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Article:

(Re)searching through play: play as a framework and methodology for collaborative design processes

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Abstract: This article presents the emergent objects research project *Hoverflies* – an investigation into hyper-physical interfaces where we explore how the traditional idea of 'user' might be supplanted by the notion of the 'participant-performer'. The concepts of play, composition and embodiment were central to the consideration of design by thinking through performance knowledge. Play frames as articulated and categorised by Huizinga and Caillois together with Deleuze's notion of the objectile were critical to the research process. Here, we discuss the design of technological and playful objects and offer a ludic response to the erasure of 'play' or 'looseness' in both technological systems and in the design process itself. The article describes the iterative performance of metaplay in the use of play as process. We ask how a

designed outcome can induce play for participants and how play can be embraced within an open system of design.

Biographical notes:

Alice is an academic-practitioner in the field of interactive performance, club culture and play and is Creative Director of the performance company ...floorSpace.... She has worked on a number of collaborative, interdisciplinary projects which investigate new technologies for performance.

Currently, she is developing a poetics of interaction which looks closely at how participation is mediated within creative collaborations and their performed outcomes. Much of her work is site specific and examines the relationship between space, context and identity within the paradigm of performance.

Derek is an innovation theorist and architect with experience of interdisciplinary projects in new and emerging technologies in art, architecture and design. Derek's practice-based work is in architecture and advanced technology working with custom interfaces and networks for mixed realities and virtual worlds. He is the Research Leader for the Digital Research Unit at Huddersfield delivering a dynamic and challenging range of work from artists at the forefront of media practice, bringing new ideas and working practices to the fore.

Scott is a performance academic and practitioner in the field of scenography with particular research interests in lighting design, projection and the interaction between technology and performance. Recent work has focused on the AHRC-funded *Projecting Performance* research project (http://www.leeds.ac.uk/paci/projectingperformance/home.html). Outcomes from this productive collaboration between performance academics and commercial digital artists also include the interactive kinetic light installation, *Dancing in the Streets* (2005), a number of experimental theatre events and contributions towards the digital scenography for DV8 Physical Theatre's *To Be Straight With You* (2008).

Jennifer is a co-founder and Director of BigDog Interactive Ltd., a company that employs creative computer programmers to develop bespoke code for interactive installations and live performance events. She is a Maker and Researcher who has published widely in the fields of HCI, mobile technologies and tangible interaction and her work has been exhibited internationally at galleries, conferences, music festivals and unanticipated performance spaces. She is currently a Research Officer at the London Knowledge Lab and is the Director of the (re)Actor conference series on Digital Live Art. She has a PhD in Computer Science from Lancaster University.

1 Introduction

This paper presents the *Hoverflies* project [1], one of three sub-projects of *Emergent Objects* [2], which was funded by the EPSRC/AHRC *Designing for the Twenty-First Century* (D421C) initiative. The overarching focus of *Emergent Objects* was to examine the way interdisciplinary exchange and collaboration within the design process may allow for fluidity and responsiveness in both the agency of design and its

material outcome. The two central research questions of *Emergent Objects* were as follows.

How does performance knowledge help us to understand and facilitate emergence in the context of design processes?

How can we design intimate interfaces between humans and technological objects by engaging with embodied experience rather than cognitive understanding?

(Re)searching through play

Working through the central concepts of play, composition and embodiment, each subproject adopted new ways of thinking *about* design by thinking *through* performance knowledge. The *Hoverflies* project focused its attention on the frame of play for the duration of the 12-month research period. After an intensive period of designing, developing and installing an interactive public artwork, this paper reflects upon how the play frame impacted on our thinking, our practice and our research methodologies. It examines play as a braid of components. Here we discuss our use of play as process, how the designed outcome induced play for participants and how, by embracing play within the system, we can begin to conceive design space as virtual-actual paracosm.

In relation to the research programme, *Designing for the Twenty-First Century*, we were interested in how acts of searching-creating in shared, imaginary or make-believe worlds could provide a transferable model for the process of designing. The make-believe worlds of interest to us are those described as 'paracosms' (Cohen and MacKeith, 1991). Paracosms can be understood as persistent and consistent

evocations of imagined places, sometimes inhabited by imaginary friends and creatures – e.g. an imaginary game played over and over by young children that becomes more intricate as details develop through play (Cohen, 1993; Hoff, 2005). Shared paracosms are the setting of a pretend game and include the general rules of the context and provide its narrative components (e.g. complex rule-bound, role-playing games played by children and adults alike). In the designing, building, creating and imagining of these shared worlds, players may come up against clashes or conflicts that require careful negotiation (Berger and Luckmann, 1966) and modification to prevent the paracosmic world from disintegrating and, thus, the ending of the game.

