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Noise Peddler: An exploration of the 21st century pedalboard

Danny Bright
University of Sussex, UK

Lee Westwood
University of Sussex, UK

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Abstract

Noise Peddler is a practice-based research project exploring the 21st century guitar pedalboard as composition and performance interface. Recent growth in the guitar pedal industry has seen a notable increase in popularity of the pedal platform, expansion in the number of manufacturers, the scope of effects available, and solidification of the concept of the pedalboard. The widespread adoption of MIDI/CV control, alongside the packaging of increasingly experimental and complex processing into stompbox formats has expanded the pedalboard's potential as a flexible canvas for the creation of unconventional guitar sounds. Performers such as Sarah Lipstate, Nels Cline and Ed O'Brien have popularised the use of unconventional processing techniques to produce soundscapes where the guitar itself, arguably, no longer occupies the main role, acting as signal generator at the start of a chain. Noise Peddler takes this development to a possible conclusion, removing the guitar to create no-input pedalboard performance systems. This paper gives an overview of the Noise Peddler project, the contexts in which it operates and the opportunities it offers for reconsidering the pedalboard as a performative and compositional tool. It reflects on the research undertaken to date and engages with a series of questions: what is the role of the pedalboard in the performance ecosystem of the contemporary guitarist? How do the affordances of the pedalboard as a performance system, and guitar pedal technology more broadly, shape composition and performance practice? What is revealed of the ghost of the guitar when the guitar itself is removed and all that remains are the pedals? Ultimately, Noise Peddler explores guitar-based music created beyond the fretboard, in the circuits, systems and processes of the pedalboard, informed by the researchers' practices that unite unconventional approaches to contemporary instrumental and electroacoustic composition with musical journeys founded on being guitarists.

Cover Page Footnote

Lecture-performance given at The 21st Century Guitar Conference 2021.

Noise Peddler: An exploration of the 21st century pedalboard[1]

Danny Bright & Lee Westwood
University of Sussex, UK

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Noise Peddler is a practice-based research project and performance duo that utilises no-input pedalboard systems to explore developments in contemporary guitar technologies and their scope for facilitating guitar-based music beyond the fretboard. The recent boom in "boutique"[2] pedal-based guitar technology – in terms of the range of technologies and builders, the media and social media visibility, and uptake amongst guitarists – has led to the widespread adoption of the curated and systematised pedalboard as well as providing a catalyst for the shift away from more traditional guitar timbres and towards the more commonplace acceptance of experimental technologies, processing and sounds into everyday electric guitar culture. The concentration of this expansion around the stompbox format or form factor (something designed to be foot-operated, with a limited array of real-time controllable parameters) brings with it a number of affordances and limitations that shape how these new developments manifest in guitar-based music. Noise Peddler builds on these ideas to explore the overlap between conventional and experimental practices, examining the impact of pedalboard culture on contemporary electric guitar practice by pushing the capabilities of the pedal format to explore at what point the pedalboard becomes an instrument in and of itself, and what is left of the ghost of the guitar when the guitar itself is completely removed.

This paper provides an overview of the project to date, focussing on the performance systems and their development, including observations in relation to analysis of the performances to date (the performance

[1] Lecture-performance given at The 21st Century Guitar Conference 2021.

[2] "Boutique" here is used to signifiy small or independent builders and pedal companies, outside of the larger music technology corporations (for example: Roland, Yamaha, Fender, Music Group). While the term and its application across the sector might have "lost some of its meaning" (Paz et al., 2021, p. 337) it is still widely used as an umbrella term for the profilferation of small pedal builders that have revitalised the sector post-2000.

presented at The 21st Century Guitar Conference 2021 in particular[3]) and an exploration of the future directions for the project.

Context

To paraphrase what is frequently lauded by Dan Steinhardt of That Pedal Show (n.d.): we are living in the golden age of the guitar pedal. Whilst its application as an augmentation of the guitar, and as a creative tool in a wide variety of settings, is well-established and long-standing, in recent years the pedal industry has seen a notable influx of new designers broadening the palette of sounds available,[4] and an increasingly experimental approach to sound processing perhaps more commonplace in the worlds of modular synthesis and electronic music, in part driven by wider access to digital audio technology and information about how to implement it in guitar pedal circuits. From the bit-crushing, console-like sequences of the Ottobit (from Meris) to the granular synth engines of the Infinite Jets (from Hologram Electronics), or the left-field emulations of broken cables (of Drolo's Stammen) and VHS tapes (of Cooper FX's Generation Loss), the pedal industry has seen the widespread adoption of features such as: MIDI control and synchronisation; Control Voltage and Eurorack integration; sophisticated switching and routing mechanisms; digital control and recall of analog processing; and technologies that can produce timbres akin to the pioneering sound experimentation of institutions such as IRCAM, Ina-GRM, and the BBC Radiophonic Workshop. These developments have brought to the modern guitarist's feet, a palette of complex and at times experimental musical materials previously only available in multi-effects units, expensive rackmount processors, through the use of computer processing, or in the studio. Whilst there is not space here for a comprehensive review of the history of the guitar pedal and its uses, or an in-depth study of its influence across experimental and popular musics, it is important to acknowledge the context in which Noise Peddler is working, and to consider how the following examples from the contemporary pedal scene exemplify a number of key developments that influence both the formation of the project and its ongoing research focus.

