

Performing the Super Instrument: Reaching Beyond Technical and Expressive Capabilities

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The genre of contemporary classical music has seen significant innovation and research related to new super, hyper, and hybrid instruments, which opens up a vast palette of expressive potential. An increasing number of composers, performers, instrument designers, engineers, and computer programmers have become interested in different ways of “supersizing” acoustic instruments in order to open up previously-unheard instrumental sounds. Super instruments vary a great deal but each has a transformative effect on the identity and performance practice of the performing musician. Furthermore, composers can empower performers by producing super instrument works that allow the concert instrument to become an ensemble controlled by a single player. The existing instrumental skills of the performer can be multiplied and the qualities of regular acoustic instruments extended or modified. Such a situation provides the performer extensive virtuoso capabilities in terms of instrumental range, harmony, timbre, or spatial, textural, acoustic, technical, or technological qualities. The discussion will be illustrated by a composition case study involving augmented musical instrument electromagnetic resonator piano.

Super instruments. Hybrid instruments. Performance studies. Composition techniques. Electroacoustic music. Piano.

1. INTRODUCTION

Composers and performers have always been interested in extending the technical and expressive qualities of a musical performance. New Instrumental techniques and modes of performance unfold when composers compose works that apply innovative composition techniques and new technologies. The availability of highly performing computers and software grant the creative musicians of today an unprecedented multitude of tools for exploring their expressive visions. They are not any more dependent on their existing instrumental techniques, the qualities of their instrument, or acoustic circumstances because they can be altered or extended. As discussed by Kallionpää, among the contemporary composers there has been general interest to develop a “super instrument” setting that would extend the qualities of a regular instrument and its performer (2014).

The idea of a super instrument is rather broad and almost philosophical: it is a piece-specific concept or phenomenon that does not refer to a specific

instrumentation or technological solution but to any constellation that aims at multiplying the capabilities of a performer, making them to achieve results that they normally could not reach. These include, for example:

1. Managing very fast tempi otherwise unplayable by a human performer
2. Playing in multiple octave ranges
3. Timbral transformation of the solo instrument so as to create a wider range of sonorities
4. Controlling larger sound masses than otherwise acoustically possible
5. Enabling different tuning systems
6. Extending the range of dynamics
7. Altering the acoustic space (reverberation, sense of the ‘room’)
8. Achieving increased flexibility with regard to musical form

As mentioned above the terminology “super instrument” does not refer to any particular instrumentation, which is why there are as many

ways to approach it as there are composers. However, as argued by the author, there are three main methods of doing so (Kallionpää 2014):

1. Electronic method (using computer based solutions to extend the musical performance or instrument);
2. Multiple instrument method (the same performer controlling various equally important musical instruments at the same time);
3. Combination of applying electronic and multiple instrument method.

It is not only the music makers that have engaged themselves in searching ways to enhance a musical performance. An increasing number of engineers and instrumental designers are collaborating with classical musicians in order to build up instruments that would best fit to their needs. As discussed by McPherson there is a growing interest towards augmented musical instruments that extend the regular acoustic concert instruments without amplification or external speakers (2012). The electromagnetically prepared piano (or the magnetic resonator piano) was invented by Bloland and McPherson in collaboration with their research group. This augmented instrument allows extended techniques that are not available on a regular piano. This paper showcases a composition process of a two-part composition that involves (acoustically performed) extended techniques and a magnetic resonator piano. Because the author is a pianist herself the paper mainly focuses on its topic from the perspective of piano music.

2. OPENING UP TO NEW SOUNDS

The composers' search for new sounds has led (and still leads) to the discovery of previously unheard performance customs and playing techniques that allow the musician to use the full potential of their instrument. Such pursuits can be seen already in the music of various virtuoso composers of Renaissance period (such as Bach, Corelli, Handel, Rameau, Tartini, and Vivaldi, among others). Furthermore, great development of technical virtuosity took place in the Romantic Era. For example, virtuoso violinist Niccolò Paganini (1782-1840) renewed the way how violin could be played by creating his own technical and expressive vocabulary. Dragonetti (1763-1846), a known virtuoso player himself and Paganini's contemporary, pronounced him "superhuman", as discussed in "The Edinburgh Literary Journal; Or, Weekly Register of Criticism and Belles Lettres" in 1831. The same source gives a more detailed description of the novelty of Paganini's expression:

"...it is also fraught with passages with double stops, in strange positions, and unexpected modulations – harmonics in thirds and sixths – rapid cadenzas, which were played with miraculous precision. The composition is in E flat, but as the instrument is tuned, he plays it as in D. This partly may account for the production of harmonics in a way never before shown."