As one of the three sub-projects of *Emergent Objects*, *Hoverflies* began as a loosely defined set of objectives centred around investigating hyper-physical interfaces where the traditional notion of 'user' is supplanted by 'participant-performer'. What constituted our project at this point was a team of academic practitioners drawn from a range of different disciplines (Performance Studies, Scenography [3], Philosophy and Human Computer Interaction), a 12-month time line and an objective to follow and implement the design process from conception and planning to iterative prototyping (Zimmermann, 2003), working towards a performed outcome with a participating public audience.

Our aim was to design and build an interactive object, which would entice performative interaction and play (Sheridan et al., 2007). Using accelerometers as the mediating technology (Sheridan, 2006) and the performing body in flight, *Hoverflies* developed into an outdoor installation that investigated how motion, gravitational pull

and velocity might manifest into a variety of digital outputs and make an impact on both the experience of the user and on those participating as observers or audience. In essence, *Hoverflies* became two adult-sized swings made from natural materials, installed in a garden space. Both swings were augmented technologically so that the very act of swinging generated sonic and visual outputs that could be played with and manipulated according to one's physical interaction with the object itself. *Hoverflies* explored the expressive relationship between participants (rather than users) and their immersive environment. The human/technological interface was emphatically and directly physical. The participant shifted between witnessing, communal play, performance and immersive reverie.

1.1 Objectile

In the original project briefing for the play frame, the research group explored how Deleuze (1993) distinguishes between object as event and the objectile as occupying an in-between state in the dissolved nothingness of space and time. Our specific research explored how the performance of embodied knowledge informs this liminality. It is important to note that an object becomes an objectile by means of an event:

> "The new status of the object no longer refers its condition to a spatial mold – in other words, to a relation of form-matter – but to a temporary modulation that implies as much the beginnings of a continuous variation of matter as a continuous development of form". (Deleuze, 1993, p.20)

The new status of the swing object as an objectile became the core of our research;

our concern was with its augmentation as to how it might read and write data, histories and stories. One of the functions of the *Hoverflies* object became the capturing of a sense of the unfolding of a life in play and the emergence of a sensorially charged engagement, played through a creative search between systems and situations – a search for rhythm, the alignment of pace and motion, speed and tuning.

2 Invoking the frame of play

2.1 Play as a frame

Ideas around play have recently gained currency both in academic fields and within industrial design processes, and play as a conceptual frame is experiencing a(nother) renaissance at the start of the twenty-first century. Turner (1983, p.233) argues that play is 'the joker in the neuroanthropological pack' and as such it slips in and out of disciplines, slides across intellectual terrains with ease and is invoked by theorists, educationalists, psychologists, social scientists and economists alike as a way of investigating human behaviour and interaction both in the public and the private realms. In many ways, the *Hoverflies* project attempted to do the same. It used play as a frame for the design process itself and as a means by which we might investigate interaction. With an inter-disciplinary team and a desire to investigate the 'in-betweeness of things', play acted as the joker in our pack and became a guiding principle that infused the final work.

The *Hoverflies* team used play as a way of thinking consciously about the design process and the designed outcome in parallel. Play became not only a vehicle for shaping thought but a means through which the *Hoverflies* team began to work. The

play frame, as articulated by Huizinga (1949), was used as a way of thinking reflectively about the design process but also as a way of prompting design ideas, finding out what we thought/felt/believed. Furthermore, it provided a conscious mechanism for applying the two key ludic strands as identified by Caillois (1958, 2001) to emerge – first the four categories of alea, agon, mimicry, and ilinx (Figure 1); and second the continuum between paidia (sheer free-form playfulness) and ludus (rule-bound play). What we set out to do was to play with and within a design brief, to allow for the elements of the unknown, unanticipated and the unexpected that emanate from the playing body in flow (Csikszentmihalyi, 1996). We were conscious that we wanted also to reflect the commitment to play within the system in the designed object itself.