One area that has seen significant growth is the online guitar demo community, driven in part by the growing dominance of online media forms such as YouTube. Notably, YouTubers such as Knobs (n.d.) straddle the boundary between demonstration and artistry, with musical examples of the pedal's workings that showcase an experimental sensibility and an unorthodox approach to guitar playing, fuelled by the possibilities inherent within the technology. In the video Chase Bliss – Spectre (Knobs, 2015), for example, we see composition and performance techniques driven by the more radical end of modern pedal engineering, which is the focus of Knobs' content. Knobs serves as an excellent example of the burgeoning relationships between YouTube demos, pedal designers, and pedal culture – as he moved from producing online demos to co-authorship of the book *Pedal Crush* (Bjørn & Harper, 2019), and core involvement in the design of the Chase Bliss Audio Blooper pedal – a loop pedal with integrated processing resembling the experimental timbres of electroacoustic composition seen through the lens of contemporary guitar practice.

Modern practitioners, of course, are diverse in their approaches to the technology and many artists use pedals, and curated pedalboards, as core sculptural tools in composition and performance. Guitarists such as Nick Reinhart (Pedals and Effects, 2013) and Nels Cline (EarthQuaker Devices, 2018) play the board arguably to the same extent as they play their guitars, making the pedals – and the signal chains which they

[3] You can watch our performance at The 21st Century Guitar Conference 2021 at https://youtu.be/IiDcWAm31EA?t=793 from 13:13 to 23:50; and a number of other performances on the Noise Peddler webpage (http://www.noisepeddler.com).

[4] Bjørn and Harper (2019) note that "starting in the mid-2000s – and especially from 2010 to the present – the pedal world has been defined by an exponential expansion of the industry… fueled by social media, demonstration videos, and online discussion" (p. 364). This is reinforced by Tzvi Gluckin who identifies a significant shift at the turn of the millennium, driven in particular by web forums, online sales platforms like eBay and the availability of technologies to small scale designers/builders (Paz et al., 2021, p. 337).

form – an equal extension of the guitar itself, as opposed to a colouring device. Cline, in particular, elevates part of his set-up so that it can be manipulated by hand during his performances, in turn demanding, at least temporarily, abandonment of the guitar to control the pedal-based part of his performance system. Radiohead's Ed O'Brien acknowledges the critical role the pedalboard plays in the act of musical creation, noting that his "pedalboard has been at the heart of the writing process: it brings riffs and textures to the fore" (Bjørn & Harper, 2019, p. 166). O'Brien's guitar work, at times, sways further towards the use of the guitar as a basic oscillator, feeding delays with a single pitch or simple phrase that is then embellished and sculpted into immersive sonic landscapes through the use of feedback, loops and harmonisers. These practices provide musical pads more typical of a keyboardist or synth player (That Pedal Show, 2019).

Sarah Lipstate combines these approaches, building complex pedalboards with multiple loopers and experimental processing that function as a source of compositional inspiration, performance interface and processor of her instrument. Her ambient solo work performed as Noveller (Lipstate, 2020) uses the pedalboard as an orchestrator to build from simple guitar lines into full cinematic compositions inspired, in part at least, by the capabilities of the pedals themselves. As she notes, "sometimes I feel the pedals are more the instrument than the guitar is, especially as pedals become more and more sophisticated" (Gluckin & Lipstate, 2021). Here she articulates the sense that as the range of available technologies, and their popularity, increases, the pedalboard is carving out its own position as a contemporary musical interface. In some ways Lipstate has moved in the opposite direction to Noise Peddler, working with BilT guitars (https://biltguitars.com) to design a Relevator model electric guitar that includes a fuzz circuit and two modes of the Old Blood Noise Endeavors Dark Star reverb built into it (Gluckin, 2021) – cementing the role of the guitar itself in the electroacoustic hybrid of guitar and effects. Her recent work as a member of Iggy Pop's Free Band (Pop, 2019) also gives a sense of how this use of atmospheric, ambient, and experimental pedal-derived sounds is capturing the attention of artists and audiences, moving beyond the world of pedal-demos, forums and experimental or niche musical communities into the broader world of popular music guitar practice. The recent release of books such as *Pedal Crush* (Bjørn & Harper, 2019), *Stompbox: 100 Pedals of the World's Greatest Guitarists* (Paz et al., 2021), and the production of *The Pedal Movie* (Lux & Orkin, 2021) are emblematic of the growing community of practice, and access to knowledge available to the contemporary musician.

This outline of current developments in pedal-based musical practice is not, however, intended to gloss over, or negate, the influence and importance of other experimental electronic music practice on the Noise Peddler project. One of the questions that the project raises in exploring the pedalboard as an instrument in and of itself, is to what extent it operates outside the world of the guitar. Undoubtedly it is important to acknowledge the relationship to feedback practices – both in terms of current research looking at feedback musicianship (Eldridge & Kiefer, 2017), the pedalboard-based performance system as a dynamical system and a live interface, and its relationship to no-input performance practice such as the pioneering no-input mixing board work of Toshimaru Nakamura (http://www.toshimarunakamura.com), and the translation of this into ensemble performance by groups such as the No Input Ensemble (http://noinputensemble.com) – the latter notably featuring some guitar pedals in their setups. All of these are important contexts for the project as it attempts to make connections between different forms of contemporary electric guitar culture and practice by exploring the overlap between each of these areas with wider popular music practice, as well as with more experimental areas such as no-input and feedback musicianship, or electroacoustic composition.