(The Edinburgh Literary Journal; Or, Weekly Register of Criticism and Belles Lettres 1831).

Furthermore, the virtuoso piano techniques were developed in the Romantic Era especially by Franz Liszt (1811–1886), Charles Alkan (1813–1888), and Sergei Rachmaninoff (1873–1943) who pushed the boundaries on what was technically possible. Instead of treating the piano as a keyboard instrument they were successfully exploring how to make it sound like an orchestra. Thus, the Romantic piano literature also changed the pianist's role and performer identity from a keyboard player to that of an orchestral conductor. This view is also supported by legendary piano pedagogue Heinrich Neuhaus (1888–1964), who argued that unlike any other instrument, the piano is essentially an orchestra by itself. Moreover, he suggested that a pianist should learn a new composition by putting it on a note stand and conducting it like an orchestral score (Neuhaus 1958).

Even if the exploration of sonic colour was already present in the orchestral music of the Romantic period, the timbre was not generally the main focus of compositional exploration: piano was still mainly limited to its natural timbral possibilities (Ishii 2005). A further step towards widening the piano's sonic potential was the introduction of the extended techniques and preparations in the middle of the 20th century. Prepared piano was originally invented by John Cage (1912–1992), who was familiar with Henry Cowell's "string piano". The latter term meant using extended techniques such as plucking the piano strings and running one's fingers and fingernails on them (Bernstein 2002). Although the prepared piano appeared for the first time in the "Second Construction" (1940) by Cage, the composer attributed it to his later work "Bacchanale". Cage started to use more complex preparations in the latter piece, which eventually resulted in a combination of twelve preparations that the composer named "gamut": their purpose was to make a solo piano sound like a small percussion ensemble (Bernstein 2002). Prepared piano (and extended techniques) has also played a significant role in many compositions by George Crumb (1929), and other numerous composers, up until the present day.

The extended instrumental techniques are never an end to themselves, but rather can function very

differently in musical aesthetics of different composers and are dependent on the context in each composition. The chosen methods of composition dictate the methods of extensions that should be applied. Ishii divides the extended techniques in following categories (Ishii 2005):

1. special effects produced on the keyboard such as tone clusters and silently depressed notes
2. performance inside the piano such as plucking, striking, stroking, or rubbing the strings with fingers, fingernails, mallets, or other objects, glissandi on the strings, tremolo on the strings, and bowing the strings with bows
3. performance inside the piano with one hand and on the keyboard with the other such as harmonics and muting or damping the strings
4. addition of foreign materials such as prepared piano
5. use of sounds made on the frame/case of the piano
6. use of microtones
7. use of sound amplification
8. use of extra-musical devices including addition of human sounds such as singing, speaking, or humming while playing the instrument
9. new pedal effects

Furthermore, Ishii presents classifications of extended techniques by Harrel (1976) and Stafford (1978), of whom only the latter one includes electronic modification of sound. Ishii herself only mentions “the use of sound amplification”. It is unclear if this also includes more complex electronic sound manipulation. However, Saxon (2000) divides extended piano techniques in four categories: 1. prepared piano; 2. special effects produced on the keyboard; 3. playing inside or on the case of the piano; 4. extensions of the piano using electronic media (Saxon 2000).

2.1 Augmenting Musical Instruments and Performance

“I can't think about your miserable violin when I am speaking to my God!” –Ludwig van Beethoven

The evolution of classical music performance has always depended on both the composers' innovations and the achievements in the field of instrumental design. Already in the 15th century Leonardo da Vinci designed the “Viola Organista”, which combines the qualities of string- and keyboard instruments and functions as an orchestra controlled by only one performer. Various other attempts of evolving superior instruments have since taken place. In the field of keyboard

music such attempts range from the historical pianos with additional effect pedals (that were installed to bring on some orchestral qualities) to the electronic instrument “super piano” that was invented in the early 20th century by Viennese architect and inventor Emerich Spielmann (1873–1951). In general, new perspectives opened up with the raise of electronic instruments. For example, mellotron, orchestron, or optigan, to mention just a few, were later results of the development that ultimately led to the discovery of modern synthesizer. According to Emmerson (2012), sound synthesis was one of the most significant ruptures between the past and the present. It enabled sound production without a physical contact to an acoustic sound source. This provides immeasurable possibilities of creating super instruments that are not tied to the natural acoustic circumstances or the mechanical qualities of musical instruments.

