Performance Interfaces and Destabilisation

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Abstract. Interaction with technology is occurring increasingly in public and semi-public settings and as a result the roles of spectator and performer are frequently being challenged by the deployment of computing systems. In this paper we discuss how the spectator, performer and interface feature in what we class as 'performance,' how we might analyse their interrelationships and how traditional roles have become destabilised historically and technologically. In studying these relationships, we examine technological and non-technological examples from art, performance and exhibition design.

Introduction

The growing interest in cultural, artistic and entertainment applications of interactive technologies in settings such as museums, galleries, theatres and even clubs, combined with the spread of mobile devices into the streets, means that interaction with computers is becoming an increasingly pervasive and public affair. The design of future systems and interfaces must therefore be informed by studying the ways in which this interaction is woven into and reformulates performer and spectator experiences during performance with interfaces.

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Firstly, what are these 'performance interfaces'? We deliberately take a broad view of performance in order to inform our discussion with the issues that surround publically deployed technology. This encompasses explicitly staged interaction by musicians, actors and artists in front of an audience, as well as more implicit performance, where temporary performers, such as museum visitors, almost unconsciously craft and perform their interactions for others to see in a public setting. It has already been noted how such situations occur in some workplace settings [10], and as we shall see this becomes a far more explicitly designed affair in many settings such as theatres, exhibitions, and galleries. This analysis, however, also applies to our everyday 'performance' situations, such as conducting mobile phone conversations or PDA and laptop use in bars, restaurants, on trains and in the streets. (There is perhaps something of a convergence between the two in several of the works we discuss later.) Our performer, then, could equally be an artist or a museum visitor, and our spectator may be an implicated bystander. As we shall see, these roles are anything but stable when the interface is factored into the analysis.

In this paper, then, we shall firstly examine in brief how spectators, performers and the interface may be conceptually arranged in order to deconstruct the relationships between each element. After this, we shall consider systematically several ways in which performer, spectator and interface positions are destabilised in several example systems and some practical issues surrounding this.

Performer, Spectator and Interface

Who is a performer and who is a spectator? We may make some simple distinctions between the roles by identifying two distinct components of interaction: manipulations and effects. Manipulations are the actions carried out by the primary user of the interface who we refer to as the 'performer.' These actions of the performer include manipulations of physical controls (buttons, mice, joysticks and so forth) as well as gestures, movements and speech that are sensed by the interface. Our definition of manipulation is different to 'input' in that we include manipulations *around* the interface outside of it's sensor scope, i.e., gestures, movements, and utterances that *do not directly result in input*.[1] Effects are the results of these manipulations, for example the display of images, graphics and sounds or the actuation of physical objects; these are typically intended to be available for those that we label as the 'spectator.' Effects include what we identify as the main 'content' of the performance, but may also include other visible side effects of the performer's manipulations of the system, such as the appearance of menus, icons, cursors and so forth that are a necessary part of manipulating the contents. Effects also include the apparent action of the interface on the performer themselves,[2] and as such effects do not correspond to 'output' since these effects are not confined to being located purely in the technology but can also be found in the human elements. (For further detailed discussion and breakdown of manipulations and effects, please see [17].)

Having characterised the performer and spectator and having discussed the basic components of their relationships, we may think of them alongside the interface as a simple triad of interrelated elements (see [22] for a related schematisation), illustrated in each of the following diagrams. Our discussion thus far has inadvertently described two sets of relationships represented in Figure 1: spectator awareness and performer interaction with technology. The left of Figure 1 represents how the spectator may be aware of interface effects, and performer manipulations of the interface. The right side of this diagram shows the performer's relationship with the technology which we discussed as the performer's interaction with and gesturing around the technology. The awareness or interaction relationships that exist between performer, spectator and interface are depicted as directional arrows. For example, the left of Figure 1 illustrates by the unidirectionality of the arrow that only interface effects are available to the spectators, i.e., that spectator manipulations are not available to the interface.

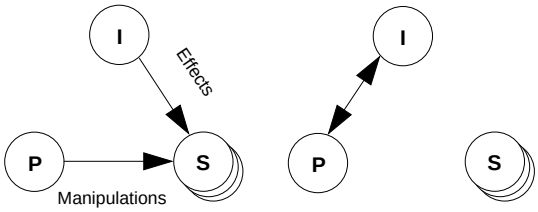

Figure 1: The spectator experience (left) and the performer's interface (right)

A further relationship that exists between performer and spectator that we have not discussed is performer awareness of spectators (Figure 2). In a typical performance, such as theatre, music or stand-up comedy, a performer's awareness of spectators is fundamental to the flow of the performance. We note, however, that it is not always desirable for a performer to be aware of spectators. Some contemplative artistic experiences deliberately isolate the performer, an interesting case being the partially revealed manipulations of the virtual