Research questions & process

The Noise Peddler project is shaped by a number of key research questions. These are:

- What is the role of the pedalboard in the performance ecosystem of the contemporary guitarist?
- How do the affordances of the pedalboard as a performance system, and guitar pedal technology more broadly, shape composition and performance practice?
- What is revealed of the ghost of the guitar when the guitar itself is removed and all that remains are the pedals?

In order to investigate these questions, the project adopts an iterative, reflective, practice-based approach. The technological or performative affordances and limitations of pedal technologies are explored through the development of no-input and guitarless pedalboard performance systems, and through the composition and performance of works using those systems. In doing so, and critically reflecting on the resulting works and performances themselves, the process of their creation, and their relationships to both the technologies and broader context of contemporary guitar culture, the project attempts to "engage on some level with the production of cultural knowledge" (Impett, 2017, p. 221) on the basis that "through practice new knowledge might emerge that was inaccessible to conscious reflection prior to that process" (Impett, 2017, p. 230). In particular, the development of the systems, and hence the resulting works, is driven by trends in pedal technology such as the incorporation of MIDI or CV control and preset recall, digital control of analogue processing in the pedal format, and the proliferation of processing techniques – such as granular synthesis and sampling or polyphonic pitch-shift – that have traditionally been the realm of electronic music practice, electroacoustic composition and computer-based performance.

Outline of the systems

Noise Peddler is built around the development of two pedalboard-based performance systems. These have developed and changed along with the project over the past three years. In the initial stages of research our instruments comprised two relatively traditionally formatted pedalboards, which simply replaced the input source of a guitar for another pedal that was able to generate its own sound through self-oscillation (see Figs. 1 and 2).

Pedals which have proved effective are flangers, analogue delays, envelope filters and certain fuzz pedals (notably the Fuzz Factory 7 from Zvex). Whilst this fuzz pedal gives a steady waveform which can be altered in pitch and amplitude by adjusting the available parameters, the sounds offered by the envelope filters and flangers are modulated by their own LFOs and thus create a contoured, patterned sound source. Without the use of presets or MIDI, any of these can only really be altered in a continuous manner in terms of pitch, amplitude or modulation, without discrete steps or accurately repeatable results. The sonic possibilities and the range of musical actions that can be achieved is then dictated by the combination of processing made possible by the rest of the signal chain. As the project has continued, we have experimented with other initial sound sources including the carrier frequency output of a ring modulator, and more recently with pedals which have, or can be loaded with, their own dedicated oscillator-based patches (such as the Rebel Technologies Owl pedal, in this case a dual oscillator/mixer patch with frequency modulation capability, and Drolo's Molecular Disruptor that allows two continuously sweepable frequencies to be combined).

Figure 1 Authors' initial pedalboard configuration ideas with synth used as a test tone (December 2017).

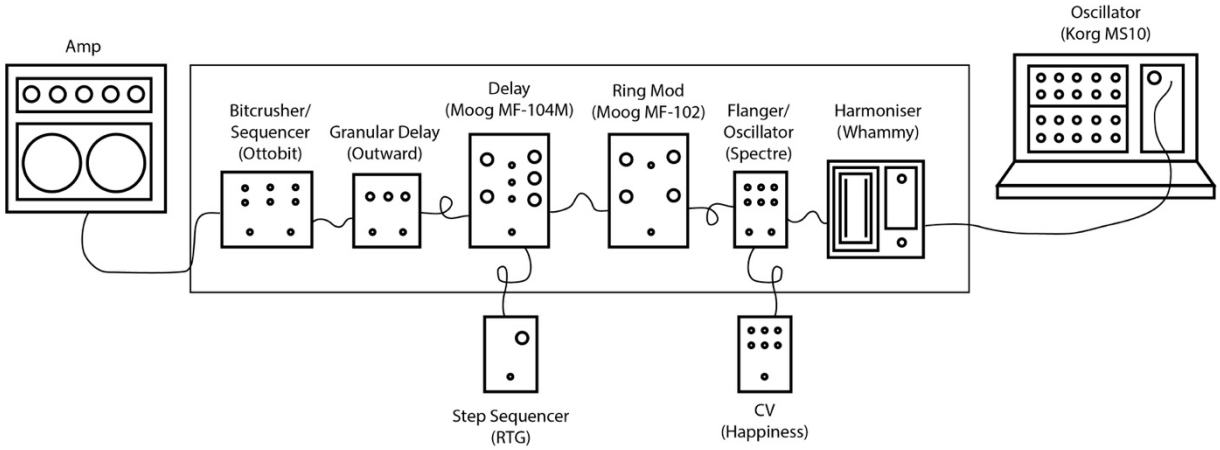

Figure 2 Schematic for the early pedalboard configuration depicted in Figure 1 (signal flow runs right to left).

Over the course of many iterations (see Figs. 3, 4 & 7 for examples of this development), our pedalboards have evolved to coalesce around a similar format (see Figs. 5 & 6). Each board begins with two or three sound sources in series, which then split into two separate signal chains via an AB/Y switcher. At various stages along each chain, dedicated loopers (or other pedals with the capacity to freeze or loop segments of sound) are placed so that ideas can be captured, repeated and layered, in order to create contrapuntal textures and free up the sound sources (and our hands) to create other sounds elsewhere along either chain. Alongside these, other pedals serve to shape the sounds through various forms of processing including ring modulation, distortion, equalisation, delay, reverb and pitch shift/harmonisation. The two chains are either fed into separate guitar amps (meaning a total of four amps onstage), or are merged back into a single audio channel via a mini mixer, which is then fed into a single amp each.