The synthesizer was not a direct end result of an uninterrupted line of product development. It was preceded by various existing electronic instruments, developed parallel to the synthesizer, that were based on different mechanisms and systems. One of them was the above mentioned mellotron, an electro-mechanically functioning keyboard instrument that uses the same mechanism as a tape recorder. Pressing down a key activates a tape that is connected to it, whereas releasing the key makes it stop playing it (Awde 2008, 17). Similar to Emerich's super piano, the mellotron is principally a sampler. On top of various different sounds, the instrument also provides six rhythmic background sets, each of which consists of three rhythmic setups and fill tracks, with the possibility of mixing the latter ones together. Merging together different rhythms is not possible (J.R. Herbst, Mellotron Mk Service Manual, 5). Variety pianist Geoff Unwin, who frequently performed on the mellotron, was convinced that the functions of this particular keyboard allowed him to provide more accomplished performances than he could have given with his own basic piano technique (Awde 2008).

Composers of today have more versatile tools in their disposal. Exploring with electronics has been spurred on by the fact that 21st century composers do not have to secure access to high class professional studios in order to produce electronic music. A composer can program the necessary functions for music electronics themselves with their laptop, thanks to affordable and easily-accessible software such as Max/MSP, PureData, or with a variety of sequencers, for example, such as LogicPro, Cubase and many others, depending on the style and requirements of each composer. In addition to live processing, these programmes also

allow for good communication between performer and sound technician in a concert situation. The music software and programmes are able to provide a variety of effects allowing changes to any parameter if necessary. In addition to computers, microphones, and speakers, computer-controlled instruments can also be used as an essential part of a composition or concert performance. With the help of music electronics, the composers can enhance the original capabilities of the instruments, as well as alter the natural qualities of sound and resonance.

Moreover, it is possible to generate artificial sounds that cannot be played on any existing instrument (although this has been possible for the electronic music composers since the early years of the genre, such techniques became widely accessible when the synthesiser came on the market) and different partials of the sound spectrum can be emphasised or altered so that the actual sonic outcome becomes much richer than the original acoustic material. The acoustic situations (e.g. the acoustics of the room) are also important factors in determining the final outcome of a musical performance. With the help of algorithmic or convolution based systems, acoustic qualities can be simulated and modified so that even the sound of a concert room (be it either a real or simulated one) can be controlled by the composer.

2.2 Kallionpää: “Chrysalis” (2015–2016). Composition Case Study

Chadabe (1996) finds two most important developments in the history of electronic music: the opening up of music to all sounds and the development of interactive instruments. The electromagnetically prepared piano is a hybrid instrument that combines the features of an acoustic piano and an electronic instrument: it was first designed in 2009. It “allows the performer to continuously shape the string vibrations for every note, with extended techniques including infinite sustain, crescendos, pitch bends, harmonics and new timbres (McPherson 2010)”. Moreover, it enables the pianist to access capabilities normally associated with stringed instruments (Bloland 2011). Although the instrument consists of hardware, software, and a specific electronic interface, the piano itself functions purely acoustically. The system is based on direct electromagnetic manipulation of the strings (Bloland 2011).

The author became interested in composing for this hybrid instrument because of its “super instrument” qualities. In principle magnetic resonator piano is a prepared instrument: the system can be installed on the strings of any regular grand piano. The instrument challenges the sound production of a

traditional instrument on various levels. For example, the performer can control the dynamics of a key that has already been pressed down, which is impossible on a regular piano. Moreover, the instrument allows the performer to play around with overtone series and to pick up different sound partials. The author’s purpose was to compose a new work that would make use of these special characteristics in conjunction with extended techniques.

“Chrysalis” is a solo piano composition consisting of two movements that can be played either separately or together. The first one is based on extended techniques only. The second part requires a magnetic resonator piano. Because the performance techniques of the magnetic resonator piano and a traditional instrument differ, it was important for the composer to familiarise herself with the new instrument. It became evident that the pianist needs to adapt their performance techniques to the new system. For example, in order to play out an overtone series of a single pitch in the middle register the pianist has to press the keys down more slowly than usually. Furthermore, to obtain the long, sustained notes typical of magnetic resonator piano, very careful *legato* must be applied.

