Percussive Fingerstyle Guitar through the Lens of NIME: an Interview Study

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ABSTRACT

Percussive fingerstyle is a playing technique adopted by many contemporary acoustic guitarists, and it has grown substantially in popularity over the last decade. Its foundations lie in the use of the guitar's body for percussive lines, and in the extended range given by the novel use of altered tunings. There are very few formal accounts of percussive fingerstyle, therefore, we devised an interview study to investigate its approach to composition, performance and musical experimentation. Our aim was to gain insight into the technique from a gesture-based point of view, observe whether modern fingerstyle shares similarities to the approaches in NIME practice and investigate possible avenues for guitar augmentations inspired by the percussive technique. We conducted an inductive thematic analysis on the transcribed interviews: our findings highlight the participants' material-based approach to musical interaction and we present a three-zone model of the most common percussive gestures on the guitar's body. Furthermore, we examine current trends in Digital Musical Instruments, especially in guitar augmentation, and we discuss possible future directions in augmented guitars in light of the interviewees' perspectives.

Author Keywords

acoustic guitar, percussive fingerstyle, augmented guitar, gesture-based augmentation, user-centered design, intelligent musical instruments

CCS Concepts

•**Applied computing** → **Performing arts; Sound and music computing;** •**Human-centered computing** → Empirical studies in HCI;

1. INTRODUCTION

The steel-string acoustic guitar is one of the most widespread types of guitar; its popularity is normally associated to the accompanying style of the American/European singer-songwriter. However, the same instrument has been at the centre of a radical wave of innovation in the approach, the repertoire and the technique involved: that of percussive fingerstyle (Figure 1). It is a set of techniques for the solo guitar performer, aimed at playing layered arrangements rich in rhythm patterns that are reminiscent of a full band.

This style was born between the 1980's and the 1990's out of the pioneering work of artists such as the late Michael Hedges; over the last decade, however, it has seen a remarkable rise in popularity and it has evolved into a community of players, mainly thanks to online media outlets. The strong visual appeal of the percussive technique is surely one of the driving factors of its success; also, the ingenuity of the arrangements has a way of inspiring guitarists and other musicians who may be inclined to experiment on their instruments beyond traditional capabilities. In fact, similar styles are already being explored on the ukulele[1], the harp[2] and the double bass[3].

Figure 1: Example of percussive fingerstyle technique: fretting and tapping the body with the left hand over the neck. (photo by Andrei Spiridon)

This article is motivated by the desire to analyse the percussive fingerstyle phenomenon within the context of New Interfaces of Musical Expression (NIME). This analysis can bring lessons in the design of new musical interfaces, and especially in augmented guitars; likewise, it could inspire a reflection on the emergence of new techniques on existing NIMEs, how they develop, and if there is a way to encourage such a phenomenon in the design of new interfaces.

We present an interview study that we carried out with percussive acoustic guitar players. Firstly, we looked into how each musician interprets modern fingerstyle: their approach to composition or arrangement, the way they perceive the instrument and their artistic intent. We investi-

[1]James Hill, `https://youtu.be/u778gSi94N4`
[2]Amy Turk, `https://youtu.be/yyeuOmieaMM`
[3]Adam Ben Ezra, `https://youtu.be/xjhZhI2Zthg`

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gated their use of available technologies in music production and in sound amplification. The participants were then introduced to the concepts of instruments' affordances and constraints through the practical example of a guitar with the body covered in bubble wrap, followed by a description of instrument augmentation; finally, they took part in a ideation session where they described their preferred interactions with the instrument, suggested possible routes to augment the guitar and commented on their expectations from augmented instruments.

2. BACKGROUND

2.1 Notes on Percussive Fingerstyle

An academic description of modern fingerstyle is still in definition, and an attempt with any musicological rigour is beyond the scope of this work. However, documentaries [26], online resources[4] and recent theses [5] paint the picture of a style that aims to reproduce the rhythm, the presence and the musical complexity of a full pop, funk or rock band.

The many historical roots of percussive guitar include the Ghanan high-life style, Flamenco percussion, acoustic blues guitar pioneered by Bukka White and Robert Johnson[5], and the British folk school of Davy Graham and Bert Jansch [5].

Michael Hedges is regarded as initiator of modern fingerstyle: the use of both hands for fretting, plucking and hitting the instrument and the use of harmonics and timbral control to achieve layers in the musical texture have all become common traits of later artists. His use of altered tunings has the dual purpose of making open, complex chord voicings easier to play and extend the instrument's range towards the bass [24].