Figure 3 Authors' early performance systems set up as large single pedalboards (May 2018).

Figure 4 Still from the video of the authors' lecture-performance at The 21st Century Guitar Conference 2021 illustrating sound source sub-boards (nearest to performers) with main pedalboards above. Retrieved from https://youtu.be/liDcWAm31EA?t=793

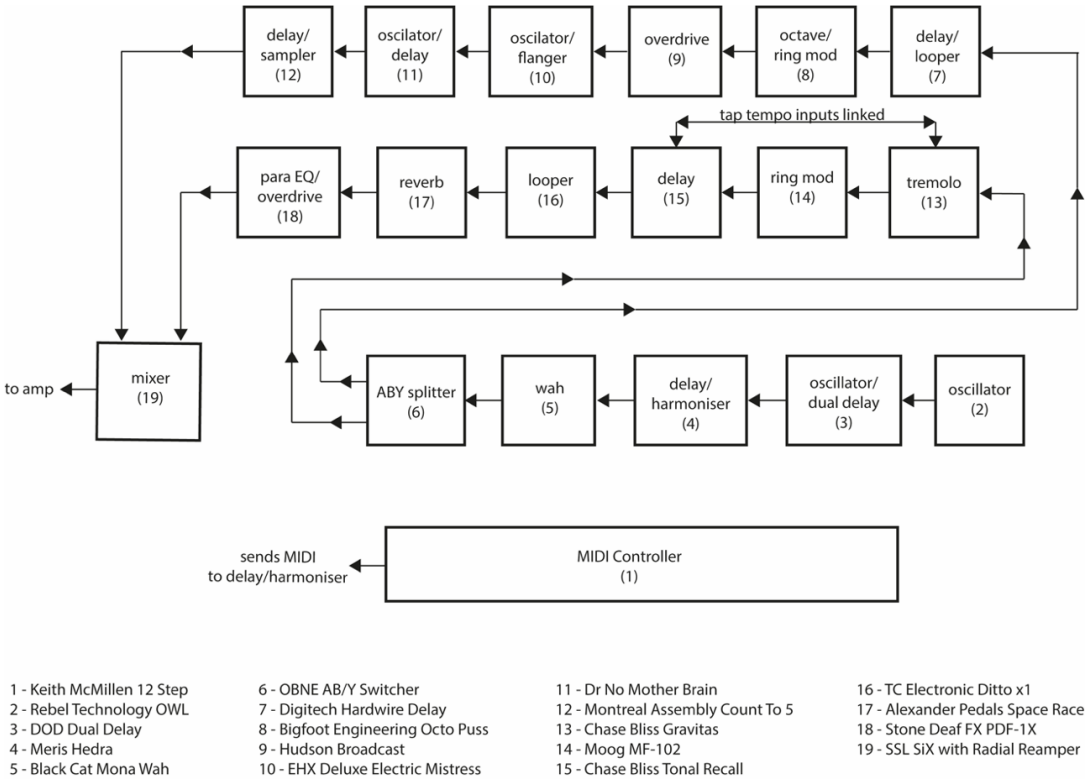

Figure 5 Schematic for Bright's board, as used in the 21st Century Guitar lecture-performance.

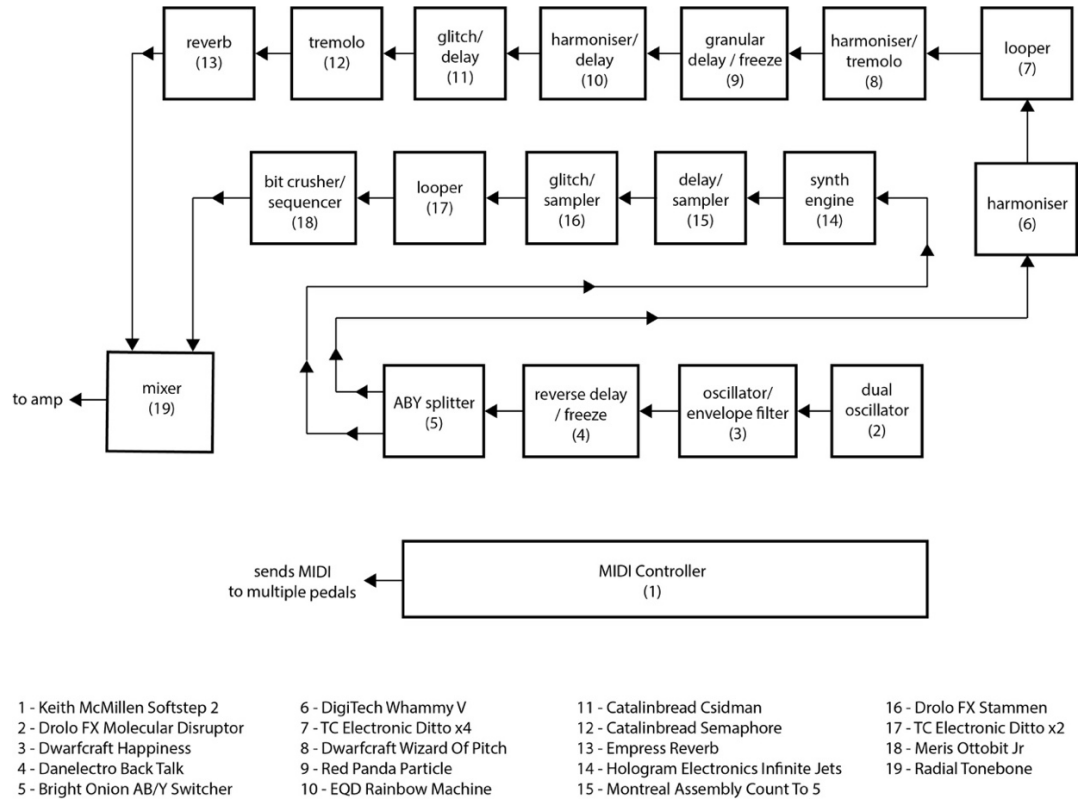

Figure 6 Schematic for Westwood's board, as used in the 21st Century Guitar lecture-performance.

