Exploring real-time sonic adjustments in the performance of notated music: Morton Feldman, space acoustics, and the variable timbres of piano sound

Victoria Tzotzkova

Computer Music Center, Columbia University, USA

In an essay titled “Coping with pianos,” Alfred Brendel assures us that “anyone who has ever travelled with a piano knows that the same [instrument] not only sounds different in different halls, it even seems to feel different in its mechanism...” (p. 336) Even more strikingly, this difference in the feel of the instrument manifests itself in the same space and on the same day between the afternoon rehearsal and the evening performance. On Brendel’s account, the acoustic difference the presence of an audience makes figures into the performance experience of the pianist in significant ways, impacting even the experience of an intimately familiar instrument. The present research focuses on the role of listening in acts of performance, aiming to open to investigation the ways that pianists may adjust their actions in performance in order to obtain a desired sort of sound under particular acoustic circumstances. It further aims to complicate the idea of timbre in piano performance, seeking to move away from a conception of timbre as an aspect of sound given solely by the instrument and move towards a conception of timbre as a given range of possibilities available to the pianist.

Keywords: piano performance; timbre; spectral analysis; acoustic conditions; Morton Feldman

Performers are continually faced with different performing situations. Typically variable factors of performing situations include space acoustics, the presence and size of an audience, as well as the particularities of different instruments, when these are provided by the performance space. On an artistic level of performance, these variable conditions have to be taken into ac-
count by the performer(s), as they significantly impact the overall sound of the performance. Taking such variability into account may well mean incorporating minute but important real-time adjustments into the execution of a performance, even when the performance is of a fully notated score, as is the case with the overwhelming majority of music of the classical repertoire. Although the performance of classical music is not typically associated with acts of improvisation, achieving a desired sort of sound in the conditions of a particular performance situation may well require actions that could not have been fully worked out in rehearsal. When focusing on this dimension of a performance act, a certain degree of improvisatory adjustability may be a routinely present characteristic of a classical music performance.

The present research is part of a larger program which focuses on timbral (coloristic) aspects of classical music piano performance. Timbral (coloristic) aspects of piano performance are considered in line with Augoyard and Torgue’s (2006) definition of “sonic effects” (see pp. 3-18) as phenomena which incorporate both “physical and human dimensions of sound” (p. 11). The long-term aims of the research are (1) to describe and document ranges of variability in the timbral profiles of comparable points in the performance of notated piano works and (2) to solicit and analyze introspective accounts by performers focusing specifically on experiences of sound during performance. The coupled approach of this research program aims to contribute to understanding the ways in which physical and human dimensions of sound interact in experiences of artistic music performance.

**MAIN CONTRIBUTION**

**Experimental design**

The current study is being conducted at the Computer Music Center at Columbia University. The studio used for the study is equipped with an eight speaker surround sound system. Using a Max/MSP patch and Matrix reverb software, the sound generated by an acoustic Yamaha grand piano is being subtly enhanced and played back into the room in real-time. The amount and type of reverb is controlled through the patch. The effect is a slightly altered overall sound, which the pianist hears as s/he performs in the studio.

Particularly important for the purposes of this study is that any enhancement to the sound in the studio be kept to a barely perceptible level. The type of reverb and the volume of the output sent through the speakers are kept so that the overall change in the sound of the room remains subtle throughout.

Pianists are asked to prepare for performance part of Morton Feldman’s *Last Pieces*. They are asked to perform the same excerpt three times in the
studio, taking as much or as little time as they wish between the three performances. The amount and type of reverb varies subtly between performances but is consistent throughout each performance. After the recording session, pianists are asked several open-ended questions about their experience in the studio.

For the purposes of this study, it is important that the sounds being analyzed be part of musical performances. It is the musical context of these sounds that allows for the criteria of musical appropriateness of a particular sound to be considered. A performer’s sense of what sound is suitable (“works”) for the performance of a given piece of music is a focal point for this study. As a performer’s sense of how well a given sound works musically is tied to the performer’s relationship with the piece of music s/he is performing, the choice of repertoire for this study is important. The considerations which led to the choice of Feldman’s Last Pieces were technical feasibility and likelihood that performers have explicit observations about listening in performance.