Figure 1 Four types of play as identified by Caillois (1958, 2001)

alea or chance e.g. throwing a dice; choosing at random

agon or contest e.g. a race; boxing match

mimicry or make-believe e.g. play-acting; disguise; simulation

ilinx or vertigo e.g. running fast downhill; splashing about in water

At the outset of the project, the team drew heavily on the work of Huizinga (1949) and Caillois (1958, 2001), and in particular, their conception of play as a framed activity where the frame both defines a space of freedom and provides a productive constraint. Also critical to the early development of *Hoverflies* was Csikszentmihalyi's (1996) notion of play as an expression of 'flow' as a state of mind characterised by concentration, non-contradictory goal, immediate feedback, warped sense of time and loss of ego. These were all qualities that we experienced ourselves

while undertaking an early and important field experiment on park swings. It was important for the team to re-visit pre-conceived notions of what the experience of being on a swing was actually like.

2.2 Play as process

Focused exercises allowed us to concentrate on the physical sensations experienced while swinging and banishing assumptions about this activity were remembered from childhood. In addition, this trip to the park forced us to think quite explicitly about the purpose of technological augmentation. A swing is, in itself, a pretty perfect object and, one could argue, needs no enhancement. We concluded at this moment that the fundamental qualities of a swing should not be interfered with or disrupted in any significant way but that our experiments into participation and interaction should serve to deepen the experience on an emotional/imaginative level in a subtle and contemplative way. At this point we began to experience directly Schechner's (1988) model of play as a set of concentric frames. Like Schechner's (1988) set of Russian dolls, we began to unpack the physical sensation of flying through the air on a child's swing by reflecting on our opportunities as adults (or lack of them), to engage in this type of play; the physical circumstance we found ourselves in; the research brief as our underlying motivation; our own professional boundaries; our personal values and so on (Figure 2).

What this early experiment taught us was the benefit of self-consciously and physically applying a particular layering of the play experience and using that embodied knowledge to inform the research design, focus and outcome. Play was called upon both as a methodology and as a theoretical underpinning: the playing

space was identified both as the social context of collaborative design and as a conceptual framework (the space of performance). The play frames were invoked as an optic of methodological research in both performance and design practices. Through this lens we began to view these activities as a wider expression of (playful) human behaviour rather than simply as a specialised set of behaviours that take place in a particular setting or context (e.g. within product design teams). Play was used for experimentation and idea generation as well as for reflection. We drew upon Schön's (1983) analysis of professional practice 'reflection-in-action', 'tacit understanding' and 'post-hoc reflection' to ask: Have I been playing? How am I playing? Am I conscious of playing?

Regardless of our individual preferred styles of working, playful activities (such as improvisation, role play, image generation) quite common to the devising processes of contemporary performance were conducted with a team not necessarily familiar or even comfortable with these practices. Researchers were asked to engage in the play of childhood by visiting local parks; we constructed opportunities to imagine, create stories, build images, manipulate materials, messing around, mucking about, competing and running free. While this process was undoubtedly a risk-laden, exciting and liberating methodology, what we learnt through play and during play in some respects was not always positive or beneficial. Keeping the design process intentionally open, fluid and organic can unsettle, disturb and pressurise. The shifts in reality and the meta-play required to get back into flow, generated when working in this way were akin to those 'uncomfortable' moments experienced during the theatrical devising process (Popat and Palmer, 2005). Reflecting on a ludic model for design methods [4] it is also important to acknowledge the potential difficulties in this

approach, especially for collaborators in design teams who might be unfamiliar with techniques that introduce openness, generative emergence and notions of the accidental and the disruptive to design.

Figure 2 Photograph from the second *Hoverflies* workshop. The research team transgressed a number of boundaries in the design process and considered the lack of opportunities for adults to play. Photograph by Alice Bayliss