This two-channel routing system is a move away from a typical guitar signal path, and is also indicative of the distinctive compositional and performative approach which the format encourages. This flexibility allows for the kind of contrapuntal playing which is possible over the 6 strings of the fretboard. However, our roles frequently span the percussive, textural, harmonic and melodic, often simultaneously, and the nature of the musical duo also invites each of us to occupy these diverse sonic spaces perhaps more so than if we were to adopt the role of guitarists.

Whilst each setup contains most of the usual suspects in terms of a guitarist's pedalboard, there are often subtle deviations (alongside the use of two signal chains) between the Noise Peddler rigs and the way in which we would build pedalboards for a guitar. In its most recent incarnation, Westwood's system has no gain stage such as an overdrive or distortion, but includes a total of five looping points (one being a delay, which is unusually situated directly after the sound sources). Bright's system, on the other hand, includes gain stages at the start and end of chains, as well as overdrives that impart timbral change (octave fuzz and EQ / drive) alongside loopers and delays at points throughout the two signal chains. At the same time, some conventional techniques are employed, such as the use of reverb at the end of the chain.

One interesting avenue of exploration emerged through the use of control voltages. By sending control voltage signals across the two boards between pedals that output and receive them, we were able to create an interactive environment where parameter changes on one board would directly affect the sounds of the other. This kind of causal relationship between the two instruments is particularly distinctive and non-guitaristic. Similar effects can be achieved by sharing MIDI signals between the boards, although these are two areas we have as yet not explored in depth, and have scope for further investigation.

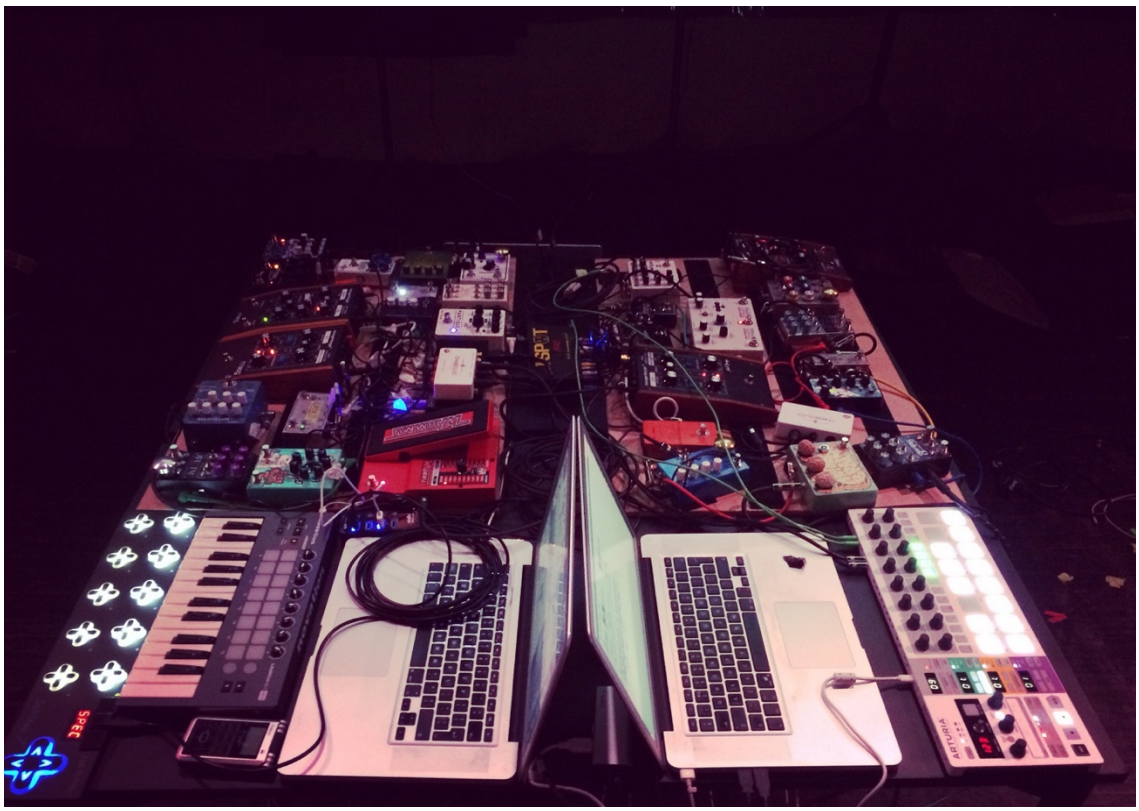

Figure 7 Authors' system in a performance at the International Conference on Live Interfaces (Bright & Westwood, 2018) incorporating MIDI control via Cycling 74's MAX, CV sequencing and interconnected pedalboards.