[1] These actions may be in turn broken down into being purely functional, purely artistic, or a mixture of both. Performers might need to to engage with and disengage from potentially many individual interactive technologies over the course of a performance, and in this way such 'functional' actions may be implicated into a performance. Artistic gesturing 'around' direct manipulations of the interface, on the other hand, is more complex since manipulations typically involve preparatory actions and follow through actions; the moment of contact is not the only essential component of a skillfully performed physical action. These actions might also be a deliberate crafting for others to see and appreciate the expression of skill and control. Accounts of experiences from various musicians have illustrated this. Rosen [20], for example, describes how performer gestures at the piano fundamentally influence spectator appreciation of the skill and emotion involved in the performance of a piece of music, and Sudnow [24] describes how seemingly extraneous gestures become part of the practice of productions at the keyboard. Previous work in HCI has discussed also the similar role of such performative gestures in playing electronic instruments (Bower's "expressive latitude" [2]).

[2] These may be direct effects, such as when the performer is tethered to the interface in some way, or more extreme cases where the system is actively (and maybe autonomously) controlling the performer's body. An example of this can be seen in the work of the performance artist Stelarc, in which the system causes his body to move through a series of electrical impulses, triggered in the first instance by spectators [25, p. 159]. Performers may also display a physical and/or emotional reaction to the interface, deliberately or involuntarily, and the resulting gestures, movements and expressions around the interface can also be seen as being part of the effect.

reality art installation Osmose [4]. This work hid the performer (who was immersed in a virtual environment via an HMD) behind a frosted glass screen, such that spectators could only see the performer as a partially revealed silhouette.

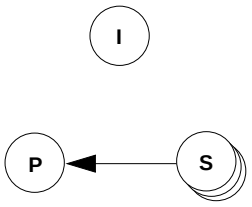

Figure 2: Performer awareness of spectators

Destabilisation

The more pervasive configuration of performer, spectator and interface[3] is arranged in such a way that, as we have suggested in our definitions of them, the performer generally creates content and the spectator receives. This is a large assumption, however, and it is challenged by history and the introduction of computer technology.

Historically, for example, the spectator's place has become more and more unstable. During the Renaissance, artists had attempted to draw the spectator into the painting [21]. Later on, the introduction of interactives into galleries as part of the avant-garde movement in the early 20th century challenged the static 'spectator' role the visitor typically was seen to assume. The space occupied by the visitor was no longer seen as inconsequential and "background" to the works of art on display [11]. More recently, performance art experiences such as Can You See Me Now [7] and Uncle Roy All Around You [6] (which shall be discussed later) position the spectator — the member of the public — in a performance role. Such moves bring into question where the art actually 'takes place' temporally, spatially, and caused by whom. The artist's relationship with the spectator has therefore come to include more actively and be concerned with the spectator's part to play.

We shall now discuss some of the different issues surrounding the increasing instability of performer, spectator and even interface roles.

[3] 'Interface' here does not necessarily mean some piece of computer technology; for example, an instrument may be the 'interface.'

Spectator as Performer

Technology has encouraged the transferral of performative elements into the spectator's hands. Aggregated input, as represented in Figure 3, provides a solution to one of the main problems in this transferral, namely, of enabling some coordination between many spectators. Devices such as the Cinematrix [3] trade on establishing this coordinated relationship between the spectator and the interface. The Cinematrix senses certain forms of audience members' actions, and then uses this activity in order to manipulate some set of variables in the system. For the Cinematrix, the audience members are equipped with coloured 'paddles' that, depending on the side held towards the screen, change the movement of the defensive blocks in a giant game of 'Pong.' These spectators, then, have some limited performative actions that establish a relationship with the interface. Other systems have aggregated audiences' leaning movement or tracked the motions of a large beach ball's silhouette [15]. Stelarc's Ping Body [25, pp. 549–552], for instance, used a section of network (internet) activity as the source for triggerings of muscle stimulators attached to his body. Here we can see how the collected activity of visitors may together 'perform' using the interface (i.e., Stelarc's body), an issue that we return to in the next section.

