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Frameworks and affordances: understanding the tools of music-making

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Abstract

This article presents a simple and flexible model in which the tools of music-making ('frameworks') are viewed in terms of what they allow us to do (their 'affordances'). The model has analytical and pedagogical applications in any discipline that involves interactions with tools. This article focuses on musical applications and will therefore be of particular interest to music educators, composers, performers and researchers seeking an alternative perspective on the relationship between music and the tools used to compose and perform it. The model deals with technology in a broad sense that includes traditional acoustic instruments and other non-electronic tools as well as electronic and computer technologies. An account of how the frameworks and affordances model could be usefully applied in teaching and research, with specific examples, is given.

Introduction

It is common practice in the field of human-computer interaction (HCI) to examine the relationships between users and interfaces, and to scrutinize the role that this interaction plays in determining the end results when we carry out tasks using computers (for a broad overview see Shneiderman and Plaisant 2009; for a study with a more specific focus on creative applications see Shneiderman 2000). Hence, there is a large volume of published literature concerning the scope and influence of computer-music tools upon various aspects of the creative process (Chadabe 1984; Jordà, et al. 2007; Kimura 2003; Mathews, et al. 1969; Pennycook 1985; Pestova 2009; Wanderley and Orio 2002).

What is less commonly acknowledged, however, is that the user-interface paradigm, with its emphasis on control and interaction, is not limited to the use of computers and software, and in fact exists when we use any tool, including acoustic musical instruments. If we use a violin to perform music, for example, then we can seek to understand the influence that this tool exerts upon the musical end results. Since the violin comprises strings stretched between two fixed points, so it is acoustically predisposed to produce pitched sounds. Accordingly, if we were to look at the violin repertoire, across all the genres of music and styles of performance we would probably find, on average and generally speaking, that it is used to produce pitched sounds more often than noisy sounds. This is one of the ways in which the tool influences the end results. It is, of course, a rather crass and superficial example that does not do justice to the myriad ways in which skilled violinists interact with their instruments. The frameworks and affordances model aims to provide the context within which more detailed and meaningful analyses of this kind can take place.

I first began to apply this kind of thinking to musical scenarios as way of exploring the ways in which composers of electroacoustic music interact with their tools (Mooney 2005: 29-35). Now I wish to develop the model further and propose more general applications for it, in the fields of performance, composition and musicology. These recent developments have arisen mainly through the continued experience of teaching music technology to undergraduate and postgraduate music students.

My purpose here is not to question the nature of technology, though there is of course highly relevant background literature in this area. Heidegger (1977) describes technology, in essence, as a phenomenon whereby we perceive the world's resources in terms of what they can do for us, thus revealing (to use Heidegger's own terminology) their latent purpose (or 'standing reserve'). Much subsequent theory is derived from Heidegger, indeed the notion of 'affordance', central to this article, owes something to his philosophical tenets.

The frameworks and affordances model is intended as a useful analytical and pedagogical tool that allows us to view the creative process as one in which composers and/or performers engage with their tools in order to achieve musical outcomes. The nature of the tools and interactions, it is argued, influences those outcomes. The purpose of the frameworks and affordances model is to encourage students, researchers and practitioners to think carefully and critically about the ways in which this happens, to consider in depth the ways in which musical frameworks are used to compose and perform, and the impact that this has upon the creative process and the resulting music.

Affordance

The idea of 'affordance' is explained by Windsor (2000: 11), echoing Gibson (1966, 1979), with the following simple example:

> A cup affords drinking […].

Drinking is something that the cup enables us to do. Drinking is, therefore, an affordance that the cup has. It has this affordance because of the way it is designed: it can hold contents; it has a handle that we can hold on to. We could also smash the cup by throwing it to the ground. Smashing is, therefore, another affordance that the cup has to offer us. Again, this is because of the way it is designed: it is made of china, which is fragile and easily smashed. Drinking and smashing are both affordances that the cup has and there are, no doubt, other affordances that we could think of.