These discrepancies aside, the instrument as a whole involves nothing custom-made for this particular environment. Each component is essentially an off-the-shelf bit of hardware which is commonly available and used by guitarists, including the signal routing ABY splitters (which are stomp boxes, intended to be controlled with the feet). Everything used in Noise Peddler is equipment we own because we are guitarists. However, it is the context in which it is used that encourages a reconsideration of the capabilities of the instrument. In particular, it is the combination of the different pedals, their processing potential and the ways these can be controlled that allows us to create compositions with more complexity than drone-based, layered, continuous oscillation, but also limits how far, or indeed how easily, we can move away from this default position suggested by the use of self-oscillating and continuous sound sources.

Observations & Reflections

So, what are the affordances and limitations of performing music with no-input pedalboards as a duo and how do they shape the music that we make?

One notable consideration is that, in using pedals designed for the guitar, the capabilities afforded by that design are, in most instances, predicated on the existence of a guitar input. Whereas, with a guitar, you are much more likely to play a rhythm or melody with your hands on the fretboard, and to then affect this sound with the pedals, in the case of Noise Peddler, the act of generating sound is something which does not require constant attention or use of the hands. Instead, the hands are free to manipulate what is often a drone through the playing of the pedals in the chain – the knobs, stomps and switches on the pedals becoming the primary interface, as opposed to the fretboard. In fact, in removing the guitar and replacing it with a self-oscillating pedal, the performance interface is almost completely reconfigured by the technical constraints of the pedals, which might include a lack of discrete pitch steps, reliable tuning, rhythmic control or the ability to create note-type dynamic envelopes. Because of the move away from the guitar - an interface that facilitates, encourages even, the creation of equally tempered music and comes with an inherited tradition of rhythmic playing techniques - interesting things happen to the creation of musical parameters such as melody, harmony, and rhythm.

Melody and harmony

The shift of pitch manipulation from the strings and fretboard to control knobs throws up a series of challenges. Control parameters on the pedals are often sensitive, and a large range in pitch (as with any other parameter) can be squashed into a small range of movement on a control knob. This is especially so when the tone is generated from deliberate misuse, self-oscillation, or feedback – in other words an element not deliberately designed into the control system. In most cases, it also becomes very difficult to jump between pitches, especially in any reliable way within a tempered musical system of notes. This might involve switching a pedal off, or somehow silencing it whilst altering the controls, then bringing it back up in level. Similarly, creating harmony of the kind made possible by the guitar's multiple strings is something that has to be achieved by additional processing (pitch harmonisation for example) or looping, the ease and immediacy of which inevitably shapes the music that we make.

Ultimately, any kind of reliable repeatability of rhythms, pitches, harmonies or timbres, whether working within a musical tradition or not, becomes problematic due to the complex interrelated parameters of the system. This is especially true when trying to achieve these quickly in a performance setting. In fact, trying to achieve repeatable melodic, harmonic or rhythmic musical gestures allows us to test the boundaries of what the system is capable of.

In some cases, melodic lines can be carved out accurately. Some examples of the techniques we've employed in order to achieve this are: by using MIDI control signals from software such as MAX (from Cycling 74) to control pitch shift in relation to established pitch groupings; creating intervallic patterns through the use of sequencers; and creating layered harmony through the use of harmoniser pedals, although in many cases this is in relation to the approximate pitch of the sound source rather than, for example, concert pitch. In the case of the latter, pedals such as the Whammy (from DigiTech) lead to further restrictions in the melodic contours and pitch content available, as a steady-pitched sound source can only be manipulated manually via either the dial (through a limited selection of discrete, non-diatonic steps) or the rocker pedal (which allows an analogue sweep between two set points), both of which are hard to control with precision. There are examples in our performances where we have used the capabilities of harmoniser pedals such as the Hedra (from Meris) to force a continuously variable sound source into discrete steps within a diatonic scale, and thus create more recognisably melodic phrases. However, this relies on a number of interrelated actions and settings across the system, lacking the ease and immediacy of the fretboard, and forcing us to create phrases that, once again, step through each pitch in turn rather than allow non-sequential intervals. As with the melodic lines themselves, many of the routes to creating harmony have the potential to lead to interesting microtonal/non-tempered results which might often be perceived as timbre, rather than harmony (as is common in Spectral music, for example). In the cases when these resemble tonal or diatonic harmonies, this is often only approximate in nature. These relationships exist within the contrapuntal performance of a single board, but become more complex when two boards interact, as they do in our performances.

Rhythm

Rhythm is a further parameter where the affordances and technical limitations of an entirely pedal-based performance system have a significant impact. Whilst some of the pedals we use are digital (or partly digital) pedals with the capacity for presets and MIDI control of tempo setting, others are purely analogue with no facility to save and recall presets. Partly because of this – in combination with the fact, noted above, that control parameters are often very sensitive, covering a large range within a small amount of movement – many of the methods which we employ to create pulses and other rhythmic gestures are not synchronised. The machine clock and the pedal interface mediate our ability to control tempo and musical feel in the embodied way we have learnt as guitarists, thus moving us further into the territory of the live electronic performer. Without the use of a MIDI or CV clock to regulate the two boards (or even just the one), not only does recreating specific tempi become problematic, but co-ordinating a global pulse between both players is almost impossible in most circumstances. We are battling against the idea that we can *lock-in* with each other or be *in the pocket* and instead there is a sense that we must, to a certain extent, accept and embrace asynchrony. As a result, our performances have leaned towards approximate rhythmic relationships and an acceptance of cross-rhythms and multiple co-existing tempi.