2.3 Playful ethnography

In practical terms, each member of the team conducted a playful workshop for the Others [5]. Playing between the striations of play categories and the smoothness of open experiment (Deleuze and Guattari, 1980, 1987), the team thereby generated a complex system of prompts for their design process through 'inductive experiment' (Bayliss et al., 2007). The *Hoverflies* team maintained a strong commitment to emergence throughout the project – always resisting the temptation to fix what they were designing despite the pressures of looming deadlines (thereby challenging traditional design protocols). The first four workshops provided not only a vehicle for play but also a malleable space in which design ideas and processes could emerge in a fluid manner, not driven by a predetermined brief or predefined super-objective. The first workshop was designed to stimulate imaginative and emotional responses to a set of images and objects. Using narrative as a way of constructing meaning the team began to engage in object-oriented devising methods, familiar to performance practitioners in the generation of new material. The second workshop (described above) allowed the team to reconnect with the physical play of childhood and was conducted at a local park. Not only did we give ourselves license to enjoy the 'sheer

playfulness' of the child's playground but we reflected on the experience using playful ethnography as a way of recording reflections through drawing, poetry and imagery, as well as more traditional observational field notes. In the third workshop, we played with an augmented harmonograph that transposed the acceleration of two pendulums swinging in opposition into digital images and sounds. We explored, experimented with, and tested out the device in much the same way a child might play with a new toy – discovering its rules, limitations and possibilities. The final workshop was shaped by rule-bound play where constraints of time, purpose and materials were applied and a competitive game constructed whereby the team were required to build 'motion machines'.

By the end of the fourth workshop, a design brief had begun to emerge as a direct result of our playful interactions and continuing in the play mode, the team created a prototype for testing at the Emergent Objects' Colloquium held at the School of Performance and Cultural Industries, University of Leeds, UK in June 2007. For research testing, we installed two adult-sized swings within a theatre space and we decided to reduce the objects themselves to their fundamental materials, rope and wood. This allowed us to provide an interesting contrast to the visible technology (the accelerometers that were subsequently attached to the swinging objects and which, in turn, generated data outputs as a result of the swing's acceleration; Figures 3 and 4). The seats were constructed from thick rough cut wood, with two holes drilled in them to enable the ropes to be attached. They suggested the basic swings of childhood memory. No concessions were made to comfort, as the edges of the wood were not planed or chamfered in any way. The ropes also contributed to this organic aesthetic as they appeared to be 'natural' materials, although in fact they were fabricated with

man-made materials for safety.

Figure 3 The *Hoverflies* prototype, June 2007

Photograph by Alice Bayliss

Figure 4 Experimenting with the positioning of the accelerometers on the swing

Photograph by Alice Bayliss

2.4 Emergent design objects

The seats of the swings were designed for adult use and so were much larger and thicker than conventional playground swings. Furthermore, the height at which the seats were set was slightly higher than was comfortable, which brought back memories of childhood and the feeling of trying to climb onto swings when we were physically much smaller. We suspended each swing from a technical gantry in the theatre that created a 6 metre drop of the rope. This had two key effects: the objects themselves appeared to be oversize (compared with a conventional playground swing) and the abnormally long ropes enabled a much longer arc when swinging. The longer arc meant that the amount of effort required for initiating and maintaining motion on each swing was significantly greater than normal. This drew particular attention to the physical action of parametric pumping, which is needed to move the swing through the air. However, once this effort had been made and participants were in full motion, it was acknowledged that the reward for this effort was significant. Performers could enjoy a very long trajectory through the space and experienced weightlessness akin to flying. The two swinging objects were located in opposition to each other to promote a playful dialogue between participants/performers.

This engendered activity was not normally associated with playground swings. Each performer was acutely aware of the person on the other swing, and their position in relation to them in the space. This constantly changing dynamic introduced a further aspect of play as the swings moved towards and away from each other. We played with the location of the two objects and experimented until the two swings could nearly touch when maximum physical exertion and timing allowed.

Figure 5 A *hoverflies* prototype and resulting harmonograph-style projection
(using uPoi technology described in Sheridan and Bryan-Kinns, 2008)
Photograph by Alice Bayliss

The sensors augmenting the swings captured acceleration data that was transformed into constantly evolving audio and visual outputs that were played back into the theatre space using uPoi technology (Sheridan and Bryan-Kinns, 2008). (Figure 5). The participants created moments of playful interaction as they threatened each other with seeming possibilities for collision. What was not immediately apparent to participants but only emerged through the process of playful experimentation was that the augmentation of each swing was such that they worked together so that through collaborative play, each participant swinging through the air could generate more complex visuals and sonic outputs than they could alone.