Norman (1998) emphasizes the role of the designer as presenting affordances appropriately to the user and highlights the equal importance of ‘constraints’, or ‘non-affordances’ as we might call them (similar ideas are explored by Brown (2007)). Extending our example, there are indeed certain things that the cup does not allow us to do, such as travelling into outer space. Once again, this is due to the cup’s design, which does not make it suitable for space travel. This seems like a ridiculous point to make, but we will return to it later. Before we apply the notion of affordance to the tools of music-making, let us first be clear about what those tools include.

The tools of music-making

> A musical instrument is a piece of mechanical engineering that must work with complete reliability, often under adverse conditions. For an orchestra to be possible at all, a very large number of wires, strings, pegs, levers, reeds, pistons, rods, pads, skins, pedals, ratchets, hammers, joints and so on, have to work perfectly and most of the silently, for hundreds of thousands of operations. The reliability of all this machinery is remarkable, and in many cases design patterns were set by ancient, anonymous craftsmen whose ingenuity has not been bettered even in our high-tech age. Music technology is thus nothing new; it is part of the essential fabric of the art. (Cary 1992: xi)

Human musical activity is thought to have its origins in vocalization (Mithen 2006): the voice can be considered the first of the tools of music-making. The earliest musical instruments per se – bullroarers, rasps, pipes – date from the Paleolithic period, approximately 200,000 to 12,000 years ago (Montagu 2007; Morley 2003). Over the years, new tools have been introduced alongside existing ones. Nowadays, sequencers and notation software packages, microphones and recording devices, synthesizers, effects processors, and networked technologies (to name a few) are used alongside earlier tools. Throughout history the canon of tools used to compose and perform music has been continuously expanding.

The history of musical instruments and technologies is well represented in the literature (Blanning 2008; Campbell, Greated & Myres 2004; Cary 1992; Montagu 2007; Sachs 1940; Webster 2002), but we must not overlook the more mundane tools that play an important role in the processes of music-making. The quill and parchment that Bach used to notate The Well-Tempered Clavier are tools of music-making as well as the clavier itself. To draw a modern-day comparison, when interacting with music software we use a mouse. The mouse is therefore one of our music-making tools. The tools of music-making include anything and everything that is used for a musical purpose.

Physical Frameworks	**Conceptual Frameworks**
Violin	Twelve-bar blues
Synthesizer	Sonata form
Manuscript paper	Western classical notation
Microphone	12-tone serialism
Sibelius software	Dorian mode
Cubase software	Raga Bhairav
Microphone	Metric rhythm

Figure 1: Some arbitrary examples of the frameworks (tools) of music-making.

Conceptual systems are also used to compose and perform music. The Well-Tempered Clavier owes as much to the conceptual systems of fugue, tonality, and western classical notation as it does to the physical tools that helped to reveal it. The conceptual tools of music-making include systems of notation (e.g. neumes, guitar tablature, non-western forms); structuring principles such as sonata form or twelve-bar blues; systems of harmony and counterpoint (organum, figured bass, etc.); systems of pitch ordering such as serialism; scales, modes, ragas; even nominally more ‘open’ frameworks such as ‘free improvisation’; there are innumerable others.

These conceptual systems exist alongside the physical tools and are, in some sense, tools themselves. Throughout musical history, the portfolio of conceptual systems that can be used to compose and perform music has been developing and expanding in parallel with the portfolio of physical tools. Figure 1 shows a few illustrative examples of both physical and conceptual music-making tools; there are, of course, literally thousands of others.

Frameworks

It is useful to consider the physical tools of music-making and the conceptual systems as essentially the same thing. The term ‘framework’ is used to enable this: both physical and conceptual tools are considered to be frameworks.

A framework is any entity, construct, system, or paradigm – conceptual or physical – that contributes in some way to the composition or performance of music. This deliberately broad view allows the frameworks and affordances model to be applied to a very wide range of scenarios. Frameworks have affordances. In making music, the composer or performer – knowingly or naïvely – engages multiple frameworks to create the end result, and in doing so brings the affordances of those frameworks into play.