Dynamics

Another important area where the absence of the guitar input in a pedal-based performance system is felt strongly, is in our ability to shape dynamics and, in particular, the individual dynamic envelopes of notes or sounds, and those within phrases. The capacity of the guitar, in both acoustic and electric form, to give dynamic shape to sound – through both right- and left-hand technique – is something that might be considered a critical part of the instrument's character, especially the possibility of mixing staccato and legato phrasing and playing at speed. Its integral nature to guitar-based sound creation is highlighted by its relative absence from pedal technology – with rare exceptions being swell pedals designed to automatically emulate the use of a volume knob or pedal, or sustain pedals which remove the natural envelope of the

guitar string (not a problem we need to overcome in the same way when working with continuous sound sources).

The tremolo pedal goes some way to addressing this, especially in modern forms such as the Chase Bliss Gravitas, which features selectable waveform shapes and tap tempo, and allows the user to create repetitive or evolving dynamic patterns akin to percussion or a drum machine. However, triggerable envelopes are rare, and replicating the dexterity with which a guitarist can mix dynamic envelopes and note length is almost impossible in a no-input pedalboard performance system. More often, the dynamic envelope of the sound source has to be created through an on/off switch (often pretty clunky and hard to operate quickly), level knob, or through subsequent processing in the signal chain. This is almost a reversal of the guitar; whose natural dynamic envelope is one that has to be processed to achieve long or infinite sustain.

Affordances and limitations

It is in these areas where our performances and approaches to the composition of musical textures differ quite dramatically from our musical leanings as guitarists. Here we find the boundaries of the system pushing us to reconsider the roles of melody, harmony and rhythm. Perhaps, as a result of these limitations, musical parameters such as texture/timbre, dynamics and approximate register/tempo take on an increasingly prominent role, and parts are often sought with these qualities in mind, as opposed to specific, detailed harmonisations or exact interlocking rhythms.

As alluded to above, the systems have evolved to help facilitate the creation of multiple voices simultaneously. This can be done using loopers, certain delays, and pedals with freeze functions. This means that, at various points throughout either of the signal chains within a single board, a sound can be held and manipulated whilst other independent voices are performed. On the one hand, this makes the building up of multiple-voice textures relatively easy, and modulated or evolving parts can be playing autonomously once established, leaving the hands free to turn elsewhere. On the other hand, this act takes some planning and co-ordination, given that a sound at one point in a chain may or may not be affected by the pedals later in the chain, and the placement of those pedals able to record and hold a sound within the chain has a critical impact on the way the other pedals around it are used.

This highlights one of the central problems of the Noise Peddler systems, which is the issue of immediacy. Realising the sound that is in your mind can be a slow and difficult procedure, and quite often there are multiple ways of approaching the same idea by a varied combination and application of different pedals, each of which will have an impact on what is then possible with the rest of the board. These problems can be likened to the learning of any new instrument. However, two key factors compound this issue. Firstly, our primary creative approach is through improvisation, which means there are no rehearsed movements to rely on. Secondly, until the last two performances, our boards would change with each iteration, with different pedals or pedal orders meaning that repeatable actions were hard to learn. Here we find an interesting interplay between the muscle memory developed when learning and recalling an action on an instrument, and the problem-solving that takes place when navigating a dynamical system with only partial familiarity. With a pedalboard of this size, there are simply so many knobs, switches and stomps to factor in, that it can be an act of mental acrobatics to remember, at any one time, what is on, where a particular sound source is coming from, what it is being processed by, which pedal has its output level turned down, which has its wet/dry mix all the way up, and so on.

All of these complexities mean that it can be difficult – and practically impossible at times – to return to a previous idea, either within the same performance, or in trying to repeat a performance, unless the sound is saved on a loop or recallable via a preset. Compositionally, this process has pushed our performances

towards very through-composed structures, in which the music takes the form of a gradually evolving soundscape that shifts through oftentimes unrelated sonic areas. In this approach there is a play-off between seeking a sound in your mind and allowing the pedals to dictate where you go.

The ghost of the guitar

This brings us back to one of the key research questions – what is revealed of the ghost of the guitar when the guitar itself is removed and all that remains are the pedals? To think of it another way, is our performance still a guitar performance at all, have we taken it so far as to negate the guitar completely, or does it somehow sit in the inbetween space where the guitar's ghostly presence is felt at a distance, through the way it shapes the affordances of the technologies or the ears, bodies and musical ideas of the performers?

It is clear that the affordances and limitations of the no-input pedalboard performance systems we have developed expose the impact of presuming the input of the guitar in the way many pedals are designed, as well as the shifts in how embodied performance alters when the nature of the interface changes. The way we play guitar shapes the way we can play the pedalboard, and this goes both ways. It is true of its form and function, but it is also true of our approach to it and the connection of the guitar pedal to its position within guitar culture – though this is something that the project needs to explore in much more depth. It can be heard, however, in the work we produce – our ears are still the same ears and we approach the project as guitarists, albeit experimental ones. There are examples within our performances where the confines of our performance systems might mean it is difficult for us to play in total rhythmic synchronisation, yet sometimes we still gravitate towards the natural home of a two-guitar group – rhythm and lead, riff and solo – even if that is in an exploded sonic or compositional form.

