PERFECT INFORMATION: SCORES AS SELF-EVIDENT PROCESSES

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ABSTRACT

Self-evident processes in music suggest the possibility of close engagement with the operation of a piece, with the potential for empathic and communal experiences to be had by both participants and observers. Taking the notion of perfect and imperfect information in games as a starting point, the paper considers what might be gained by presenting scores as systems of perfect information. In games with perfect or public information, all the necessary information is made available to us, so we have the potential to understand player choices and empathise with them when spectating. In process music, if the necessary information is made available to us we also have the potential to understand player choices and empathise with them. The paper considers the development of self-evident music in this context, proposing three modes of information delivery: demonstrating, explaining and showing. These modes are considered in relation to the management of information flow and the corresponding cognitive load placed on listeners through the control of speed, density, simultaneity and sequentiality in the presentation of instructions.

1. INTRODUCTION

In a game such as chess, players have access to *perfect information*, where 'all players have complete knowledge about every element in the game at all times.' [1, p. 204] What is happening in terms of the movement and relationships between pieces is always visible, both to the players and, crucially, an audience. In a card game, such as whist, however, 'some of the game information may be hidden from players during the game' [1, p. 204], where managing such *imperfect information* might form part of the challenge. The parallels between games and other instruction-driven activities, such as scored music or instructional art, suggest the possibility of considering systems of perfect and imperfect information in those contexts to see how they impact on our experience of such work as participants or observers. Specifically, what might be gained by presenting scores as systems of perfect information?

While there are many examples of pieces which deal in perfect information in different ways, perhaps the most common form of presentation is that of imperfect information. For players in an ensemble context, the starting point may be that of not initially knowing what others are doing as they have access only to their own part, or there may be events that are more unpredictable to which they must react. For audiences, much of this working is also hidden, leaving them only with the trace of the process apparent in the performed result. There are contexts in which this is mitigated however–such as projecting the score or knowing it well–but these situations are often overlaid on the basic premise that discernibility is not necessary to the realisation or experience of the work: they might represent added value. Viewers may also not know how to decode any scores made available to them, rendering the impact of their visibility a moot point.

Some pieces, however, present perfect information such that all players know what is happening, and what has happened, and that these events may also be evident to the audience. In these situations, revealing the inner working of a piece offers up other ways to engage with the experience, potentially creating an affinity between players in their understanding of each other's choices, and empathy for the players from the audience. While this can in some cases remove the mystery of performance, it might also allow the experience to be more communal.

In this paper I consider the ways in which perfect information can be managed to create these correspondences in meaningful ways for participants and observers in scored compositions, focusing on open scores where decision-making processes are inherent to the mode of performance. My interest here is in creating a self-evident experience for observers, such that being welcomed inside the often-closed world of performance might shed light on the way we think and work together in groups.

2. INFORMATION

2.1 Perfect and Imperfect Information in Games

Our experience of games as observers is related to our understanding of what is happening. In games, the notion of perfect and imperfect information is crucial to our understanding of how processes operate, and correspondingly how games are played. The amount of extant knowledge we have regulates the choices that might be available to us, be they rational or not. In a game with perfect information, observers can also see what the players see and are able to speculate internally and strategise as a result. Such games flatten the differentiation between players and observers so that perceptible engagements with a game's components–moving a chess piece for example–are known to all. Perfect games may not explicitly reveal players' in-

ternal processing of game states, but the tangible results of their actions based on universally available information are. The availability of perfect information is referred to as an *extensive-form game* in game theory, where a game such as chess can be represented by a branching structure, the game tree, which outlines possible moves as a consequence of previous moves. We know, at least in theory, all possible moves from a given position. Observing a perfect information extensive-form game therefore allows us to empathise with the players by shadowing their decisions in a non-participatory manner. We can ponder what we would do next.

In imperfect information games, we may still receive gratification as observers by the reveal of hidden information by a player: the laying of a surprisingly effective card, the fortuitous dice roll, the opportune use of a power-up. Here too, while decision-making is less explicit as the field in which decisions are made is partly obscured, knowing the possibilities that might occur can open up similarly empathic responses predicated instead on the element of surprise. Our knowledge of the process, the system of interactions which unfold before us, may be sufficient to draw us in at a level where our understanding engages us in the strategy of players and their adaptability to circumstance. This is equally the case whether watching a cricket match or a livestreamed video game.