The frameworks used have an influence upon the musical results. This cannot be over-emphasized. If a composer choose to write for violin, for example, (s)he is buying into a certain set of affordances and therefore the musical results will be infused with ‘violin-ness’. If the composer chooses to use the five line staff framework to notate the composition, then the musical results will be constrained to those attainable using that system of representation. Collins (2008: 21-3), in her book on music in computer games, gives the example of a fairly primitive sound chip used in early games consoles. With this chip, it was only possible to produce certain pitches, while others would be badly mistuned. In order to produce music that was harmonically acceptable, because of the restricted pitch availability, composers ended up writing fairly obscure and strange-sounding harmonies. In this way, the affordances and constraints of the system quite conspicuously governed the musical results. We might compare this, tangentially, to the tuning of viols in the sixteenth century. Because of their unequal temperament, certain intervals would always be badly mistuned, meaning that ‘the complete E and B major triads [were] unavailable anywhere.’ (Barbour 1951: 186). Composers would need to avoid these triads in their compositions, or else accept the dissonant results; either way, the affordances and constraints of the framework make themselves known in the musical output.

Spectrum of affordance

Before we can explore the influence of affordances and constraints further, we need to extend the notion of affordance. We previously identified smashing and drinking as two affordances of the cup framework. Let us now consider these more closely. It is very easy to smash a cup. In fact, it is possible to accidentally smash a cup: no particular skill or previous experience is required. To drink from a cup, on the other hand, is less easy, and it is hard to imagine that this could happen accidentally. It is necessary first to fill the cup. It is necessary to hold the cup steady and upright, and to move it carefully to ones lips without spilling the contents. Although many of us probably take it for granted, drinking from a cup requires both prior knowledge of how the cup ought to be used as a tool, and certain skills. With the right training and some practice, most of us are able to develop the requisite knowledge and skills.

It is very easy to smash the cup; it is more difficult, but clearly possible, to drink from the cup; and it is impossible to achieve space travel using only the cup. We have now begun to define the cup’s spectrum of affordance. At the bottom end of the spectrum are the affordances that are most easy to achieve; at the top end of the spectrum, affordances that are impossible without an almost complete re-design of the framework, constraints in essence (Norman 1998); in the middle, intermediate affordances that are clearly achievable within the given framework but require a degree of expertise.

For the sake of a simple musical parallel, let us very briefly consider the spectrum of affordance of a violin. It is relatively easy to produce arbitrary scraping timbres on a violin. Comparable to the breaking of the cup, this can be achieved almost by accident by an untrained amateur. To play the cadenza from the Sibelius violin concerto, on the other hand, requires skill, but is nevertheless achievable within the violin framework (particularly since it was created with the unique affordances of the violin in mind). The cadenza is higher up the spectrum of affordances than the arbitrary scraping.

Thus, the notion of affordance can be expanded by considering the relative ease or difficulty with which a given affordance can be actioned within a given framework. The result is a spectrum of affordance particular to that framework. The examples given are illustrated in Figure 2. Note that it is a misunderstanding to think that affordances toward the bottom of the spectrum are qualitatively ‘bad’ while those at the top of the spectrum are ‘good’. The affordances at the bottom of the spectrum are simply easier to actualize, while those at the top are closer to being impossible to achieve within the given framework. The spectrum of affordance merely orders the possibilities of the framework according to their relative ease or difficulty of realization.