One area where the guitar's ghostly presence is still very much heard is in the timbre of our music. Although we may have removed the guitar as sound source, the sonic capacity of the no-input pedalboard is still shaped by the design of the pedals, which are tested and calibrated for a guitar-type input and the associated limited frequency range that has. This is reinforced by the culturally organised hearing that leads us as listeners to associate certain types of harmonic distortion, compression and spectral shaping with the sound of the guitar, and as guitarists to seek them out. Some of this is deliberate on our part. For example, by using guitar amplifiers (and especially valve amplifiers) rather than modern full-range PA systems as the final processor and transducer of our sounds, we make both a sonic and visual link back to the electric guitar. There are also moments in the performances where we can be heard reaching out to try to conjure the sounds of a distorted guitar[5] and this reinforces both the nature of the pedalboard systems to facilitate certain types of sounds, and the fact that we approach the project as guitarists, with guitarists' ears. It is arguable that many modern guitarists – including the examples outlined in the context section above – are experimenting with pedals and timbre in their work in order to distance themselves from the conventional sound of the electric guitar, or that a distinguishing feature of contemporary pedal development is the facilitation of that movement. In Noise Peddler, there is a sense that in removing the guitar itself from our performance systems, we don't have to get away from it and can instead embrace its ghostly presence, embedded in the design of the pedal technology and revealed in our approach as players.

Future directions

One of the most central practical considerations moving forward has been the merits of repeatedly using the same setup, versus the potential for reconfiguration within an essentially modular system, both

[5] See authors' Noise Peddler performance at The 21st Century Guitar (available at: https://youtu.be/IiDcWAm31EA?t=793 at approx. 13:32).

approaches having distinct advantages and disadvantages. The former allows us to begin learning the instrument's parameters and aids in the ability to recreate certain sounds, thus facilitating the development of repeatable repertoire and compositions that are set to some degree. To live with the limitations of one signal chain brings with it the benefits of knowledge gained through repeated use, much like a traditional instrument. On the other hand, the latter maintains that sense of spontaneity in the performance that comes with the struggle to navigate something new. Here we are greeted with the notion that we aren't so much playing the boards, but that the boards are playing themselves, and we're simply helping to steer them. It is this constant battle against not knowing exactly what the system does which comes with exciting creative potential.

Stemming from this dilemma are broader musical concerns that we are keen to address, which include expanding the capacity for more accurate or repeatable harmony, synchronised rhythms, repeatable forms and ideas, and greater control over structure in general. One possibility is to build on our previous work with MIDI and CV in order to expand the control of musical parameters such as pitch and rhythm, either with pedals or with external software control. This direction may allow for repeatable compositional structures (through the control of MIDI enabled looper pedals or pedal presets), which would enable the development of repertoire and a performable set of works. Contrarily, the exploration of the control of each other's rigs via MIDI and CV paves the way for a unique mode of player interactivity which conceivably leads in the opposite direction to repertoire, enhancing the sense of struggle against a system over which one can have limited control.

Another line of enquiry involves the detailed exploration of the potential for routing variations, patching and feedback loops. Utility pedals such as switching systems that hold each pedal on a discrete loop are relatively commonplace within the guitar world and the use of a switching system such as the G3 (from Gig Rig) would allow us to move all the pedals within the chain to a number of different orders instantaneously. Also, in recent years more left-field options have become available such as the Matrise (from Pladask) – which would allow for matrix mixing – or the Patchulator (from Boredbrain), which enables live manual re-patching. These open up vast possibilities in terms of the role of each pedal, and would help to overcome the problem of the positioning of looping/freezing pedals within a chain, but this freedom comes with the considerable caveat of losing the visual feedback over the running order of a signal chain which, even in a static form, can already be overwhelming. Beyond this, there is an ever-expanding volume of new pedals being released, with designers continuously offering the musical world novel functionality and creative approaches to sound-sculpting that are important to explore, time and budget permitting.

Whilst exploring these various avenues, one underlying question is what this practice reveals about guitar culture itself. At the same time, in removing the guitar from our performance system we begin to question the relationship between the guitar and the pedalboard, to establish the nature of the pedalboard as an independent instrument in its own right, and to explore what kind of music it wants to make.

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Danny Bright is a composer, sound designer, performer, and sonic manipulator working across the fields of music, performance, installation, theatre and media. His creative and critical work investigates space/place/memory through a Sonic Ghosting practice; develops multi-modal compositional, performance, critical and installation work; and explores contemporary guitar technology-based performance systems. His work has appeared on Channel 4, at the Hatton Gallery, Brighton Digital Festival, V&A, Prague Quadrennial, Semaine des Arts at Paris 8, ICLI, NYCEMF, World Soundscape Conference, British Science Festival, and throughout the UK, Europe, Australia and the USA. Danny is a senior lecturer in Music and Music Technology at the University of Sussex.

Email: D.G.P.W.Bright@sussex.ac.uk

Lee Westwood is a guitarist and composer whose output is extremely diverse. With a background as a touring and recording fingerstyle guitarist, his current compositional research explores the notions of 'blur' and 'focus' in contemporary instrumental music. Recent projects include collaborations with Magnum photographer Olivia Arthur ('Stranger', 'TiChan', 'Stopgame'); multimedia exhibitions of the music/geometry crossover 'A Hidden Order' (Saatchi Gallery, Athr, SCOPE); the soundtrack to the BBC documentary 'The Windermere Children' (Nimzo Studio); international tours with prog-folk group Moulettes; and commissions from some of the UK's leading ensembles and choirs (LSO, Riot Ensemble, Joby Burgess). Lee currently lives in Brighton, and lectures at the University of Sussex.

Email: L.D.Westwood@sussex.ac.uk