Percussive fingerstyle's current popularity owes much to the work of Andy McKee[6], Antoine Dufour, and the label CandyRat Records. Their blueprint helped shape the style into a visually attractive package of virtuosity in the performance, skilful composition and instrument experimentation.

2.2 Gestures, Guitars and Augmentation

The rich gesture vocabulary present in percussive fingerstyle performances and the players' drive for experimentation suggests a brief survey of current gesture-based augmentation, especially on guitars.

Gesture-based augmented instruments intervene in the gesture-to-sound mapping: they change the effect of *sound-producing* gestures [12, 17], give sound-facilitating or *ancillary* gestures a meaning that produces or modifies sound [31], or introduce new sound-affecting gestures into the expressive space of the instrument. Examples of augmented guitars of this family is Reboursière's Multi-modal Guitar [25] and Lähdeoja's electric guitar with a classifier for percussive interaction [14]; however, sensors to detect the player's movement for MIDI or audio control are a widespread paradigm in commercial augmentations [10, 30].

More fundamental re-designs of the augmented guitar are based on the decoupling of the mapping between the gesture and the sonic event [18]: historically, the MIDI capabilities of hexaphonic pickups (e.g. Roland GK3) have made this decoupling possible on the guitar. The decoupling might be partial if the acoustic sound generation of the instrument is kept [7] or active sound control intervenes on its acoustics [2]. Otherwise, the guitar's interface can be reproduced as a gestural controller for a sound-synthesising module, as is the case for the Jammy MIDI guitar [10] and the SynthAxe, a MIDI instrument from the 1980's [3]. The decoupling allows the reassignment of the instrument's affordances and constraints, in line with the possibilities offered by other Digital Musical Instruments (DMI) [16].

Instrument augmentation can also offer new perspectives in the relationship between the player and other players, the audience, or the player themselves. GuiART explores the control of many layers of the performance through looping and sound modification [17]. The Sensus Guitar [30] is a commercial product that gives the player both a complex sensing interface and possibilities in the realm of collaborative music [28]; Turchet and Barthet's Ubiquitous Guitar explores the involvement of another person in guitar playing via mobile interface control [29]. Augmented instruments can also support learning, enhance accessibility or remove encumbrances during specific activities such as playing along to a video [1].

3. STUDY METHODOLOGY

A semi-structured interview study was carried out with five professional musicians who had published original percussive fingerstyle pieces. The composition of the participants, four men and one woman, covers a wide age range (19-55) and a varied musical background, from self-taught to varying degrees of classical or formal training. None of them was familiar with NIME literature, and they had varying knowledge of current commercial DMIs. The interviews were arranged between December 2019 and January 2020 either at Queen Mary University's Media and Arts Technology recording studio or remotely, via Skype.

The interview sessions were scheduled to run for about one hour. Questions, performances and activities were arranged around the following main topics, in running order:

- **Performance of an original piece**: the participants were asked to play a percussive piece of their own composition, up to about one minute, and to provide a verbal description of the piece.
- **Approach to performance and composition**: the questions included a subjective definition of percussive fingerstyle, the background of the musician, main inspirations, their relationship with percussive fingerstyle as a technique and as a community, comments on their approach to songwriting and live performance.
- **Current technologies**: the artists were asked to describe the equipment used for performances, they commented on the role of audio effects in their performance, and gave their opinion on technology commonly used by solo musicians such as loopers and octave pedals; finally they were invited to discuss about the perceived limitations of their current equipment, and how they could be overcome in the future.
- **Wrapped guitar performance**: participants were asked to perform the same piece they selected for the start of the interview with a guitar whose body was wrapped in bubble-wrap, leaving only the strings exposed (Figure 2). They could then report on their thought process, and highlight their difficulties.

  This task has a double aim. Firstly, the user is made aware of new constraints in their interface, and we can observe the artist exploring other suitable affordances. Moreover, this practical example is useful in preparing the participant for the following discussion around redesigning constraints through augmentation.

[4]Mike Dawes, `https://youtu.be/R_IIdLzFjqI`
[5]Jon Gomm's History of percussive guitar, `https://youtu.be/B5_OrmD8Iq4`
[6]Andy McKee, `https://youtu.be/Ddn4MGaS3N4`

Participants calling in via Skype were offered the possibility of using an unplugged electric guitar for the task, as the solid body does not allow meaningful sound-producing interaction.