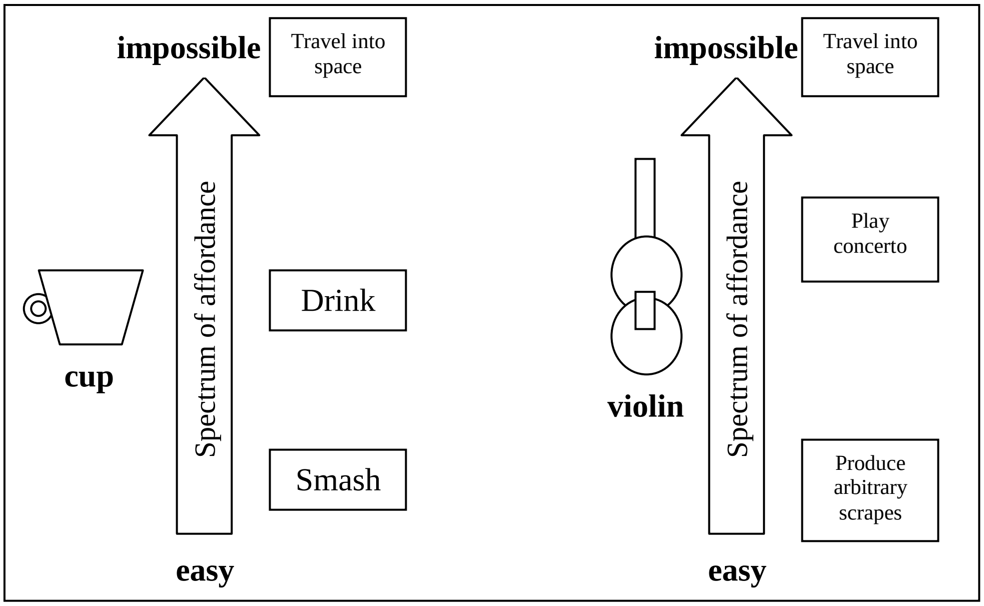

Figure 2: Two example frameworks – a cup and a violin – with example affordances positioned on a spectrum of affordance that ranges from 'easy' to 'impossible' to achieve.

The frameworks and affordances model

We are now in a position to review and summarize the frameworks and affordances model. A framework for music is any entity, construct, system, or paradigm that contributes in some way to the composition or performance of music. A framework is a tool, in essence, but one which can be physical or conceptual. An affordance is something that a framework allows one to do: the cup affords drinking; the well-tempered scale affords writing two preludes and fugues in each of the 24 major and minor keys; just intonation, on the other hand, affords writing music in the tonic, sub-dominant and dominant keys and not much else; the violin affords making scraping noises, or pitched notes, or impressive cadenzas. Because a framework can be used in many different ways, and for different purposes, every framework has a number of different affordances that it offers to its users; a list of things that one might try to achieve using that particular framework. Some of the affordances are easier to achieve than others, and by ordering the affordances from 'easiest' to 'most difficult' we obtain the spectrum of affordance for that framework. Put simply, every tool has a range of things it allows us to do, and some of those things can be done more easily than others.

Applying the model

The frameworks and affordances model can help us to build an understanding of why musical compositions and performances unfold the way they do. If a particular recurring musical structure is evident, for instance, an explanation might be found through discovering the affordances of the frameworks contributing to that musical discourse.

One way of applying the frameworks and affordances model in a pedagogical context is to set students assignment tasks designed to develop their awareness in this area. Several examples will be given in the sections that follow. Each task requires the student to employ the frameworks and affordances model in order to give an analytical account of a particular music-making tool. A sample answer is given in each case.

The sequencer as a musical framework

- Give an account of *the ways in which Steinberg's sequencing application Cubase, through its* design, might have an influence upon the music it is used to create. Include a spectrum of some *of the framework's affordances in your answer.*

The concept of the sequencer is straightforward enough: musical events can be ordered in time, one after the other, on a time-line, and the software is designed to enable the composer to determine how this happens. Within this paradigm exist certain assumptions, the most obvious being the assumption that music should be built additively by appending one item after another until the desired duration is achieved, as opposed to, say, subtractively by shaping existing masses of sonic material. In other words, the sequencer is biased towards what Wishart (1996: 23-30) has termed 'lattice based' musical paradigms. However, before we begin to question the general nature of the sequencer itself, let us first consider a rather more bite-sized example.

