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**New modular synthesizers and performance practice**

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**Abstract**

Modular synthesisers present a new, perhaps rediscovered, paradigm in electronic musical performance. There is often a minimum level of observable physical gesture in the use of these instruments, although clear visual cues are still present, thus challenging existing conventions in musical performance. The primary cause of this disruption to the traditional performance paradigm is the interface and operation of the modular synthesiser. These are systems where individual modules have specific functionality yet require the performer to connect and manipulate those modules to realise a meaningful sonic output.

Marc Leman’s 2007 work on Embodied Music Cognition and Mediation Technology considers how for some musicians “technology stands between what they want and what they get.” This paper will look to discuss several areas relating to this new performance paradigm and ask; to what extent do modular synthesizers afford the ability to perform in a *live* manner, and what are the factors that dictate how that performance might be interpreted? Is the performer a *ringmaster* of a kind of *sonic-circus*, thus exhibiting a unique method of control over the instrument?

**Historical Patchwork**

The birth of the modern synthesiser is well documented and generally attributed to the work of two North American electronics engineers during the 1960s: Don Buchla and Bob Moog (Vail, 2014). Working concurrently, although entirely independent of each other, they brought together many of the electronic components that we now associate with synthesiser architecture, and in a format that offered new possibilities for sonic expression and sound design. Prior to the launch of the Minimoog Model D in 1971, the first single-unit integrated synthesiser (Chadabe, 1996), these instruments were mostly modular devices requiring the user to physically connect component parts using patch cables to generate interesting and expressive sound-synthesis. Like a number of their early 20th century predecessors; Thaddeus Cahill[[1]](#footnote-1), Leon Theremin[[2]](#footnote-2), Harald Bode[[3]](#footnote-3) and Friedrich Trautwein[[4]](#footnote-4), they chose to deploy very contrasting user-interfaces. The choices that Don Buchla and Bob Moog made have had a profound impact upon how electronic music is both performed, and received by an audience.

While Bob Moog’s instruments proved to be commercially viable in the mainstream, Don Buchla’s designs remained marginal and on the fringes of popular music culture (Pinch and Trocco, 1998). One of the most significant differences between the Moog and Buchla systems was the former’s ultimate decision to use a well-tempered clavier (piano/organ-style keyboard) as performance interface, while Buchla opted for a more esoteric approach in deploying touch sensitive control-plates for some of his designs, such as the kinesthetic Input Port (Holmes, 2015). The style of music and subsequent creative output resulting from these two differing approaches is no more clearly demonstrated than in the work of Wendy Carlos and her keyboard-based electronic re-imagining of the works of JS Bach (*Switched-On Bach*, 1968). This contrasts with Morton Subotnik’s musical abstract *Silver Apples of the Moon* (1967), a bold avant-garde sonic adventure in musical expression through *new* electronic means using Buchla’s technology.

In recent years there has been a resurgence of interest in the modular-synthesiser format, due in large part to the success of the compact Eurorack format introduced in 1996 by Dieter Deopfer [[5]](#footnote-5). This new incarnation of the modular allows for independent third-party manufacturers to develop new and experimental modules that draw upon earlier design concepts, whilst introducing digital signal processing and other new ideas to this traditionally *analogue* format. Offering fresh horizons for electronic music making, what we might now refer to as the *new* *modular instrument,* presents an appealing mixture of familiarity and innovative technology. Electronic musicians and performers are again drawn to the playful, transient and sometimes-frustrating experience of directing voltage through discrete electronic components in an effort to realise new and unique musical experiences - perhaps seeking liberation from the pre-defined, readymade culture of music production software. The new modular instrument however is not for those seeking an immediate fix of electronic music. It is unlikely to be the go-to instrument for a composer commissioned to deliver musical works to a specific brief on a tight deadline. Instead, long periods of consideration are required to assemble, and re-assemble the instrument, along with repetitive practice and improvisation before achieving any meaningful musical reward. Ultimately, every musician must command mastery and control over their instrument of choice, and in this respect the modular synthesiseris no exception (Navs 2016).

