

# ACCELERATING THE EDITING PHASE IN MUSIC PRODUCTIONS USING INTERACTIVE SCORES

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## ABSTRACT

The editing phase is often the most time-consuming task in classical music production. One reason is the media disruption that arises from constantly switching between the printed score and other technical visualizations in Digital Audio Workstations. Introducing digital scores to this process could enhance the editing speed and workflow. This paper sketches an approach to overcome this media disruption, showing a potential path to score-based editing.

## 1. INTRODUCTION

The production of classical music is usually divided into three phases: *pre-production*, *production* and *post-production*. These major phases can be refined in more detailed steps, see Fig. 1. Many of these steps require the producer to frequently refer to the score, which is the basis for classical music. It serves as performance instructions for musicians, as means of communication during rehearsals, and as reference for recording and editing. The editing phase, however, utilizes additional views upon the recorded audio material, e.g. consecutively rendered takes (recorded sections) in a single row in the Digital Audio Workstation (DAW) [1], see Fig. 2.

It is often required to review a lot of audio data with similar sections spread across the various takes while keeping track of their corresponding positions in the score. Constantly switching between the printed score and other views can be very time-consuming. The following section therefore proposes a solution to this problem by introducing interactive digital scores throughout the editing process.

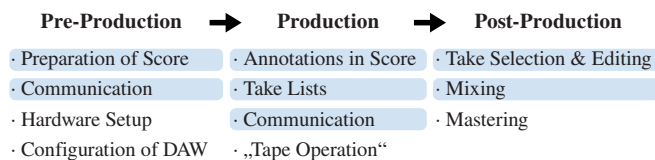


Figure 1: Essential tasks in classical music production. Score-related tasks are highlighted.

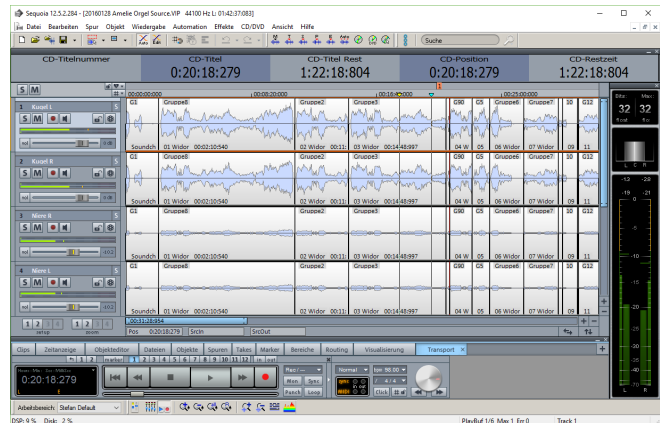


Figure 2: DAW with multiple takes lined up in a row.

## 2. SCORE-BASED EDITING CONCEPT

During the recording, the producer usually annotates the score for later reference. In the editing phase, the score and its annotations act as template to create an aesthetically and technically satisfying result.

To speed up the navigation through the audio material, the digital score is rendered as a single continuous staff (see Fig. 3). Such a view resembles the traditional timeline in a DAW. This enables the takes that belong to a specific section to be rendered beneath their corresponding positions in the score. Since the various takes are not equally long, the displayed bars are an abstraction, marking the beginning and end of each take. Multiple tracks (e.g. *Voice* and *Piano*) are only shown as one bar to give a more structured overview of all recorded takes. Such alignment does not only increase the navigation speed but also helps choosing the desired take for an edit due to the direct access to all potential candidates in a single view without further searching.

In order to keep the ability of printed scores to be annotated, pen and touch displays (as used, e.g., in graphic design) can be used as an adequate substitute. A digital pen makes it possible to link the annotations with the recorded audio data and process them accordingly. Limitations become apparent when musical sections have to be recorded repeatedly, each take introducing new annotations until the digital “paper” is overfull and hardly readable. In the digital domain, however, previous annotations can be switched off if required.

