on different tempo curves to listen in to their corresponding rehearsal recordings at the appropriate playback position.

26 Code and demo available at https://iwk.mdw.ac.at/trompa-clara

27 Code changes incorporated into the main "develop" branch of the Verovio GitHub repository at https://github.com/rism-ch/verovio/ at time of writing (February 2020).

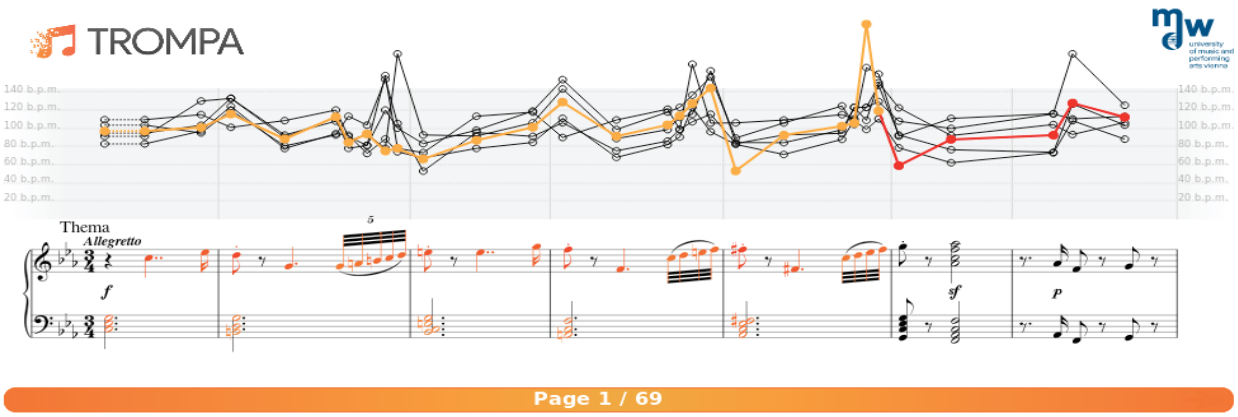

Figure 16: CLARA interface visualising tempo curves for six renditions of Beethoven's 32 Variations in c minor (WoO 80). Coloured tempo curve corresponds to currently selected rendition; colouration of tempo curve and notes indicates current playback position.

The rehearsal companion as a social machine

CLARA is a powerful tool for review of rehearsal progress, allowing renditions to be captured, gathered, and compared with fine granularity, thus providing insights on the evolution of performative aspects of one's rehearsals over time.

Beyond this, CLARA supports comparison of different performers' renditions. CLARA is implemented as a MELD (Music Encoding and Linked Data) [7] application; all alignment information is expressed as RDF triples,[28] identifying each timeline instant with a URI and interconnecting instants with the MEI structure through fragment URIs. Timelines are gathered for comparison according to their URI's inclusion within a Linked Data Platform (LDP)[29] container, itself a simple RDF structure. A selected rendition can be shared by simply importing its URI into the appropriate LDP container; the same rendition can be included in many containers (potentially owned by different users), and one user may manage a number of different containers, each potentially including different users' renditions. CLARA also supports the creation of Web Annotations[30] targeting specified score regions and corresponding timeline intervals of selected renditions. These annotations are themselves RDF structures with their own URIs, meaning they too can be shared between different users.

Through these mechanisms, we foresee performers tracking their own rehearsal progress; comparing their playing with selected peers; communicating with their teachers, through annotations and by comparison to reference renditions; and, incorporating notable pianists' renditions into their comparisons, allowing a pianist user to attempt to emulate, say, the tempo curve of Claudio Arrau's performance in their own renditions of Beethoven's Appassionata.

This work is being pursued as part of the TROMPA[31] project—Towards Richer Online Music Public-domain Archives [8]. TROMPA is building an infrastructure interconnecting publicly licensed music resources on the Web, adhering to FAIR principles [9] of making data Findable, Accessible, Interoperable, and Reusable. This infrastructure will support musicians in locating or generating MEI encodings of the scores they wish to rehearse, and coordinate the recording, alignment, and storage of rehearsals and annotations, allowing users to control the accessibility (public/private) of individual contributions, as well as incorporating others' (publicly licensed) contributions into their own views. Beyond instrumental players, this data, expressed in interoperable fashion using web standards, becomes available for reuse by others—providing scholars with empirical data on performance practice (e.g., to determine a typical tempo profile of the Appassionata as rehearsed in the "wild"), or music enthusiasts with a landscape of renditions to listen into and explore.

Together, we envision these technologies and their user base to function as a social machine [10] generating an interconnected Web of music information in which "the people do the creative work and the machine

28 https://www.w3.org/TR/rdf11-primer/

29 http://www.w3.org/TR/ldp/

30 https://www.w3.org/TR/annotation-model/

31 https://trompamusic.eu

does the administration" [11, p. 172] — and, in our case, the music information retrieval. We are faced, however, with a cold-start problem; in order to be attractive to new users, we require MEI encodings to rehearse, and users' rehearsal renditions to seed comparisons. Within TROMPA we are addressing this issue through crowd-sourcing techniques and by recruiting participants at partner institutions.[32] We will require coordination with the wider community of music encoding and music information researchers and practitioners in order to fully achieve our vision of a shared, dynamic, and richly interactive repertoire of publicly licensed scores and performance recordings.

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