**Taming the Beast**

First impressions are a mixture of fascination, aesthetic appeal and often intimidation. As children, many of us are excited by the innate beauty of a musical instrument at rest, such as a piano or violin. We feel an urge to pick it up or sit down and play, imagine and even perform. However, those early encounters often produce a mixture of discordant noise, inharmonious sound, and perhaps the odd happy accident. A first encounter with a new modular instrumentcan be an equally enchanting experience; a familiar looking suitcase of vintage design containing an array of twinkling electronic components with exotic names like Gallian Moons, Three Sisters, Dinky’s Taiko and Pamela’s Workout. These names tell us nothing of their functionality however; instead they draw in the curious and demand to be played with. Like attempting to blow a trumpet for the first time, early physical encounters with a modularoften produces limited musical results, or sometimes no sound at all. The prospect of performing live with such an instrument seems like a very ambitious goal indeed. Therefore, like learning to play any instrument, you begin by copying established gestures – you start to patch cables into sockets, make connections and find the path of least resistance.

The central concept of Marc Leman’s embodied music cognition paradigm is the idea that physical, bodily gestures are key components of musical expression, and that the body functions as a sort of mediating device between the situated physical experience and the subjective musical reality (Visi, Schramm and Miranda, 2014). Traditional acoustic musical instruments, such as guitars, violins, drums, pianoforte and other keyboards afford musical expression through explicit physical exertion specific to the mechanics of the respective musical weapon of choice. These unique performance actions connect with established listener expectations based upon cultural experience and prior knowledge, and we will discuss how an audience might interpret gesture, or indeed a lack of it, later on. First let us consider electronic music in practice and performance and highlight the stark contrast that exists between performing music on an acoustic instrument, as referred to here, and attempting musical expression through entirely electronic or digital means.

Acoustic instruments require the performer to *expertly* excite a resonator to produce sound and pitch. The relationship, or definition, between the control interface and sound resonator is often somewhat blurred and unclear. However, the physical process required to control these instruments is both explicit and well established – we can all play the air-guitar, and we all know how to mimic a violin player. As Sergi Jordà (2013) explains, this is very different to performing with many digital musical instruments, which might be thought of as having a distinct input control, such as a computer-keyboard, mouse or control pad. These allow for analogue performance *information* to be translated into sound via the associated subsystems. The physical performance here is often minimal, less obvious and perhaps even mysterious to the observer. This idea may also extend to electronic music performed on a modular instrument, especially without the presence of a conventional black and white piano-style keyboard to offer clear and familiar cues.

**Another way**

A brief review of social network media, or a visit to specialist conventions hosted by, and for, the new modularcommunity, and it immediately becomes apparent that the popular method of performance with a new modular instrument rarely involves the use of a conventional piano-style keyboard. Performers often demonstrate the complexity of their patch[[6]](#footnote-6) with minimal physical gesture, relying upon the use of on-board sequencers and membrane contacts instead. This style of performance approach embraces the legacy of Don Buchla’s designs and early proponents of his instruments such as Suzanne Ciani (2016), who in 1975 performed live concerts in New York operating exclusively on a Buchla system-200 - and without the conventional use of a piano-style keyboard.

With a minimum level of physical gesture, while affording some degree of perceptible action - such as patching cables, pushing buttons and turning controls, this type of performance practice challenges established conventions in musical performance. As such, it is difficult to place the performance practice associated with modular instrumentsinto those definitions previously referred to here. Instead, the new modular instrument may perhaps occupy a unique centre-ground between our established understanding of what it is to perform and engage with both acoustic and digital/electronic music.