Preliminary data

At this stage, two pilot studies have been completed. One focuses on timbral variability by comparing timbral profiles of the first chord of Last Pieces played under identical studio conditions. The other focuses on the interview responses of one participating performer, New York City-based pianist Amir Khosrowpour.

Comparing timbral profiles

Comparison of the timbral profiles of corresponding points in several recordings of Last Pieces recorded under identical conditions suggests that sonorities of identical timbral characteristics are extremely unlikely to occur in piano performance. Although the pitch content is identical across all recorded performances and dynamics levels are very similar for the excerpts selected for comparison, the presence, strength, and mix of partials varies for corresponding sonorities in each recording. On careful listening, the variations in spectral characteristics can be appreciated as variations in the sound heard.

Handling the instrument

In talking about performing the Feldman pieces, pianist Amir Khosrowpour continually referred to how well a particular sound “worked.” During the in-
Figure 1. Graphic images comparing the sound of the first chord in two performances of Morton Feldman’s *Last Pieces*. Even for chords chosen for maximal similarity in voicing (relative dynamic level between the notes comprising the chord) and overall dynamic level, both the sine wave representation (A and B) and the spectral profile representation (A1 and B1) show detectable differences.
terview after the studio session, Khosrowpour recalled several instances of being more or less happy with points in each of the three performances we recorded. He particularly recalled that during one of the three performances, things kept going wrong in a particular way: “...I kept playing louder than I wanted to”; “the outer [pitches of a chord] was always a little startling, it didn’t work”; “the attacks were stronger...than I expected.” During this particular performance, the enhanced sound played back through the speakers, although kept to a very low volume level, was simulating the acoustics of a large, reverberant space. Although nothing about the instrument had changed, obtaining a sound that “worked” (in this case a sound that was softer and not startling) became more difficult in comparison to the other performances.

Khosrowpour talked of the sounds that “didn’t work” in terms of his own actions at the instrument. From his practical perspective, the change in room acoustics was experienced in terms of these actions. As the performer, he did not control the acoustic conditions of the performing situation, but he did expect himself to be able to handle the instrument in such a way as to obtain sounds that “work.” Implied in his remarks is the observation that with the change in acoustic conditions, the actions which would obtain a sound that works would have to change as well.

**IMPLICATIONS**

At this stage, it is premature to generalize on the implications of this project. It was designed, however, with two broader aims in mind. First, a considerable body of research exploring sound quality in piano performance exists in physics and related fields. Often with a focus on instrument design, such research offers a wealth of information on piano sound in terms of the dynamics between the action mechanism, string vibrations, and soundboard behavior (Vyasarayani et al. 2009, Guillaume 2006). Sound quality in music performance, however, is a phenomenon with subjective perceptual dimensions as well as physical ones. The current study aims to explore interactions between these different dimensions. Second, another relevant and exciting body of research exists focusing on experience-dependent, enhanced linkages between auditory and sensorimotor function for skilled musicians (Lenay et al. 2003, Zatorre et al. 2007). A preliminary hypothesis behind the current study is that skilled pianists come to “feel” the sound through the keyboard and pedals. Obtaining a desired sound in different performance conditions likely entails adjustments in the keystroke and use of the pedals which are affected as a sound is being made. Such adjustments suppose an acquired,
instrument-specific ability which relies concurrently on auditory and haptic cues.

Acknowledgments

Heartfelt gratitude to Brad Garton, Director of the Computer Music Center at Columbia University, whose support was instrumental in the development of this project. Thanks also to Sampo Haapamaki for musical insight and technical know-how, to Bryan Jacobs for valuable technical assistance in the studio, and to Amir Khosrowpour for thoughtful and enthusiastic participation.

Address for correspondence

Victoria Tzotzkova, Department of Music, Columbia University, 2960 Broadway, MC 1813, New York, NY, 10027, USA; Email: vdt3@columbia.edu

References