As with our own field notes, we asked participants at the June colloquium to record their experiences in a playful manner, responding to questions using drawing, poetry, text and the recorded voice. Many of the comments suggested that the relationship between this first prototype swing and the sonic/visual outputs were not sufficiently

connected making cause and effect difficult to determine. However, the physical pleasure gained from engaging with the object was clear. Words such as 'exhilaration', 'fun', 'enjoyment', 'effort' and 'reward' occurred frequently in participant comments. In addition to the descriptions of the physical experience, some comments began to point towards a more emotive or imaginative response. Participants began to talk of feeling as though they were 'part of a whole', that the experience was 'romantic/sweet', that it reminded them of 'lost childhood' and evoked 'empathy' when watching other people at play. As objects within the workplace, the swings were also appropriated by fellow academics that were discovered playing on them early one morning. As they played on the swings they began thinking aloud, discussing research problems, planning their time and activities for the forthcoming day and so on. Both colleagues commented that the physical sensation of flying through the air on the long arc of the swing-pendulum freed up their thinking and, in turn, their own play became a conductor for the articulation of thought. With these observations in mind and with various 'accidental discoveries' made through play during the June event the team entered the second half of the design process.

A key 'accidental discovery' of the prototyping exercise, was that one of the swing ropes had repeatedly knocked against an overhead bar in the theatre space and had created a regular sonorous accompaniment to each swing of the object, reminiscent of a tolling bell. This resonant sound led us to focus our attention further towards the sonic rather than visual output for the final design. The project team's aim was now to develop *Hoverflies* into an exertion interface (Mueller et al., 2003) by which participants would still need to interact physically with the object and exert energy to

generate a digital signal, but that this should result in an ambient sonic and visual output, which would evoke paidia and the sheer joy of child-like immersion through engagement with a nongoal-oriented object.

2.5 Siting the objectile

The latest iteration of the *Hoverflies* object was to install the swings in an outside 'public' location [6]. Despite the many challenges that this created, the team felt that it was important to create an accessible space in the hope of enticing passers by to play and perform. The rough wooden seats were replaced by hand-crafted and highly polished objects that were able to contain the technological augmentation of the accelerometers. Rigging consultants were employed to create a frame from which the swings were suspended and a sound designer engaged to assist with generating a three-dimensional sonic response to the movement data. The installation was created in a busy circular garden space in the middle of the University of Leeds campus – a space through which many people pass each day, but that also has areas set aside for relaxation and contemplation. The two *Hoverflies* swings were this time positioned so that participant-performers could swing towards a central point of an arc, again so that they could not quite touch each other (Figure 6). The data from the acceleration of each object was translated into abstract projections on the adjacent wall and into three-dimensional audio in which the participant-performer was immersed. Both the visual and sonic materials responded to the input generated from the movement of each swing, promoting a dialogue between the two participant-performers and creating an arresting performative encounter for passers-by.

Hoverflies explores the possibility of connecting an everyday, but liminal object, the

chair swing, with a sensor network so that its acceleration can be employed as part of an exertion interface to an immersive virtual environment. *Hoverflies* offers an invitation for playful interaction, an objectile where the boundaries between self and the world are revealed as labile and fluid. As with any invitation, the advance can be welcomed, embraced or rejected. There is no coercion to participate. The objectile was designed to invite participation through its visual/aesthetic appeal, an object that evokes memory and requires a human agent to bring it to life – and at the same time introduces complexity. One of the outputs of *Hoverflies* is to be able to see the world as a mutable and co-created reality in a play of participation.

Figure 6 Outdoor installation of *Hoverflies,* Leeds, December 2007

Photograph by Pixelwitch

Hoverflies is therefore a transitional object, neither fully part of the self nor explicitly an external object. As a system or framework, it occupies the paradoxical site of the transitional object (Godwin, Mäkirinne-Crofts and Saadat, 1997). It also acknowledges the cross-cultural embeddings of the swing as a pendulum and the pendulum as an image, a source of knowledge and as an object capable of generating concepts that provide passage from the everyday world into other realms. Its properties as a catalyst for transcendence and transformation intersect with our own priorities as a design team for creating an interactive system that enables participants to fly through the air, to literally rise above their usual physical connection with the ground and to (re)consider the sensory experience of this activity with the additional augmentations of sound, light and visual imagery provided by the sensing of the body's acceleration through the pendulum's arc.