**Liveness**

The notion of live music performance has shifted with the increased use of technology. The composer and musicologist Simon Emmerson, asserts that the term *live* has moved beyond *physical action* towards a model for ‘living performance’ (2007, p. 2). Interpretation of live electronic music performance combines aspects of physical presence of performers and systems, the apparent intentions and choices of the performer and what these mean in the context of ‘what you mean to me’, ‘where I am’ and ‘who I am with’. “Personal and social presence” Emmerson explains, is the key to how the listener accepts what they take from a performance and how the performers are interacting with technology (2012, p. 153). The meaning of the performance therefore is not restricted to the relationship between musicians or between musician and a new modular instrument.

What we hear when listening to any sound is informed, enhanced and altered by our other senses.  Our senses work together to give us an amalgamated interpretation of our environment. Musicians performing with new modular instruments might be described as *ringmasters*. The performers join the audience in experiencing the sound produced by new modular instruments in a acousmatically dislocated environment, even though the performer may know technically how the sound has been produced and the audience may not. In the case of the performer and the audience, the *mode* of listening is different to that of watching a musician perform an acoustic instrument live on a stage. Pierre Schaeffer referred to this *mode* of listening as “reduced listening” where the listener focuses on the abstract properties of sound, such as amplitude, spectrum and morphology over time. All sounds have the potential to be interpreted according to their mimetic or abstract qualities. The acousmatic situation presented by performing with new modular instruments is that they are perceived sonically in the same manner by the performers as they are by the audience.

 New modular instruments are totally unfamiliar to the majority of people and are often considered devices that belong in a laboratory. When performing with new modular instruments, there is an assumption made by the audience that if someone is physically interacting with the system which, even if not understood, puts it into a context where it becomes an ‘instrument’. However, when performing with new modular instruments the number of physical gestures made by a performer that correspond in a transparent manner to an obvious change in the sound during the performance, may be few, or none.

This apparent disconnect and unfamiliarity with how the performer is producing sound with a new modular instrument can lead to the listener perhaps disengaging with the live performance. This may have several consequences. Firstly, the listener may focus much more on the sound being produced and not concern themselves with the manner of its production. Secondly, the listener may focus more intently on the performer to find a conjugation between physical action or gesture and sonic change, perhaps not considering the music more holistically. Thirdly, the listener may disengage and their mind wander to other things not related to the music they are hearing and seeing performed. This brings up perhaps a more fundamental question of how the criteria for live performance have been changed by the manner of electronic music performance. There is no longer a clear demarcation in the established perceptual aesthetic continuum between listening to recorded music and live music performance. Performing with modular instruments creates more points within this continuum where the listener can choose to connect with the performance at different perceptual levels, moving between them depending on their desire of how to connect with the performers, the music or the technology.

**Sign posts**

 There are further questions intimated by this suggestion of how new modular instrument performances are received. Such as, how do the musicians want the audience to receive the performance? And how can the musicians achieve this performance aesthetic? Every musician who uses new modular instruments and wishes to perform live with them may have a different intention of how they wish that performance to be experienced by the audience. Perhaps some musicians wish the audience to know that the performance is totally ‘live’ and provide a more transparent aesthetic, whereas others may wish to put forward a more abstract and opaque performance.

Marko Ciciliani in his paper on electronic music performance practice, puts forward a method to evaluate the aesthetics of different performance practices in electronic music based upon different parameters of that practice and their impact on the aesthetic (2014, p. 262). He places these parameters into two groups. The first group includes the visibility and prominence of the performers body, the correlation between physical gesture and sonic result and the transparency of that correlation. This first group of parameters he describes as part of the *centripetal* model, where the performer is central. The second group of parameters include space, where the sound source either appears close to the performer (centered) or is omnipresent in the performance space (expanded), sounds that seem to occur completely independently of any gesture and whether there is any deliberate effort to hide the actions of the performer from the audience. This second group of parameters he describes as part of the *centrifugal* model, where the performer appears conducting or guiding and not a directly performing agent.