In Cubase, when one starts a new project, one is presented with a time-line that is divided up into bars. The meter is 4/4 (four crotchet, or quarter note, beats per bar), and the tempo is 120 crotchet beats per minute by default. The time-line is further divided up into a 'grid' of quavers (eighth notes) – this is the 'quantize' setting – and 'snap to grid' is enabled, meaning that musical events can only begin on the quaver subdivisions of the bar. This default state of affairs makes it comparatively easy to create rhythmical music in 4/4 time at 120 beats per minute. Because it requires a small (but significant) effort to change these default settings, so it is slightly (but significantly) more difficult to use this framework to create music in a time signature other than 4/4, or at a tempo other than 120 beats per minute, and it is more difficult still to create music that is not metrically rhythmical at all. The spectrum of affordance that this implies is shown in Figure 3.

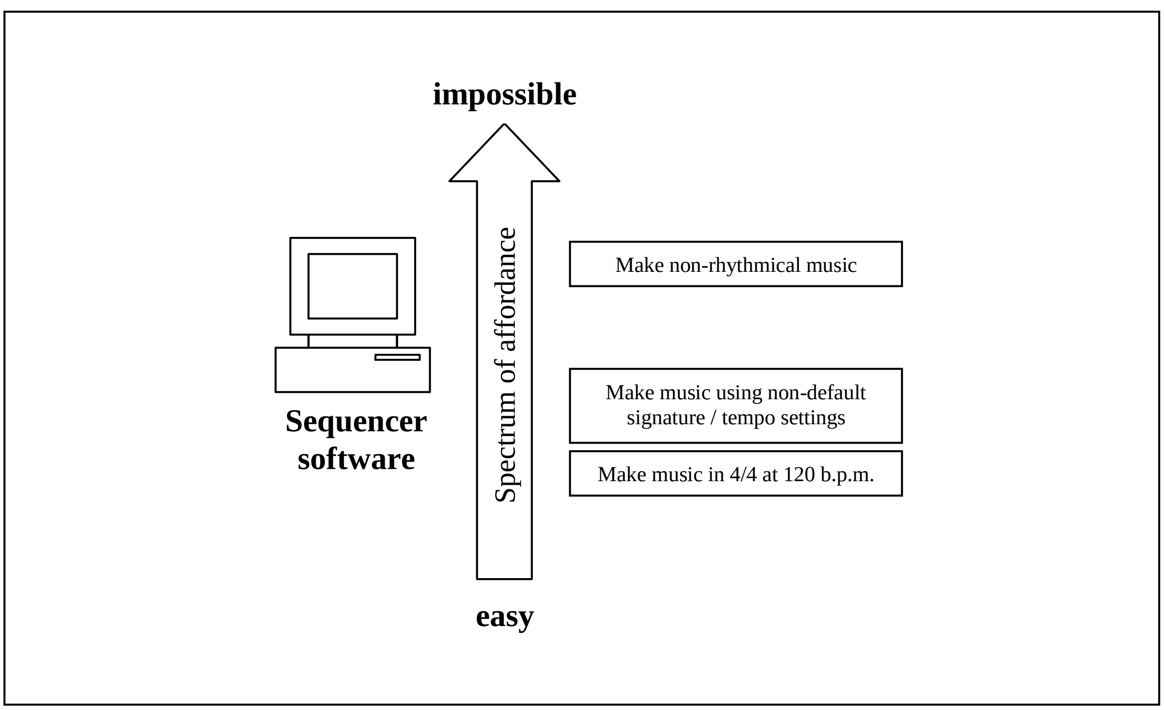

Figure 3: Spectrum of affordance for a typical software sequencer application, with some example affordances.

To put it another way, we could say (echoing Wishart) that this framework is slightly biased in favour of metric rhythmical music in 4/4 at 120 beats per minute. It could, therefore, quite easily exert an influence in that particular direction upon the music that it is used to create.

In briefly analyzing the computer sequencer as a framework, we have made some superficial yet illustrative observations as to how its spectrum of affordance might manifest itself in a bias in favour of particular kinds of musical output. Similar studies could be undertaken with other pieces of software. Apple's GarageBand, for example, can only produce pitches in 12-tone equal-tempered tuning, and has no support for less common time signatures or tempi outside a fairly limited range.