- **Gesture-based guitar augmentation**: the interviewees were handed a set of drawings of the guitar from three perspectives, front, upper shoulder and lower shoulder. This was the basis for a discussion about the preferred location for their interactions with the instrument's body; this context was also used to discuss the design of an ideal guitar from a purely functional and non-technical standpoint. The participants were not asked to draw or produce a prototype, but rather to discuss about features they would like to see implemented and how the implementation of such features would change their relationship with the instrument and affect their creative output.

The recorded interviews have been transcribed, then we conducted an inductive thematic analysis (outlined in Braun and Clarke [4]). Transcriptions of the interviews were coded and organised into themes, enabling us to examine any common narratives and highlight trends, differences or unicity in each theme.

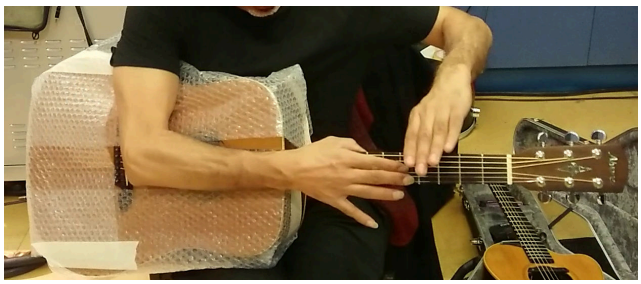

Figure 2: The wrapped guitar: participants were not allowed to touch the parts covered in bubble-wrap whilst playing.

4. RESULTS

We present in this section results from the thematic analysis by reviewing each theme.

4.1 Subjective Definitions of Percussive Fingerstyle

Percussive Fingerstyle was described in part as the product of the desire to provide a complete solo performance, especially of a modern pop/rock song, by using all the sonic possibilities offered by the acoustic guitar; continuous research and innovation on the instrument has the aim of "*elevating what you can do with a box and six strings*" (**P4**):
P1: "*It's trying to sound like a full band on one acoustic guitar, by playing bass, harmony and melody and also trying to emulate a drum-kit. It's the effort to make the guitar sound bigger than it normally is in pop music.*"

The desire to perform a complete musical idea without relying on the use of recording studio time, other musicians or Digital Audio Workstations (**P3, P5**) also motivates percussive fingerstyle's pursuit.

Some participants hinted at the removal of subjective, cultural and stylistic constraints as a conscious goal, in an ongoing exploration of all the possible affordances of the instrument:
P3: "*It's the power of curiosity, it's taking a set of resources and totally re-thinking their potential, utility and perspective on the musical instrument.*"

Michael Hedges, and in particular his album *Aerial Boundaries*, was cited as an inspirator of the movement, as well as the influence of Mike Dawes and his work in percussive guitar tuition. The transformation of the steel-string guitar from "*campfire instrument*" (**P2**) to a unique tool with its own repertoire was also a common theme:
P5: "*Michael Hedges, Alex De Grassi, Pierre Bensusan and the acoustic Pat Metheny all brought the steel string guitar to the level of concert instrument. They were the first ones to write specifically on the acoustic guitar, and they gave it its own stage and its own space.*"

4.2 The Instrument, Composition and Performance

Information about the artists' compositional process was collected from their description of theit original piece and questions about their approach to songwriting. All participants pointed to a routine of continuous discovery of chord voicings, patterns, drones and rhythms, which they gradually elaborate upon and collate to form a musical piece. This process is supported by their learning method: players reported to make the effort to not learn an entire piece of music, but rather extrapolate techniques and inventions to be re-used and re-interpreted in a more personal context (**P3**).

The interviews mention a feeling of "*not being always in control*" of the composition (**P2**, **P4**). Sometimes, an active role is attributed to the instrument or the music itself, and the composers describe themselves more like enablers or observers:
P4: "*Good songs come quickly and naturally and I connect with the song that is trying to come out. You don't really realise fully what's happening.*"

Particular relevance is given to the experimentation with tunings, promoted as part of the compositional process: a different song often requires a different tuning. One participant reports:
P5: "*I intentionally change tuning after composing a piece so that I don't end up writing the same piece twice!*"

4.3 Topology of Percussive Interaction

The interviewees were asked to comment on where and how they interacted with their guitar: their explanations and their drawings allowed to identify a set of common *loci* of interaction, a simplified map of percussive fingerstyle technique. Figure 3 shows the three most common positions of the hand in percussive hits. Resting around the soundhole affords a kick drum sound above the strings with the wrist, a snare-like sound when the strings are hit with four fingers, and a more tonal tom-like hit when the upper shoulder is hit with the thumb.