Elias, Garfield and Gutschera [2] refer to such perfect information as *public*, where players know things about the game, and imperfect information as *hidden*, where there are things they do not know. This may or may not be different for observers (e.g. peering over the shoulder of someone playing cards). They note the relationship between hidden information and spectation, suggesting that 'the more information is hidden, the worse the game's spectation' and that in hidden settings 'if the problem can be solved in some reasonable way. . . the audience may find the revelation of secrets quite appealing, leading to good spectation'. [2] In order to do this they suggest emphasising directional heuristics to 'make it easier for viewers to understand the state the game is in' and to let them say '"I would have done that differently!" and thus become more involved in the game.' [2] While this is framed within a gaming context, the idea of public and hidden information is relevant to spectation in music performance too.

2.2 Public and Hidden Processes in Music

Our experience of music as listener-observers is also related to our understanding of what is happening. In process music if the necessary information is made available to us, we have the potential to understand player choices and empathise with them. There is some commonality here with Steve Reich setting out the case for audible processes in music in his 1969 manifesto 'Music as a Gradual Process' [3]. He notes his wish 'to be able to hear the process happening through the sounding music' in such a way that we experience 'a compositional process and a sounding music that are one and the same thing'. While there is some ontological dissonance in this statement, the aim of revealing information that might normally be hidden as a way to shift

attention towards a different kind of understanding is significant. Crucially Reich advocates doing this through the sounding music rather than through a separate explanation, such as a programme note or scholarly text.

This attitude is mediated through a compositional practice that focuses on gradual processes that unfold as we listen, rather than those buried within the compositional workings and seemingly obscured or privileged. But there are other ways to reveal aspects of these workings in the way a composition is experienced, such as listening with a score, whether this is through following it privately, viewing a score follower video where the audio and notation are synchronised, or by projecting the score for an audience. This can go some way towards the kind of revelation Reich advocates, but it is contingent on understanding the notation and being able to connect that in an analytical way with what is heard. It can be a specialist skill, and does not necessarily reveal information to all users.

It is important, therefore, to note the audience for this awareness of process. Later in the manifesto Reich comments that 'I don't know any secrets of the structure that you can't hear. We all listen to the process together since it is quite audible'.[3] This contrasts with many experiences of scored compositions, where the musicians realising a piece are permitted to glimpse aspects of its workings. As listeners we might recognise formal devices and technical models through exposure, but the contract is not with us directly.

But making processes audible does not necessarily equate with making the score public, although this can help. Rather it is about making available ways to understand what is happening in a piece more holistically. Sandeep Bhagwati suggests five different *conveyance modes* utilised in audio scores as a way to consider the best way to frame a scorer's intentions, such that 'each score type will need a different set of conveyance modes and will weigh their importance differently.' [4, p.26] These modes isolate instructional aspects of audio scores which may be useful in considering ways to share what is happening with observers. In particular his second category, instruction mode cues, contains four types of instructions:

- *Musical* instructions 'provoke musical structures that concern only the musician receiving the instruction' and might include commands to start or stop an activity, to play something previously specified such as a memorised pattern, or to play in a particular way.

- *Interactional* instructions 'concern the musical relations between two or more musicians', such as being instructed to accompany another player or emphasise a pitch heard in the soundscape.

- *Para-musical* instructions 'direct the performers to enact non-sonic behaviours' such as moving or other physical responses to the context.

- *Indexical* instructions 'point to, explain, and set up other conveyance modes' such as instructing one player to imitate another. [4, pp. 26–27]

If these instructions are made available to observers as well as participants following the instructions, the possibility of a self-evident music might result. In order to 'hear the process happening through the sounding music' however, enough of what is happening needs to be perceptible for observers. Self-evident processes suggest the possibility of close engagement with the operation of a piece, with the potential for empathic and communal experiences to be had by both participants and observers. If we are to consider what might be gained by presenting scores as systems of perfect information, we need to know what strategies and processes are available.

3. SELF-EVIDENT MUSIC

There seem to be relatively few pieces where the audience is made fully aware of the process as they observe it unfold. Composers use different modes to make this apparent to the audience, and these might form a partial framework for considering how such approaches could work. I suggest three intersecting ways this might happen: demonstrating, explaining and showing.

3.1 Demonstrating

The actions of the players may demonstrate non-verbally what is happening in the piece. The players might be tasked with an activity which they do in front of an audience. In undertaking this they do not explicitly explain what they are doing but their discussion and/or actions make this evident. In contrast to the notion of showing, demonstrations make processes self-evident through actions rather than presenting the score itself.