Depth and hierarchy

Before we continue with our sample analyses, we must consider how depth and hierarchy might be assimilated into the frameworks and affordances model. Continuing our most recent example, whether we treat the software sequencer as a single framework, or each of its individual faders, automation tracks, the computer's keyboard and mouse, and so on as multiple frameworks operating together, is a matter of choice that may vary depending upon the context and level of analytical detail required. This demonstrates an important characteristic of the frameworks and affordances model: any single framework can also be regarded as a collection of independent, smaller, frameworks; and likewise, any collection of frameworks can also be regarded as a single, larger, framework.

- Choose an improvising ensemble and analyze its practice using the frameworks and affordances model.

How might students approach this task? A violin can be treated as a single framework, or (recalling the quote from Cary given earlier) as a collection of multiple string, tuning peg, bridge, tail-piece (and so on) frameworks. An orchestra can be treated as a collection of multiple violin, viola, cello, French horn (and so on) frameworks, or it could be regarded as a single 'orchestra' framework. In applying the frameworks and affordances model we must decide how 'deep' we want our analysis to be.

This lays open a number of possibilities. On the one hand, a group of performers working with multiple instruments and conceptual constructs could be regarded as embodying one single framework. In determining the affordances of that framework one would be analyzing the creative practice of that ensemble at the most general level. The affordances would of course be very broad, but would incorporate, holistically, many performance practice attributes: the dynamic interactions between players; structuring principles at work; instruments being used; and so on.

On the other hand, the same ensemble could be deconstructed into its constituent frameworks and each of these analyzed individually to build-up, piece by piece, an overall impression of that ensemble's creative practice. Here, by contrast, the affordances would be numerous, and highly specific. One might also consider modeling the hierarchical relationships between frameworks in order to form a structural model of the ensemble and its constituent frameworks.

There is, of course, the possibility of an infinite regress here, since any framework can be broken down into multiple constituent frameworks. It is ultimately the decision of the person applying the framework to determine a useful level of depth based on the purposes of the analysis. The following sections focus individually on the fader and the mouse, both of which exist within the larger sequencer framework.

The fader as a musical framework

- Give a written account of the fader as a musical framework, explaining in your answer its affordances and constraints might evidence themselves in the musical output.

The fader has a history as a musical framework dating back at least as far as the first analogue mixing desks, which used faders (known to electronic engineers as slide potentiometers) to control the electrical resistance – and therefore signal amplitude – in each audio channel. It is worth noting that slide potentiometers (and also rotary potentiometers; knobs, in plain English) have their provenance in electronics and not in music; that is, they were originally designed to serve an electronic purpose rather than a musical one. Nonetheless, the fader has gone on to be emulated as a musical framework in software, as in the virtual mixing desks of sequencing packages. A brief exploration of the musical affordances of the fader is therefore worthwhile.

The fader affords us progressive incremental control; that is, in order to move from position ‘a’ to position ‘c’, the fader must move through the intermediate position ‘b’. It is not possible to move from ‘a’ to ‘z’ without momentarily visiting positions ‘b’ through ‘y’. Furthermore, the end-points of the fader cannot be transgressed: once we are at the top of the fader’s travel, the fader can only move downwards.

If a fader is used to control a musical parameter, its affordances become relevant musically. We can only make progressive and incremental (or decremental) changes in volume, for example; we cannot make instantaneous changes. If a fader is used control pitch, then we are forced into using glissandi between notes; there is no equivalent of ‘stopping’ as in stringed instruments. In a previous conference paper (Mooney, et al. 2008) I elaborated upon the affordances of faders in the context of sound spatialization and free improvisation.

The mouse as a musical framework

- Give a written account of the mouse as a musical framework. In your answer, you should make reference to musical examples in which the affordances of the mouse are evident.