The formula of wrist as kick, fingers/fingernails as snare and thumb as tom is repeated in two other hand positions: moving from the soundhole to the upper right shoulder, the wrist and the thumb can rest on the top whereas the fingers can hit the side of the guitar, giving a deeper, drum-like snare sound (**P1**, **P4**). A third position around the lower right shoulder achieves the same snare sound but gives the bass drum more thickness and loudness (**P4**).

More details to the rhythm are added by using accents, akin to a drummer's hi-hat patterns or ghost notes. They are tapped by the left hand on either of the upper two shoulders, but more commonly they are single-finger taps on the strings, a technique borrowed by slap bassists such as Victor Wooten (**P2**). In fact, the percussive parts are organically integrated into the playing rather than being a separate

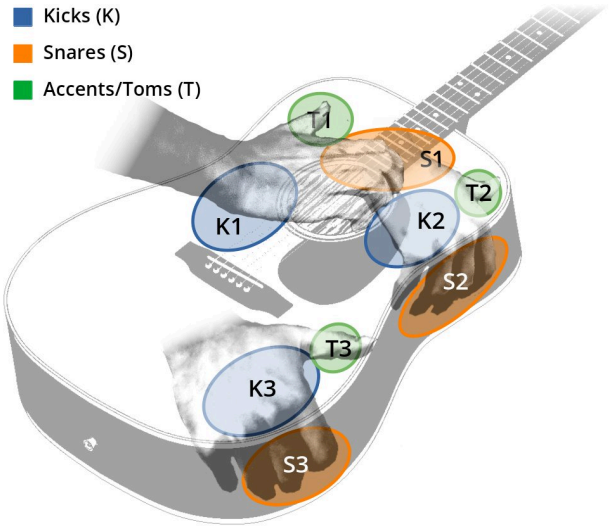

Figure 3: Simplified map of percussive interaction. *Zone 1*: hand on the strings, wrist just below soundhole. *Zone 2*: hand wrapping upper shoulder. *Zone 3*: hand wrapping lower shoulder.

interaction: the phrasing adds detail to the rhythm, and conversely the rhythm pattern is moulded around the hand position on the strings:
P3: "*Most percussion happens as a byproduct for a gesture I'm already doing to another effect. The less effort I need to make, the better.*"

4.4 Wrapped guitar performance

All participants used the provided wrapped guitar in Figure 2, except **P2** who was interviewed via Skype and therefore used a Gibson ES339 electric guitar. The performances showed that the disrupting effect of the task was dependent on how much the player's technique relied on body sounds.

Players **P2**, **P3** and **P4** were able to play the full piece with minimal changes. For those players, the interaction pattern mainly rests around the soundhole and the loss of percussive abilities on the body is limited to the wrist-kick movement. In those arrangements, however, the percussive element is often happening at the same time as string plucking: the wrist-kick always accompanies a bass note struck with the thumb. Removing the percussion, the rhythm is still implied in the string technique.

Other participants had arrangements that relied more heavily on accessing Zones 2 and 3, as well as the reversed left-hand position seen in Figure 1. They had to fundamentally re-think their arrangement, starting from the embodied reference of its original sound. Some tried using the neck but were frustrated by its lack of resonance; ultimately they all resorted to muted string tap sounds to reproduce rhythm. They described the experience as a "*fight with muscle memory*" (**P5**): the fight against the embodied movements was complemented by a dissatisfaction with the timbre of the alternative solutions (**P1**).