The purpose of the composition was to make use of the harmonies, sonic colours, and overtone possibilities of a piano in an acoustic setting, which is why magnetic resonator piano was selected as the instrumentation. Moreover, the singing voice of the pianist is used as an additional part of the musical structure. It is not treated as a vocal solo but merely as a complementary part of the overall instrumentation.

The following extended techniques were selected from Ishii’s (2005) categorisations as the core material of the first movement of “Chrysalis” (for either regular or magnetic resonator piano):

- special effects produced on the keyboard such as tone clusters and silently depressed notes (1)
- performance inside the piano such as plucking, striking, stroking, or rubbing the strings with fingers, fingernails, mallets, or other objects, glissandi on the strings, tremolo on the strings, and bowing the strings with bows (2)
- performance inside the piano with one hand and on the keyboard with the other such as harmonics and muting or damping the strings (3)
- use of extra-musical devices including addition of human sounds such as singing, speaking, or humming while playing the instrument (8)

- new pedal effects (9)

The following special instrumental features formed the key material of the second movement of “Chrysalis” (for magnetic resonator piano):

- overtone series of single pitches
- changing the dynamics of keys already pressed down
- pitch bending
- sonic colour resembling the stringed instruments

The structural link between the two movements of the piece is the pursuit of supersizing the sonic potential of an acoustic instrument by using overtones and sonic colours that would not usually be associated with piano. Whereas the pianist normally needs to seek for different tone partials by moving their hand on the strings while pressing the adequate key down on the keyboard, the whole overtone series can be accessed on the magnetic resonator piano by softly touching the appropriate key. Both methods have been used in “Chrysalis”.

Although “Chrysalis” is a solo piano work the instrumentation was intended to sound like an ensemble consisting of equally important instrumental lines. The piece includes percussive elements (drumming the piano strings), silent singing voices, and single pitches played on the piano strings, which together give an impression of harpsichord or percussion sounds (a comment of an audience member at the author’s concert, Pori Town Hall, Finland, 6.12.2015).

Because “Chrysalis” is based on a multitude of special features and includes an augmented instrument, the pianist has to re-define their performer identity and to fit their technical customs to the new set of sounds, techniques, and instrumentation. “Chrysalis” is an example of a super instrument composition that aims at improving and extending the existing capabilities of both the performer and the instrument itself.

3. CONCLUSIONS

The development of contemporary classical music is a continuing process in which the innovations of composers, engineers, instrument designers, and computer programmers play an equally important role. Furthermore, performers participate to the evolution of musical language and instruments by commissioning and performing new works and collaborating with the researchers and instrument designers. The general availability of highly performing computers and software grant the creative musicians of today an unprecedented multitude of tools for exploring their expressive

visions. Musical instruments are no more tied to their existing acoustic or technical limitations as almost all parameters, as well as room qualities, can be augmented or modified in real time. Various augmented instruments and real-time-based systems enable technical, sonic, and expressive qualities that would not be accessible on regular concert instruments.

The genre of contemporary classical music has seen significant innovation and research related to new super, hyper, and hybrid instruments, which opens up a vast palette of expressive potential. An increasing number of music professionals and researchers have become interested in different ways of “supersizing” acoustic instruments in order to discover previously-unheard instrumental sounds.

This paper has shed some light on the general concept of the super instrument. The terminology is rather broad and almost philosophical: it is a piece-specific concept or phenomenon that does not refer to a specific instrumentation or technological solution but to any constellation that aims at multiplying the capabilities of a performer, making them to achieve results that they normally could not reach. As discussed above there are three main methods of approaching the super instrument:

- Electronic method (using computer based solutions to extend the musical performance or instrument);
- Multiple instrument method (the same performer controlling equally important different musical instruments at the same time);
- Combination of applying electronic and multiple instrument method.

Super instruments open up new kind of challenges for the composers and performers in terms of instrumental and compositional techniques, aesthetics, and performer identities. There are as many ways to approach the idea of a super instrument as there are composers and each composition creates its own set of rules and selection of composition techniques. The same also applies to the performers: a new technical and performative language has to be developed according to each performance.

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