The mouse has become a ubiquitous part of almost every computer setup and, therefore, an almost unavoidable framework for music-making nowadays. When combined with its on-screen counterpart, the cursor, the mouse allows us to interact with graphical user interface controls (also known as ‘widgets’) on the screen. In the case of a complex graphical user interface such as that of a sequencer or software synthesizer, the cursor – controlled by the mouse – can be used to manipulate a large number of graphical controls.

The first observation to make here is that a cursor, when tied to mouse control in the usual way, can only be in one place at one time. The mouse, therefore,

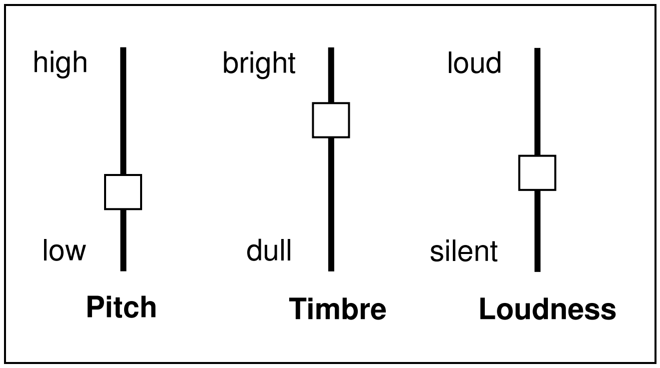

Figure 4: A simple imaginary software synthesizer with three parameters. Pitch, timbre, and loudness are each adjusted with a mouse-controlled fader.

allows us to manipulate only one widget at a time. Once again, the affordances of the framework become relevant in a musical context, and the precise consequences vary depending upon the musical mapping of the controls.

Figure 4 shows the graphical user interface of an imaginary piece of sound generating software; a simple monophonic synthesizer with pitch, loudness and timbre controls. The pitch can range from 'low' to 'high'; loudness from 'silent' to 'loud'; timbre from 'dull' to 'bright'. The pitch produced by a software instrument is often controlled with a piano-style keyboard, but in this deliberately crude example each of the three sonic parameters, including pitch, is controlled by a graphically emulated fader, with the mouse being used to move the cursor between faders and to 'drag' the faders up and down.

Let us assume that the synthesizer continuously produces sound without stopping (unless we reduce the 'loudness' fader to 'silent'). Because we are using a mouse, we can only change one of the sound's constituent parameters at a time. In this simple example, the implications of this will be easy to identify in the resulting sound: the pitch changes; and then the volume increases; and then the timbre brightens; and so on. Modifications to the sonic attributes will happen sequentially, one after the other. In addition, because we are using (graphically emulated) faders, we can only change those parameters progressively and incrementally, and this too will be readily identifiable in the resulting sound, as described previously. In this way, the framework leaves this characteristic fingerprint on the musical output.

Technological determinism

Might it be said that the model adopts a rather technologically deterministic stance where creative practice is viewed simply as the product of its tools, with no room for creativity? The answer is no, but this concern is an understandable one that demands some exploration.

A completely deterministic account of the creative process would assert that the exact nature of a composition or performance could be predicted, down to the very last detail, only by scrutinizing the frameworks employed in its realization. It is not the purpose of the frameworks and affordances model to imply that this is the case. What this completely deterministic view fails to account for is the fact that, as composers and performers, we are at liberty (knowledge and skills permitting) to make use of the whole spectrum of affordance of each framework we use. By choosing a particular framework, in other words, we do not subscribe ourselves to one single predictable outcome, but rather to a range of possible outcomes that are enabled by the affordances of that framework. Thus, the exact detail of the musical results cannot be completely predicted by examining the framework alone.

Now, consider that the creative process actually involves the use of not just one, but multiple frameworks, and so the potential outcomes are multiplied and increase exponentially with every additional framework used. In all practical senses, therefore, it becomes impossible to deterministically predict musical outcomes based on an analysis of the frameworks alone.