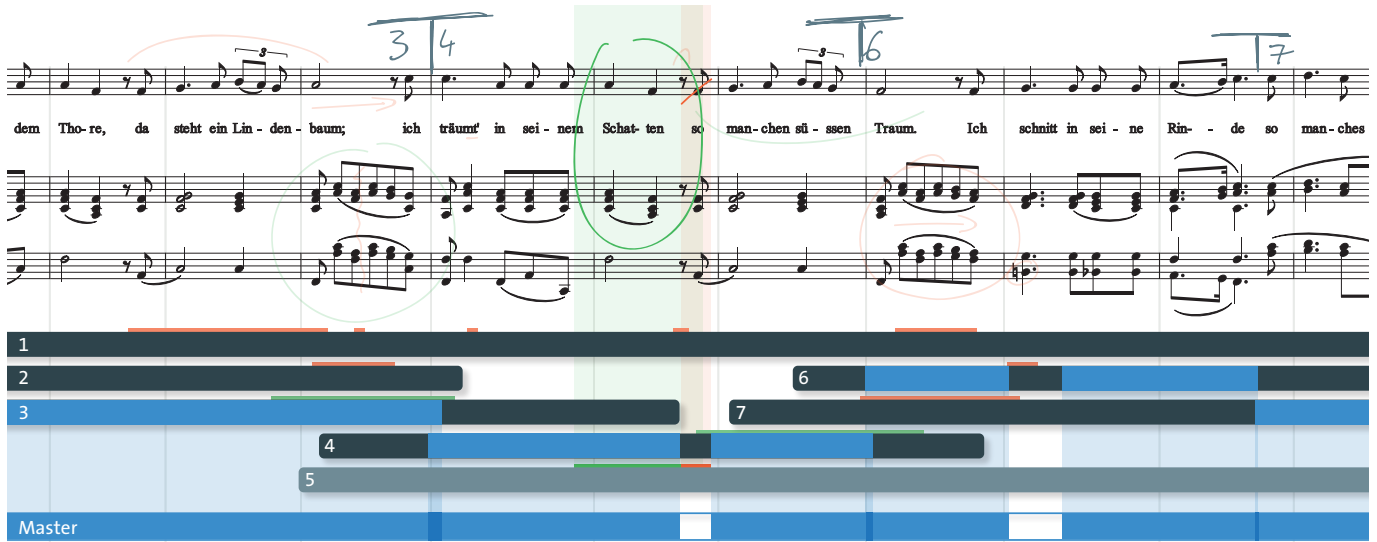


Figure 3: Proposal of a pen-based user interface for annotation, take selection and editing.

Mostly, annotations are also rated as positive or negative which helps the record producer afterwards to select the best takes. Such ratings may be indicated by symbols such as “+” and “-”. Each additional mark during the music performance however costs time and has to be made very quickly. Thus, instead of such additional symbols, the side-switch of a digital pen and its eraser can be used as mode switches and the annotations may be color coded accordingly, see the thin green and red bars in Fig. 3.

In a final step, the chosen sections can be semi-automatically spliced, creating rough crossfades on a master track. The actual specification of the precise edit locations remains the responsibility of the editor who has to decide by ear and on the basis of a music-aesthetic sensitivity.

### 3. TECHNOLOGICAL ASPECTS & CONCLUSION

Many of the outlined aspects and issues have already been addressed by current research. The concept of aligning audio to a score in order to accelerate the editing process was first introduced by Dannenberg et al. in [2]. Since then a large variety of audio to score alignment algorithms was developed [3] that significantly improves the accuracy of the alignment. Algorithms specifically designed to align various takes from the same recording session with very high precision have been discussed in [4]. Recent music notation libraries such as “Verovio” [5] can be used to render one-staff versions of digital scores and allow for interaction possibilities with the score. In order to provide an intuitive experience with the pen and touch-based interface, established pen and touch interaction modalities [6] can be adapted.

The crucial remaining issue is the limited availability of digital scores. However, major music publishers are currently transforming their catalog of printed music into digital coun-

terparts, potentially overcoming this obstacle in the near future. The prototypical implementation and evaluation of the outlined concept is subject of current research.

### 4. REFERENCES

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