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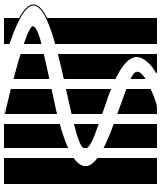

NEW DIGITAL MUSICAL INSTRUMENTS:

CONTROL AND INTERACTION BEYOND THE KEYBOARD

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Foreword

At the beginning of the 21st century we stand at a fascinating point in the evolution of contemporary electronic music. The current availability of prodigious processing power not only in the form conventional and ubiquitous personal computers, but also in non-conventional processor designs, where signal-processing algorithms are mapped directly onto gate-array technologies has opened up new opportunities for designers and musicians alike.

The issues are not just technological – they are also philosophical in the broadest sense. Using *current* technologies, we can now involve the performer in the conceptualization as well as the performance of acoustic (and visual) art.

There has long been a debate whether this is necessarily a good thing. Many an audience member (and some composers) may have regarded a performer's less-than-perfect rendition of a score as an undesirable, distorting filter between the immaculate conception of the composer and the final realisation of the piece in the auditorium. Yet others have regarded the performer's interpretation or improvisation of a piece as an essential element of what is meant by art.

The state of technological development through much of the 20th century has meant that whatever we might have thought in relation to this debate, the reality was that the performer's art could make little and in many cases, no contribution to the realisation of a piece. The technology simply was not good enough. For example, an electro-acoustic composition had, in many cases, to be created as an output of a computer program (the "Music n" languages, Csound, and so on), possibly involving many hours of processing and further manipulation in the studio. In this case, a concept of real-time "performance" was simply out of the question in any realistic sense.

Of course, performers have been able to make a contribution to the realisation of electronic music through perhaps limited, but still useful means. A classic example is the use of MIDI-based systems since the mid-1980s. However, there is a danger that we regard such systems as "the" natural way to communicate electronic-acoustic art. MIDI was, perhaps, a good place to start, given the state of available technology in the latter part of the 20th century. Nevertheless, many (especially string and wind players) have argued that its basis in the keyboard player's technique has limited its usefulness in the future evolution of the performer's contribution. It is also perhaps an example of the developmental distortions, which may arise if we let engineers and commercial interests excessively influence the agenda in the evolution of contemporary music. (I speak as an engineer, as well as a wind player!)

The new technologies mean that we can start with a blank sheet of paper in the design of musical instruments and potentially, the music performed through them. This gives us great freedom, but also, great challenges. This stems from the fact that perhaps uniquely in the history of the performance of music, we are able to separate entirely the production of sound from the means used to control it. In computer parlance, we use different algorithms for the generation of sound from those used to perform it, and maybe (arguably) there is no particular reason for these two classes of algorithm to be inexorably linked in any direct sense.

This is in marked contrast to the history of the evolution of conventional acoustic instruments. We bow a string, blow a pipe, strike an acoustic resonator, and we know what nature of sound to expect and have some inkling of the means we should use to control it. The physical characteristics of the instrument dictate both points of view to a considerable extent. We also have the benefit of the experience of millennia in the way we have learnt to make these instruments.

At a fundamental level, we have few of these benefits (comfortable restrictions?) in the design of new instruments. We have few constraints, apart from the limits of our imaginations, but we also have the tyranny of the blank page. How should we proceed?

We are inspired by the nature of conventional instruments, but should we limit our thinking to their "good" characteristics? Many of them have unstable and non-linear acoustic behavioor – something which the beginner rapidly becomes aware of, but which may be overlooked by the competent performer with years of practice and study. Should we listen to the engineer's view that an instrument should be "easy to use" or be "user friendly," especially when we are aware that these very acoustic imperfections give *skilled* performers the freedom of expression found in extended playing techniques for example? Alternatively, should we deliberately design such complexities and imperfections into new instruments?

We can produce these new designs in maybe a few days, and change them radically a few days after that. How are we to assess the effectiveness of our work, given that the history of performance points to the need of a lifetime's study even to start to be an acceptably good performer with existing instruments?

Conventional instruments have an essentially passive, although possibly complex, nature in the hands of the performer. How are we to (should we) use the capability of modern designs to *adapt* these behaviors and their response to performers' gesture through techniques related to artificial intelligence? What does this behaviour offer in terms of new musical approaches and responsibilities?

It is rare in art that such philosophical debate underpins the creative process, certainly in my own discipline. This makes instrument design a fascinating field to work in.

This book provides a timely and comprehensive primer for anyone working in the field. The authors have a thorough understanding of the current state of research in electronic instrument design, and their book brings together into one place a summary of some of the best current practice in this research. It deals with basic "bricks and mortar" issues such as sensor technologies and protocols so that this information is available in one place, at the designer's fingertips. At the same time it also provides a look over the horizon at those technologies, which have the potential to radically influence our view of what a musical instrument is in the electronic age. Go create!

Ross Kirk
York, April 2006.