Further pedagogical considerations

In pedagogical settings where the aim is to teach students 'how to use' a particular framework, an awareness of the spectrum of affordance can help learners to conceptualize and understand the difference between difficulty experienced due to a lack of training, skills or experience, on the one hand, and difficulty experienced owing to the wrong tool being used, on the other. Kirk and Hunt approach the issue of 'ease of use' in computer-music frameworks as follows, making a rare and welcome analogy with two non-software frameworks:

> Most people would expect an ideal computer system to be easy to use and easy to learn. However, nobody expects learning to drive a car to be easy. No musician would ever say that a violin or a clarinet was easy to use. Yet the subtlety of control and real-time interaction which can be shown by car drivers and instrumental performers is often astounding. By making the assumption that interfaces should be easy we are in danger of undervaluing the adaptation capabilities of human operators and thus limiting the potential human-computer interaction to a lowest common denominator of 'easy to use' commands. […] A musician who has to work hard to produce a good sound is likely to be rewarded with appreciation from an audience. In contrast 'easy-play' instruments tend to produce 'cheap-and-easy' musical results. (Kirk and Hunt 1999: 311-312)

We know that the affordances occupying the lower (easier) portion of the spectrum are, by definition, those that can be actioned easily, unwittingly, or even accidentally, like the breaking of the cup. As such, the results attainable through an exploration of the affordances occupying the lower end of the spectrum are, as Kirk and Hunt put it, 'cheap-and-easy'. These are the kinds of results that might be attained by an unskilled, untrained amateur, or even through chance or random interactions.

Student work apparently exploring affordances at the lower end of the spectrum does not conclusively demonstrate that the student can successfully engage in greater-than-chance or above-amateur-level interactions within that framework. Here, the aim should be to progressively broaden the range of affordances accessible to the student through training and, indeed, through raising awareness, ontologically speaking, of the notions of frameworks and affordances themselves.

As we ascend the spectrum of affordance toward the higher, more difficult, extremity, we naturally begin to encounter affordances that are really rather difficult to attain with the framework in question. Here, we must ask ourselves a very important question: is it worth persevering, or is there a better tool for the job? Might we find a different framework where the affordance in question is lower down the spectrum? There is a danger that student work exploring affordances towards the top of the spectrum is due to an inappropriate choice of framework that requires reconsideration.

It can be seen that, in this particular pedagogical scenario, it makes sense to encourage students to aim for the upper-middle portion of the spectrum of affordance. Here, they can demonstrate both an appropriate awareness of the limitations of the framework in question, and a level of skill above that of an untrained amateur.

Of course, a different pedagogical scenario, with different learning outcomes, might have a completely different system of values. In teaching group improvisation, for example, the ease with which a particular musical utterance can be generated with an instrument (read: its position on the spectrum of affordance) might be of secondary importance to role which that utterance might play within the musical dialogue. In this context it would not make sense, as a rule-of-thumb, to encourage students to aim for the mid-to-high end of the spectrum, since there is no guarantee that this would result in the most effective musical dialogue. Rather, in a group improvisation context, students should be encouraged to think about what their individual musical utterances afford to the performance as a whole: gesture ‘a’ affords responding to; gesture ‘b’ affords a transition to a new section with different musical characteristics; and so on.

Conclusion: frameworks as non-transparent mediators

The all-important point is that no framework is a transparent, neutral, mediator of artistic expression. All frameworks – because of their design – have a spectrum of affordance whereby certain objectives are easier to achieve than others. We have no choice but to operate within this spectrum: we can do so naïvely or knowingly, with or without skill, but in any case we are operating within a spectrum of affordance. In this way, all frameworks invite the user to work in particular ways and, therefore, every framework will make its influence known, to some extent, in the creative output. One can ‘hear’ the affordances of the frameworks used to compose and perform the music.

There are educational, analytical and reflective contexts in which this model of the framework as a non-transparent mediator, having a spectrum of affordance, will prove useful. Pedagogically, it might be considered important for students to be aware that the nature of their creative endeavours can be influenced by the tools that they use, and the frameworks and affordances model helps to elucidate this. Analytically, the frameworks and affordances model allows us to understand, in certain particular ways, why musical compositions and performances turn out the way they do.

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