This model for electronic music performance practice can help to guide musicians when performing with new modular instruments to create the aesthetic desired. As previously discussed, a new modular instrument often lacks a conventional input controller, such as a MIDI keyboard. This immediately has a *centrifugal* effect of drawing attention away from the musician as the performance actor. A performer may feel that they need to compensate for this by making overt gestures when adjusting a control on the instrument, which they know will have a clear and transparent correlation to a change in sonic output, this having a *centripetal* effect of increasing embodiment and apparent transparency. This is evidenced in performances by Colin Benders (2016) and VCOADSR (2016). Alternatively, a performer may wish to appear more detached from obvious sonic changes, thus exhibiting a different kind of control over the instrument, that of the *ringmaster* or *godfather*, as evidenced by Kraftwerk (2013) and Robert Aiki Aubrey Lowe (2014).

The traditional physical layout of a performance space where the musicians are facing the audience with their instruments in front of them, inherently creates a *centrifugal* effect when using new modular instruments. The modular instrument usually appears to the audience as the back of a flight case or similar, with no clear view of the modules but perhaps a glimpse of patch cables and the reflection of flashing lights from modules on the clothes or face of the performer. Some performers have chosen to perform either perpendicular to the audience, such as Ulrich Schnauss (2015), or as is the case with performers using the online music broadcasting platform, Boiler Room, with their back to the audience (2014). These positions allow the audience to gain a better view of the modular instrument and gestures of the performer, thus helping to create more transparency in the performance. However, due to the unfamiliar and perhaps perplexing manner in which new modular instruments create sound, from the viewpoint of the layman audience, no amount of visual or embodied visual input may help to better inform them of what is taking place in a manner that enables for a comprehensible and transparent performance.

There are also considerations regarding the style of music being created by the performers that will impact upon the perception of the performance by and audience. For example, an ambient, noise or drone style of performance may encourage the audience to disengage from the live *moment* and to engage in a deeper listening experience where they may wish to disconnect from their physical and social environment (Rich, 2014). This is in contrast to a beat driven house, techno or trance performance, where the audience can gain more from the shared social experience and being in an environment that Emmerson terms as a *living performance*.

Ultimately, the audience will decide for themselves individually how they wish to engage with a performance including use of new modular instruments, perhaps because of, or in spite of the efforts of the performers to elicit a desired perceived level of *liveness*. Perhaps just the gestures of good will shown by the performer to prove that a new modular instrument is indeed making the music being heard in some form of *real time* is sufficient for an audience experiencing it.

There is a greater area of debate to be explored here regarding how new modular instrument performance is disrupting the performance conventions of established western music, including ideas around digital laptop-based music performance. Conventions developed to aid the perceived validity of music performance are now being challenged, not just by technology, presence, gesture or the style of music, but by what can be considered as a truly *live* performance.

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1. Between 1902 and 1906 American inventor Thaddeus Cahill began work on an early electronic music instrument known as the *Telharmonium*, which deployed an organ-style keyboard as controller (Vail, 2014). [↑](#footnote-ref-1)
2. In 1920 Russian inventor Leon Theremin demonstrated the *Aetherphone (Theremin),* an electronic instrument that could be performed without conventional mechanical means (Chadabe, 1996). [↑](#footnote-ref-2)
3. In 1950 German engineer Harald Bode presented a keyboard–controlled electronic instrument called the *melochord* for use in a lecturecalled *possibilities of Electronic Sound Production* (Chadabe, 1996)*.* [↑](#footnote-ref-3)
4. In 1928 Friedrich Trautwein developed another alternative to the conventional keyboard, using a metal bar and wire configuration to control his own electronic musical instrument design: The *Trautonium* (Vail, 2014). [↑](#footnote-ref-4)
5. Eurorack is a compact and comparatively affordable modular system introduced by Deopfer Musikelektronik in 1996. ModularGrid (https://www.modulargrid.net/e/vendors) currently lists 223 manufacturers producing modular components for this format. [↑](#footnote-ref-5)
6. ‘*A* *patch’* is the term commonly used to describe a modular system once it has been configured to produce sound or music. Discrete components (modules) are physically connected by the operator using patch-cables. [↑](#footnote-ref-6)