Revisiting Kontakte:
Issues of history, performance and intuition.

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Abstract
An experiment in using digital technology to recreate some of the analogue techniques used by Karlheinz Stockhausen in Kontakte has been undertaken. Recently it has become possible to perform these techniques in real-time. These experiments lead to a consideration of computer music's relationship with its history, the significance of interaction and intuition in the studio, and the role of performance of electroacoustic music.

1. Introduction
In a previous article (Clarke 1999) I have shown how the analogue techniques Stockhausen used in Kontakte to realise his 'Concept of Unity in Electronic Music' (Stockhausen 1962) could be adapted to the modern digital era. It was shown how, using FOF synthesis in Csound, a close approximation to the examples from Kontakte quoted in Stockhausen's article could be achieved. The purpose was not to try and imitate Kontakte but rather to show that techniques and concepts from an apparently distant analogue period were not in fact lost and irrelevant to today. This paper reflects further on some of the issues raised in this work and on issues raised by work the author has undertaken more recently towards being able to perform these examples in real-time using MSP with MIDI control.

2. From analogue to digital
Stockhausen's concept of unity was based on analogue techniques. An impulse generator was filtered and recorded onto tape and which could then be accelerated on playback (sometimes the acceleration process was repeated many times over). In accelerating the tape, impulses which had been originally perceived in terms of rhythm and pulse became perceived as pitch. A continuity, a unity, between rhythm and pitch was thereby achieved. FOF synthesis provides precisely the same possibilities in the digital domain. It generates a series of impulses or excitations. Changing the shape of the excitations is equivalent to filtering the impulses and changing the filter settings. Virtual acceleration is achieved simply by multiplying the fundamental and formant frequencies and adjusting other parameters accordingly (temporal parameters are divided). In principle the process is identical to that Stockhausen used and very similar results can be produced (more details can be found in my earlier paper).

3. Real-time performance
Originally my examples were produced in non-real-time using Csound with data taken from Stockhausen's score programmed in. With increases in computer speed it is now possible to produce the sound in real-time. Furthermore, using MIDI control of the computer synthesis it is possible to perform the algorithm live. There are a number of ways in which this can be done. For example, Csound could again be used. I have in fact used MSP (see figure 1 below) for this experiment, running on a Mac and controlled by a Peavey PC1600X providing up to 16 MIDI faders. It is possible to imagine one or more 'performers' controlling the synthesis rather as Stockhausen and his assistants did in the Köln studio. The difference, however, is that the whole process can be accomplished in one pass, the final result being generated in real-time from a single performance.
4. Authenticity
As has already been mentioned, the purpose of this was not to try to reproduce Kontakte precisely. That the potential for doing so might exist does, however, raise interesting questions about 'authenticity'. This is a topic of major concern in acoustic music where musicologists and performers are increasingly interested in trying to reproduce the composer's original intentions using period instruments etc. With electroacoustic music where tapes exist it might seem that this is not an issue. However, many of the early tapes have deteriorated and no longer represent the sound as the composer originally intended it. Should the original tape (or a copy of it) in its existing state be used for a performance or should modern technology be used to 'clean' it? Going one stage further, if a composer used what is by today's technical standards substandard equipment to realise a piece, should we try to improve the sound quality, or is the original sound quality an integral part of the work? Might a modern realisation be too 'clean'? What would the composer have wanted if s/he were working today? Is that relevant, is the music of its time?

5. Performance and Intuition
Another issue concerns real-time performance, be it in the studio or on stage. Although many of the procedures Stockhausen used were tedious and time-consuming overall, at most of the separate stages the process was live and, furthermore, interactive. In recording impulses onto tape and modifying filter settings he may have been a long way from the final sound, but he heard the results as he manipulated the controls in real-time. There is a sense in which, therefore, my Csound realisation with predetermined data was less 'real-time' even if the overall process of generating the final result was much quicker. This is true in a sense even with Csound now able to generate the sound instantly, it is certainly less interactive. Programming data into Csound for the Stockhausen examples I found many discrepancies between the apparently very detailed realisation score and the tape. These included differences in pitch and relative timings. The reason probably lies in the fact that Stockhausen was not programming a computer but using diagrams and charts from which to perform the music live in the studio. Perhaps something is lost when studio work involves calculating and programming but not performing?

Until recently, in order to regain the interactive spontaneity of the analogue studio it was necessary to resort to commercial MIDI equipment. Although such a way of working has been possible using commercial synths, the gains in spontaneity, interaction, intuition and performance have had to be traded against a reduction in sound quality and sophistication of timbral control. I have sometimes worked with commercial synths in the studio when interaction has seemed crucial and at other times with programming computers where precision has seemed more important. Stockhausen has mainly used synths in more recent works. But he has complained about the restrictions of commercial synths (Misch and von Blumröder 1998) finding they do not offer the control afforded by the traditional analogue studio.

MIDI (or ideally perhaps a better alternative to MIDI) controlled computer synthesis/processing permits the composer to work in real-time and interact with the sound. It also gives very detailed control over the sound as composers can design sounds themselves by creating their own computer patches. Using MIDI devices to control MSP in real-time (or other equivalent programs) does make the process genuinely interactive once again, and performance and intuition again become part of the creative process. In fact it is possible to get the best of both worlds. MIDI performance data can be recorded and later edited combining, it might be argued, the best aspects of interactive performance with precise control.

Similar MIDI controlled set-ups can also of course be used for live performance in concert. Imagine performing Kontakte totally live, not just the piano and percussion but the 'tape' too! There are many reasons why this would not in fact be possible but the idea again raises interesting issues. To what extent would a totally live performance be different from the usual live performance plus tape accounts? How far are the dynamics of the work's structure dependent on the interaction of the flexible (piano and percussion) with the inflexible (the tape)? Composers have frequently complained about the restrictions of a fixed tape when working with acoustic instruments and many have tried to find ways around its rigidity. Much, no doubt, can be gained from the increasing possibilities of sophisticated live
synthesis and processing, but something may also be lost.

6. Conclusions
What started as a simple experiment, arising from curiosity more than anything else, has resulted in a project that raises many interesting and important issues in computer music today. Perhaps electroacoustic music has, more than acoustic music, tended not to look to its past for ideas. However, the fact that the technology has moved on and old equipment has become redundant does not mean that the ideas that went with it are necessarily obsolete. There is potentially much richness in combining different approaches developed in quite different technical situations. The possibilities for live performance, be it in the studio or in concert, are rapidly increasing and raise again, from a new perspective, the issues of intuition versus planning and live performance versus/plus fixed media.

References
Clarke, M. 1999 “Extending Contacts: the Concept of Unity in Computer Music.” Forthcoming in Perspectives of New Music 36(1).