4.5 Discussing Technology and Guitar Augmentation

4.5.1 Approach to Technology

In the descriptions of the artists' use of current technology, audio effects were reportedly used as "*polishing tools*" (**P2**, **P3**) to enhance the guitar's acoustic sound, rather than modifying it for musical effect. Careful positioning of multiple acoustic transducers on the guitar is coupled with significant equalisation, to get both a natural string sound and good response from the percussive hits (**P1**). Reverb effects are sometimes used to enhance the decay of drony sounds in compositions, and were viewed as "*creators of space*" (**P4**). Loop stations are used to build upon ideas during composition, but their use as a live performance tool imposes constraints on the structure and on the delivery of the song:
P3: "*The problem is that it feels like your song is taking 5 minutes to start: it feels quite predictable and slow as a listener, unless the act of laying foundations for a track becomes part of the entertainment.*"

4.5.2 Participants' Suggestions

In the ideation session, the musicians were asked to discuss the features of an ideal guitar with which they would overcome their perceived limitations, or find new expressive possibilities. A frequent remark was that some gestures have a mismatch between the force needed to produce sound and the loudness of the outcome: hammer-ons with the left hand (**P1**) and drumming "rolls" on the soundboard (**P4**) require a lot of force, therefore they feel unnatural during quiet parts of a composition, and have a reduced expressive dynamic range.

Other examples hinted at the separation of the layers of the composition, to give them a more distinct sound quality. The vocal quality of the melodies would be enhanced by longer and possibly controllable note decay, as could long drones (**P1**, **P5**); magnetic actuators (E-Bow) are already used by some participants to that effect. The selective application of effects and sound overlays (synth and piano samples) was proposed as a way to enrich particular techniques: a practical example would be to enhance the sensation of "space" through the use of reverb swells only on chords and harmonics (**P4**).

An outlier is **P2**'s suggestion of an intelligent instrument with real-time computational creativity capabilities through the creation of AI musicians. Playing with virtual musicians was regarded as a desirable performance tool, on the condition that the AI-driven part would also have a visual element for the purpose of audience engagement.

4.5.3 High-level Design Suggestions

When confronted with the idea of having digital technology on their own wooden instrument, most players confirmed that they would approach an augmented instrument with the same drive for sonic exploration that informs their current compositional approach:
P5: "*[An augmented guitar] would make me think different. When I play I'm thinking, if I'm hearing sounds I would try to follow them. I would move towards exploring the sound, rather than the physical instrument.*"

We were cautioned against drifting away too much from a simple instrument: Pat Metheny's Pikasso guitar, an instrument with 42 strings, was used by **P5** as an example of a device that appears to have endless possibilities but ends up being used to always make the same sounds.

A perceived limit of digital interfaces seems to be the lack of spontaneous, nuanced control:
P4: "*Being at the mercy of computers is frustrating, because it cuts the level of spontaneity and unpredictability in the performance. The best performer is the one that gives you a different interpretation of the piece every time. I'm a bit hesitant to mechanise those real-time human decisions.*"

Finally, one participant demonstrated an awareness of the meaning of their ancillary gestures, arguing that music needs an element of "intangibility":

P4: "*The intangible is what makes music music: on the one hand, you can say that physically [the gesture] producing nothing, but it's a part of that person getting lost in the piece, and what makes the audience completely captivated.*"

4.6 Discussion

4.6.1 Virtuosity and Material-Based Interaction

All players described a compositional process that matches the description of *material-oriented* musical interaction [20]: the creative process is seen as a negotiation between the player and the instrument, and its sonic outcome is not fully anticipated. The top-down approach of conveying a musical idea is complemented or even superseded by the bottom-up inspiration that comes from the experience of the device's constraints [16].

A consequence is that the creative output is highly influenced by what De Souza called the instrument's *idiomaticity* [6, chapter 3]: the space in pitch, chord voicing and timbre that the interface affords most naturally. An exploration based on the geometry of the guitar will favour positions that are easier to reach, or require less effort to play in sequence.

De Souza also observed how the change of tunings, central in modern fingerstyle, was useful to jazz guitarist Kurt Rosenwinkel: he reported to change the tunings across compositions, in an act of "voluntary self-sabotage" aimed at breaking the embodied geometric idiomaticity of standard E-A-D-G-B-E tuning [6, chapter 4].

4.6.2 Percussive Fingerstyle NIME

There are important similarities and differences between what we observed in percussive fingerstyle and NIME practice, as described for example by Morreale *et al.* [19]. Modern fingerstyle researches the broadest possible palette of sounds and wants to connect guitar playing to as many music-making practices as possible, rather than perfecting a single craft: the desire to connect different practices is one trait of NIME design. On the other hand, where NIME and DMIs are normally designed to every specific need [16], percussive fingerstyle looks more like the attempt to enhance the guitarist's expressive capabilities to their physical limit, without re-engineering the instrument.