A decision taken early on in the design process was to attempt to further meld the physical and emotional elements of the swing pendulum by producing an external manifestation of acceleration in both visual and sonic forms. The design reflected both the ludic workshops exploring the harmonograph and other motion machines and creative writing experiments that created fictional design spaces for *Hoverflies* to occupy including the psychedelic, the crypto mysticism of crystals, pendulums and psychoactive drugs, the surreal and the phantasmagoric in projective shadow play and flights of imaginary transformation – as angels, birds, flies and other aerial beings.

"We got by for a long time with an energetic conception of motion, where there's a point of contact, or we are the source of movement. Running, putting the shot, and so on: effort, resistance, with a starting point, a lever. But nowadays we see movement defined less and less in relation to a point of leverage. All the new sports – surfing, windsurfing, hang-gliding – take the form of an entering into an existing wave. There's no longer an origin as starting point, but a sort of putting into orbit. The key thing is how to get taken up in the motion of a big wave, a column of rising air, to 'get into something' instead of being the origin of an effort". (Deleuze, 1995, p.121)

Hoverflies imagines a single swing as a surrendering to simple Newtonian gravitational forces in the sweep of a pendulum arc. However, *Hoverflies* is also a non-linear system with the generative potential of the harmonograph created by the interactions of two pendulums. It is made quasi-complex through playful interaction – a 'getting into something' of human participants. It is not quite a surrender to the form

of an existing wave or a column of air, but closer to the co-creation of turbulent waves or interacting fields of forces. *Hoverflies* becomes a site where objects, places and relations are made traceable and searchable in location and time, becoming both narrative objects with a history and processual events that unfold in a field of electromagnetic interactions of wired and wireless network infrastructures (Figure 7). Observations of the latest prototype show that participants communicated both verbally and non-verbally during the experience. Not only did they talk to each other but they stopped the swings abruptly, changed their speed, tried to compete with each other in terms of heights reached – a physicalised, embodied version of the cadences of interaction.

Figure 7 Bodies and imaginations in flight, *Hoverflies*, December 2007

Photograph by Pixelwitch

Participants were asked 'How did it feel to be on the swing? Responses included:

"It made me feel young again".

"It made me feel like a child".

"Happy – suspension of reality, like entering an imaginary play".

"Stimulating to play with the rhythm of swinging. Impressive to hear the sound 'swing' with you".

"joyous, a reminiscence of childhood memories – enhanced by baby noises" (there were none)

"Distressing, exposing, exciting"

"like being a child again, only with more to see and hear"

"free"

"exhilarating"

"relaxing"

"like flying"

"like being underwater".

It is therefore with reality and its augmentation, as a play of material forces, felt through experience and sensations that *Hoverflies* explores – not only a contemplative transcendental experience, but an exposure to differential flow – through physical exertion. *Hoverflies* produces a reality that is sensed rather than understood or comprehended by participants. Performers and audience are exposed to *sensations* that open up a virtual-actual space for play in the feeling of movement. They, potentially, experience play or flow of freedom of the mechanism, and play within the constraints or framework of its emergent processes.

3 Play in the system and play in the system of design

As an augmented experience and as a designed framework for an emergent process, we came to think of *Hoverflies*, going beyond the prototype stage, as a mixed reality system in which acceleration influences the position of visual and audio output. Where, in our prototyping *Hoverflies* explored only a single axis of acceleration data, in a more sophisticated system this could be combined with other methods that would typically involve tracking and searching in four-dimensional space through multiple inertial and other sensors to determine motion parameters. These could measure the orientation in space and time of moving and moveable objects. The play between various objects within this system – human, tangible and abstract – became critical to the creation of reality both for the team, in performing the design process and

experientially for participants, in the installation and testing of prototypes. In getting under the surface of the objectile and specifically its basis in sensation and acceleration, we found the play between elements in the assemblage significant. The Philosopher and technology theorist, Paul Virilio, suggests that:

> "There are two ways of understanding the notion of play: playing cards, dominoes, checkers; or the play of a mechanical part when it is loose in its housing. I think, in fact, that the second is the angle from which we should envision play today. Play is not something that brings pleasure; on the contrary, it expresses a shift in reality, an unaccustomed mobility with respect to reality. To play today, in a certain sense, means to choose between two realities". (Sans and Virilio, 1996, p. 24)

In *Hoverflies*, boundaries between elements are changeable, become fluid and interdependent. We found that it is a characteristic of both *Hoverflies* as an exertion interface and a system dependent upon participant agency or autonomy and a client-server sensor network, that its processes were non-linear and had an emergent dynamic. This quasi-complexity in *Hoverflies* is a product of the figure of looseness that Virilio describes – the participation of players, both human and augmented pendulums – and a changing relation or interplay between the machine and the organic. It is to this play of shifting realities, a transitional state, that participant-performers at the final installation began to allude to in their comments and responses to the *Hoverflies* swing.