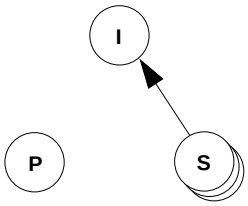

Figure 3: Spectator interaction with the interface

Other experiences, however, push those that would be traditionally be considered as spectators (i.e., members of the public), further — i.e., more so than aggregation of spectators — into a performer or co-performer role. The performance art game Can You See Me Now?, for example, allows website visitors to interact virtually with performers on the streets of the city who are able to see, via a PDA, these virtual visitors' positions. The performers must 'catch' the online players by coming into close proximity with them. For the visitors engaging with the online game, performers are fellow game players, albeit with asymmetrical facilities; that is, the performers are able to read online player's text

messages and these players can hear the radio communications between performers. Thus, online players have become co-performers of the interaction. Pushing the spectator further into the performer's role is Uncle Roy All Around You, a game-like performance in which members of the public, equipped with wireless PDAs, search the city streets for a mysterious character, guided by remote online players, encountering live actors and even interacting with members of the public as they go [1]. The experience is carefully designed to give street players (the performers in this case) the unnerving but exciting sense of being involved in a conspiracy that potentially implicates everyone around them, even casual bystanders. The key here is a performer's experience of interaction in public space is greatly enhanced by an implied awareness and involvement of spectators. Furthermore, as spectators move towards this active performer's role, what traditionally are considered performers become orchestrators, often assuming behind-the-scenes experience management (orchestrative) positions, as illustrated in Figure 4.

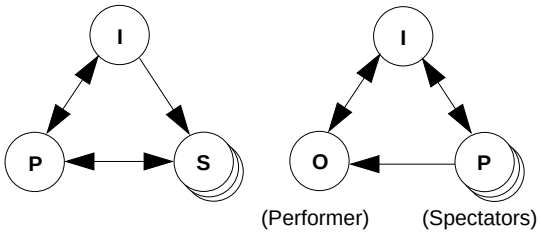

Figure 4: Spectators in a more traditional role (left), and their reformulation as performers whilst the original performer assumes an orchestrative role or similar (right)

Performer as Interface

Artists such as Stelarc and Marcel.lí Antúnez Roca both explore the amalgamation of performer and interface as one, interactable object. Stelarc's Stimbo [25, p. 159], for example, allows 'spectators' to interact with a touch-screen interface that triggers muscle stimulators located on his body. Thus, the spectator becomes a performer of Stelarc's body, and Stelarc, in turn, becomes the interface. Similarly, Roca's Epizoo enables audience members in turn to manipulate him by triggering pneumatic mechanisms attached to his face. Roca's intentions are to "investigate the depersonalisation of relationships" [25, pp. 160–161], however in doing so, the separation between himself and the interface must be collapsed.

Interface as Performer

There are instances where the interface goes beyond merely being a thing that is manipulated by performers and then its effects are seen or heard by spectators. The influence of Artificial Intelligence in art has created some fascinating installations where the interface becomes a far more active element in interaction, and at times could be considered to have performer qualities of its own (Figure 5).

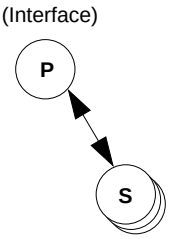

Figure 5: The interface as performer

Suchman describes the naturally inherent potential the computer has in presenting itself as an "irreducible" entity, promoting "the inclination to ascribe actions to the entity rather than to the parts is irresistible" [23]. Some art has deliberately courted this irreducibility of technology, creating ambiguity by instantiating the interface as a performer itself and introducing elements of agency. This can be seen in installations such as The Flock [19], in which a number of computer-controlled robotic arms are endowed with the ability to react to each other and visitor movement and sound, embodying forms of emergent behaviour. Whilst the mapping of visitor movement to the motions of the arms in The Flock was a major factor in each arm's path, the arms also interacted with each other, such that behaviours of the same order as the famous Boids 'flocking' [18] emerged. Rinaldo's later work, Autopoiesis, pushes this concept further by providing the robotic sculptures with a 'memory'[4] that creates modified behaviours over time. These robotic performers, therefore, incorporate relationships they have shared with spectators previously into their current 'performance.'

At the more extreme end of replacing the performer

[4]It is with some philosophical trepidation that these and other words are placed in inverted commas.

(or 'artist,' we may say) with the interface are systems such as AARON [16], a drawing program by Harold Cohen that is able to draw scenes described to it. This software has gone through a long maturing process, initially from basic childlike doodles to something approaching what might be expected of a competent artist. The work of Nicolas Anatol Baginsky similarly centres around creating autonomous systems, however in this case his interest is in musical performance, expressed through devices such as "Aglaopheme," a slide guitar robot controlled by a series of Kohonen neural networks [25, p. 431]. Collections of these instruments perform in public concerts as a band, and are able to 'listen' and learn from their own and one another's performances.

Practicalities of Destabilisation

Surrounding this destabilisation and reformulation of performer, spectator and interface positions, are several more practical issues that fundamentally impact implementation and running of an experience.