In Peter Ablinger's *Wachstum und Massenmord* (2009–10), a string quartet rehearse some unseen musical material for the first time in front of an audience. Ablinger notes that "The Rehearsal is the Piece. [. . .] The performers have not seen the score (except this foreword) ahead of time, and will receive it only directly before the performance, or, the scores are waiting for them on their music-stands." [5] Here the activity of the quartet references the rehearsal situation as a staged process of production. If we recognise and acknowledge this, aspects of the piece are traceable. The audience is not explicitly told what is happening, but it might be deemed self-evident that we are observing a kind of performative rehearsal.

Visible and audible cueing is another effective way of making player choices evident through demonstration. Depending on the nature of the instruction, interpersonal cueing can show aspects of each player's thinking, and the way such choices impact on the resultant music. I have explored this in my piece *it is the behaviour that a system tends towards and encourages that needs to be understood* (2021), where players cue material verbally, and then play it, creating connections with what other players are doing through explicit instruction or careful listening. The score pages comprise a series of 100 numbered cues, each of which indicate the starting point for the material chosen to be played. Other cues modify the way the material is played, including instructions to pause, change speed, reg-

ister or direction of movement, and create looped sections. Players can give cues themselves and respond to those of others in order to investigate how concerted activity might emerge, co-ordinating and disrupting the structure of the group as a whole. The power structures within the group are playfully revealed, as are aspects of the performed personalities of the participants.

Other kinds of physical demonstration are possible, such as in Michael Baldwin's *a kind of nostalgia* (2014) where a guitarist playing a memorised piece of standard repertoire is controlled by mirroring the movements of another performer sitting opposite them. The other performer makes a series of fluid movements while holding a guitar of their own, and the guitarist must copy them, thereby rendering much of the playing impossible through the imposed contortions. No explanation is given, and the gradual exaggeration of movements that might occur leads observers through the process. It is of course questionable whether these demonstrations do reveal their workings to observers or whether it is just an aspiration: either way, the staged attempt is significant.

It should also be noted that the three categories – demonstrating, explaining and showing – intersect to form hybridised presentations. For example, in Robert Luzar's *Demonstrations* series (2016–20) videos or live performances "show audiences step-by-step actions on how to do – and possibly change – certain actions with their bodies, common materials and spaces." [6] These demonstrations are also partially explained by text captions or spoken commentary but often destabilise what is being observed.

3.2 Explaining

Pieces which involve demonstration can be allusive, whereas pieces which use explanation tend to reveal what is happening more explicitly using words. This may be through one or more of the players, or the composer, acting as a narrator and explaining what is happening to the audience. There are many examples of this, including pieces such as Tom Johnson's *Failing, a very difficult piece for double bass* (1975) and *Naryana's Cows* (1989) in which the narrator explains the process as it unfolds, Johannes Kreidler's *Fremdarbeit* (2009) where the composer explains the alleged outsourcing of the composition's making, or Matthew Shlomowitz's *Lecture about Bad Music* (2015) which playfully explores our habituation and relationship with music as listeners. All of these pieces involve spoken performative explanation of elements of the composition, such that these might be foregrounded as the listening focus. This could be a genuine attempt to clarify and make explicit what we observe, or it might distract from or obscure other aspects of the work, depending on what we believe.

In a similar way, pre-recorded voices can explain to the players what they must do. This explanation, and the actions that result, are apparent to the audience. Alvin Lucier's *I am sitting in a room* (1970) is a useful point of reference for this approach, with the score, and its realisation, turning this into a piece which describes its own making, enabling listeners to track the progress over time

as the audio gradually flattens out. A more performative example is Louis d'Heudieres' *for ＿＿ on ＿＿* (2015) which

> explores the idea of learning and rehearsing as performance. A group of performers hear a field recording for the first time. A voice explains that they should use it as a score, and have a limited time to learn it on their instruments. The audience is with them as they negotiate this task. [7]

The result is the players' attempt to do this within the temporal constraints set by the pre-recorded track. The audience follows the players' decision-making and can both think through their own approach and evaluate the players' choices as a result. Similarly in Stephen Crowe's *Tenvelopes* (2011–), horn player Samuel Stoll opens a series of ten envelopes, each containing a set of instructions for mostly uncomfortable activities such as licking the floor to partial undressing, guided by the (sometimes distorted) pre-recorded spoken voice of the composer. Although we do not know what is written on the cards, the framing of the wider piece makes it clear what is happening, and the enjoyment is in part from the comic timing and discomfort of the realisation of what Stoll is being asked to do.