It seems, however, that the approach behind percussive fingerstyle is not inentionally limited to acoustic traditional instruments. We observed how our artists seemed keen on our hypothetical discussion about digital instrument augmentation. The literature has accounts of unexpected appropriation of highly constrained NIMEs [8, 33], albeit not by NIME practicioners themselves. We infer that there may be a practice within the NIME community analogous to modern fingerstyle guitar, whose purpose is to find affordances and develop virtuosic technique beyond the basic sound-producing capabilities expected from the instrument. This subset of players, or the encouragement of such practice, could arguably be named "percussive fingerstyle NIME".

4.6.3 Interpreting Design Feedback

Our participants' considerations on high-level design decisions in augmented instruments are quite consistent with current literature on control and appropriation.

Firstly, we showed that the players argued for a small number of simpler affordances in an augmented instrument. Zappi *et al.*'s study [33] also underlines how reducing the degrees of freedom of a musical interface enhances the granularity in its appropriation.

However, fewer degrees of freedom do not imply a reduction of *micro-diversity* or of *predictable* control over the instrument. Jordà [13] defines micro-diversity as the ability of the instrument to enable expressive deviation [27], by means of control over details such as differences in tempo, timbre, intensity and voicing. Plus, the degree of HCI control that proficient practice expects is the ability to predict the instrument's state at any given time [32], regardless of how non-linear the control interface is [21]. The desire for micro-diversity, expressed as spontaneity in the performance, emerges from the players' critique of loopers and **P4**'s description of spontaneous control at p. 4.5.3.

Finally, we propose a design decision based on **P4**'s account of the need for an "intangible" gesture space in live guitar performance. We intend to limit our augmentation to those gestures that have an obvious sonic meaning, in other words, any tactile interaction on the instrument. The sonification of ancillary gestures of guitar players (investigated e.g. in [15]) will be outside the scope of our work. The challenge there is to complement the musician's thought process and the communication with the audience, and also avoid HCI's "Midas touch" [11], the effect of a controller responding with sound to involuntary or purposeful non-sonic gestures.

4.7 Future Research

We considered how to involve our participants' suggestions in future studies and prototypes.

The perceived lack of dynamic range in the percussion suggests a number of solutions: examples are the reinforcement of the percussive hits through active control, or even a total de-coupling of percussive interaction through the virtual physical model of a plate or a drum, similar to Pardue *et al.*'s violin work [23]. We intend to evaluate these models and use them as research probes: understand how different technologies are appropriated, and whether the relaxation of physical limitations translates into more perceived affordances.

The players' desire to separate different techniques suggests an investigation into real-time classification of guitar gestures, including percussive interactions. Each separated layer could be given a wider dynamic range, be processed by different effects, or control a different synthesised sound. This task-based improvement may not give the instrument any new affordances [22]; however, classifying capabilities in an augmented guitar open up to the new and growing field of AI in augmented instruments. Machine understanding of the player's gestures could be coupled with a degree of computational creativity, following the example of simpler NIMEs such as Hantrakul and Kondak's gesture follower on the ROLI Lightpad [9]. this more ambitious target could help define the identity of Intelligent Instruments and the future direction of augmented instruments.

5. CONCLUSIONS

The interview study has given us important initial insight into the percussive fingerstyle technique; we outlined the most common types of interactions and a simplified map of their locations. Our findings suggest that percussive fingerstyle players have developed a method of performance and composition around the constraints of the musical instrument, that is reminiscent of NIME practice. This affinity seems to be preserved in their exploratory attitude to digital instrument augmentation. Their expectations from musical technology, on the other hand, are akin to those of expert players using traditional techniques: they include the search for micro-control and carefully contained unpredictability. The role of ancillary gestures as an "intangible" but irreplaceable element of musical performance was also discussed in the context of gesture-based augmentation.

We suggest that percussive fingerstyle could be generalised as the search for all non-obvious affordances and the development of solo virtuoso practice on constrained musical interfaces: it could be extended to many other instruments and even NIME. We also propose, as part of our future research, a range of probes built around our participants' suggestions to improve the dynamic range of percussive hits and enhance micro-diversity in a DMI interface; we will also look into the integration of classifying capabilities and limited computational creativity in an augmented guitar.

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7. ETHICAL STANDARDS

Informed consent to carry out the interviews was collected from all the participants, in conformity with Queen Mary University of London's Research Ethics Committee. Personal data has been stored and treated in accordance to European Union's GDPR directive.

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