Transitions and Handovers

Many experiences involve moments of transition between spectating and performing, especially in exhibitions when visitors hand over control of exhibits to one another. Some experiences deliberately use these transitions in order to produce a particular effect, such as Deus Oculi [9]. This was a large renaissance-style painted scene featuring two figures whose faces were painted on small doors. Behind the doors were small screens that were linked directly to two handheld 'mirrors' situated on either side of the painting. When a visitor, assuming the role of a performer, picked a mirror and looked into it, an image of their face was captured on a hidden video camera and then displayed on one of the screens in the painting. As a result, performers could not see the effects of their own manipulations, resulting in highly engaging collaborative exchanges as the spectators pointed them out to the performers and/or other spectators. So, the organisation of manipulations and effects in relationships between performer and interface, and spectator and interface required rapid and frequent transition. Thus, it is necessary to consider how a design may incorporate unusual sets of relationships and therefore how transitions might feature in terms of frequency and fluidity. The results of this consideration might, for example, influence the choice of technologies.

The concept of 'traversable interfaces' is worthy of note here as it deliberately supports transitions between spectating and performing by enclosing a performer and interface within a physically traversable secondary projected display (such as a curtain, screen made of smoke or water spray [13] or even a tent-like screen into which users can move [8]) while leaving spectators outside [12]. This fulfils several purposes. Firstly it isolates the performer and the interactive technologies from interference by the spectators. Secondly, it allows for a spectator view of events to be generated separately which may not show all of the performer's effects, maintaining an element of surprise. Thirdly, by designing the screen so that spectators can physically pass through it, it supports dynamic transitions between spectating and performing.

Orchestration

We have already mentioned in passing the orchestrative roles that are part of a performance, particularly in Uncle Roy All Around You. Whilst we have noted this as being linked to the spectators assuming performers' roles, orchestration is invariably also employed in performances involving a relatively large group of performers such as a stage production. Such performances often involve an element of orchestration, meaning a set of activities that are oriented towards the smooth running of the experience. These typically include the activities of 'front of house' staff such as ushers, receptionists, and announcers, as well as those 'behind the scenes,' such as stage managers, floor managers, prompters and an extensive technical crew (sound, lighting, stagehands and so forth).

Brenda Laurel has argued that interactive experiences can also be thought of in terms of orchestration [14]. Studies of interactive performances show that they too rely on a significant element of orchestration, although the roles, processes and technologies involved differ. Here we note in addition to the previously discussed Can You See Me Now? and Uncle Roy All Around You, another performance, Desert Rain [12]. This was a touring performance in which six 'players' at a time carried out a time-limited mission in a mixture of a shared virtual world and a physical stage set. At the heart of Desert Rain, was a technology called the "rain curtain," a projection screen made of a fine water spray that could hold a back projected image

of the virtual world and through which the players as well as actors could pass. An ethnographic study of Desert Rain revealed the subtle ways in which actors and technical crew orchestrated the experience, introducing players, assisting players who were struggling, hindering players who were doing too well, and dealing with technical problems. Ideally, much orchestration was invisible to the players, for example subtly repositioning their avatars via a remote console. At other times, actors would make carefully timed and delivered interventions, either over an audio channel or face-to-face. In both cases, orchestrators would invisibly monitor players' activities from behind the scenes, via secondary displays of their avatars' viewpoints, or though the asymmetric rain curtain (it appeared transparent from the far side, allowing surreptitious monitoring of players).

Other studies of interactive performances have also revealed the ways in which actors and technical crew monitor and intervene in ongoing interactions in order to subtly shape an experience as it unfolds, such as the handling of magical effects in Avatar Farm [5]. Here the impression of magic was collaboratively achieved by the careful and often hidden manipulations of performers in the virtual world.

These studies highlight the importance of orchestration and identify a series of common concerns including: introducing participants to an experience; managing their exit; handling transitions between different phases of a performance when engagement may easily be broken; managing technical problems; and finally, maintaining the pace of an experience so that it reaches a climax at an appropriate time. In order to deal with these issues crew and actors need to closely but invisibly monitor players physically and virtually, manipulate them, and communicate with one another.

Conclusion

We have described a performer's use of an interface in terms of manipulations which lead to effects, concepts that deliberately encompass their physical actions — movements, gestures, expressions and utterances — around an interface as well as their direct input to and output from it. We have then discussed how these may feature in relationships between performer, spectator and interface, and how they are typically organised. Following on from this, we discussed how the destabilisation of all of these roles is well-represented in art and related experiences, and attempted to identify what this means for the organisation of performer, spectator and interface. Finally, issues of handover, transition and orchestrative roles were discussed as practical measures that need to be further developed technologically to cope with the destabilisation interactive technology can bring to performance.

In first identifying several basic components of performance and then discussing how their relationships change across a range of examples, we hope to provide a way of thinking about the issues that will surround an implementation of interface in 'performance' situations. Our simple idealisation of the triad of performance elements and their interrelationships is, however, just that, and it clearly captures only part of a complex performance ecology. In its simplicity, though, we hope that some of the requirements and considerations placed upon interface design are elucidated.

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