Although I am focusing here on performative explanations which take place during the piece, it should be noted that external explanations such as programme notes, pre-performance talks, academic papers and interviews can contribute to developing an understanding of what happens in a piece. Some work is more ambiguous though, such as La Monte Young's *Composition 1960 #3* and *#4*, both of which require the activity of the piece to be announced to the audience.

3.3 Showing

Perhaps the simplest way to make what is happening evident is to show the score to observers, thereby removing much of the hidden information it contains. By doing this, it opens up aspects of the piece that may aid comprehension for some observers, although any understanding depends on being able to decode what is shown, whether this is stave-centred notation, tablature, static or moving images. For stave-centred notations, online score follower presentations are a clear way to connect what the notation shows to the audible musical responses from players, but this does require familiarity with these forms of notation. In a different way, animated notation can remove some of these barriers, such as in Ryan Ross Smith's *Study No.9* (2012) where players play one of their three sounds every time a moving cursor crosses an event node. Smith states in the performance instructions that "If possible, the Animated Score should be projected for both the performers and audience to see." [8] A common performance practice with animated notation is to project the score in this way, which, as David Kim-Boyle notes, "encourages an engagement with procedural relationships as they temporally unfold in the score and are musically sounded in the performance space." [9, p.48]

In some of the examples above, aural scores which explain or demonstrate what is happening intersect with the notion of showing in that observers have access to some of the same information as the players. Verbal explanation, in particular, may be a trace of the primary score, which sets out the process for what the players do and what observers experience: this is related, but different to showing the score itself.

3.4 Managing Information

Through the examples above I suggest three modes of delivering public information. The success of these approaches is contingent on the way such information is framed and managed for observers, such that it is understandable and meaningful. The factors which affect comprehension can also highlight the attitude towards revealing information encoded in a piece: some aspects might be hidden, deliberately made ambiguous, accidentally obscured, or revealed in absolute detail. The mode of delivering information and the method used to do it are both fundamental to this process, and comprise a set of broad parametric considerations that impact on the result. Four parameters are key to an understanding of what we perceive. The *speed* at which information is delivered has a direct bearing on how cues are understood. The *sequentiality* of information affects how we process cues in time with all the non-linear complexity of perception, memory, and expectation. The *density* of information regulates the audibility of separate cue elements and how we might differentiate them. The *simultaneity* of information affects how we manage parallel streams of cues and determines where our focus is placed.

Together these four parameters affect the cognitive load inherent in processing the information. In particular Sweller et al. note the difference in cognitive load between "the intrinsic nature of the material (intrinsic cognitive load) and the manner in which the material is presented (extraneous cognitive load)". [10, p. 57] Extraneous cognitive load is of particular relevance to comprehension in revealing the processes that are active in a piece. For example, in my piece *you are required to split your attention between multiple sources of information* (2018), multiple streams of audio cues articulated by six different artificial voices are occasionally densely layered, simultaneous and delivered at high speed making it difficult to isolate specific instructions. The extraneous cognitive load is high at these points, although it is introduced earlier in the piece in a more relaxed manner to aid comprehension and learning of the system by listener-observers. In all three modes of delivering public information, the cognitive load placed on observers, in addition to the players, has a direct bearing on how perceivable processes in the music are.

4. CONCLUSION

In the introduction, I asked what might be gained by presenting scores as systems of perfect or public information. Perhaps by revealing aspects of a piece which are normally unavailable through demonstrating, explaining

and showing, the opening up of the experience may be seen as more welcoming for observers. Reducing the reliance on privileged knowledge, whether cultural or technical, has the potential to reduce barriers for engaging audiences. In some circumstances, this might suggest a kind of participatory engagement, one shared by observers of games or sports where thinking through strategies for possible moves or 'kicking every ball' reduces the space between them and more active participants. This sense of involvement-through-understanding can produce a feeling of empathy for participants from observers, especially where an activity has a tangible relation to everyday life and things that are already within our experience. This is not a suggestion that everything should be revealed, or that situations employing hidden or imperfect information are somehow lacking. Indeed there may be a concern that this kind of revelation removes the ineffable in music, despite Reich's note that "there are still enough mysteries to satisfy all." [3] But such self-evident processes in music can suggest the possibility of close engagement with the operation of a piece, with the potential for empathic and communal experiences to be had by both participants and observers.

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