We began to think of this quasi-complexity in the context of the modernizing

tendency to erase play in the design of ever more sophisticated and 'striated' machines – where the progress of machine technology might be seen to require the increasing elimination of play (Hubert, 1996). Might this apply equally to the design process itself, as well as the technological systems of its output? Might the system of design itself be increasingly geared towards this erasure? Having asked this question, it is perhaps important in concluding, to draw out some aspects of a ludic methodology for design as it relates to concepts of design space and design as a search within that space.

> "The more primitive the technology, the less attuned the parts of the machine to each other, the greater the degree of play … The more perfected the technology, the less play the individual parts have to each other". (Reuleaux, 1875; cited in Hubert, 1996, p.66)

In our ludic design process, players/performers at various iterative cycles could suggest new gestural physical interactions. Within the limits of play and within the mechanism of the design process or the 'system of design', we prototyped through playful iteration, attending to the design of ludic workshops as much as to the *Hoverflies* installation itself. In playing with the cultural spaces and cultural objects of play, our broader interest was always in design methods that were playful, paradoxical, puzzling or pataphysical. We were interested in how these might provoke pivotal points of interest in the design process. In devising or designing an objectile, occupying Deleuze's in-between state in the dissolved nothingness of space and time, where might the limits of play be? Perhaps we found this in the anxieties caused by being permanently and self-consciously within a play mode, or in the tension of the

play between realities that the objectile paradoxically occupied and described, or in the play between the seriousness of the design task itself and the 'unusefulness' of the designed object? By applying the performance frames of play and embodiment from the start of the design process we have been examining consciously how the physical action of swinging (or becoming pendulum, becoming aerial) makes us feel, how it connects to those around us, how it engages our emotional response or delves into our memory banks and creates somatic response in the moment of swinging. In creating an exertion interface that is hyper-physical and works through the 'parametric pumping' leg-swinging exertion of a traditional swing, we have been constantly and consciously aware of the connections between physical action and an emotional or psychical response. Viewed in tandem and without hierarchy these connections then contribute to the developing composition and to attend to both becomes a priority of the design team. Playing in this system is the participative pleasure of creating and re-creating through rule sets – the programming of space, setting up of the play space that is virtual-actual, the unexpected pleasures in creating and re-creating emergent environments, playing within fields of bifurcation – the play of a world of divergences. In characterising the designed output as objectile in this way we extend playful design process and allow its creativity to continue unfold in ways that complicate traditional notions of a finished object. This approach also has implications for thinking about design methodology particularly in relation to the notions of play and prototype as developed by Schrage (1999).

Our ludic methodologies of creating iterations and paracosms shaped the way our 'unuseful' problems were solved and ideas came about in ways quite distinct from the scientific considerations of 'creativity as a search space' (Boden, 2004, pp.90–93).

Our searching was perhaps closest to the way Winnicott (1971) asked, in relation to play and reality: Did you find that (in the world) or did you make it up? Is that real? We shaped our paracosmic and ludic creation through a metaplay in which play and reality are interdependent sites with a combined action and influence that we learned to negotiate, by moving intentionally in and out of flow and reflecting upon that experience. In stepping in and out of the flow of smooth and striated design spaces in these ways, the *Hoverflies* team was able to prototype through the creation of sensation and the desire to produce interaction, finding in this process the motivation to create new worlds. We found that both play and metaplay provided us with a speculative, transient and fragile design realm where processual frameworks could be negotiated or played out and tested iteratively, and in which our design system was the modification and negotiation of paracosmic events. Recognising the virtual-actual and material nature of this play as crucial, Polanyi (1967) describes how in viewing objects, we attend from internal processes (which we cannot feel in themselves) to qualities of the object outside, transposing bodily experiences into the perception of objects. We 'incorporate it into our body – or extend our body to include it – so that we come to dwell in it' (Polanyi, 1967, p.16). The prototyping process in our ludic studio practice and our field research develops design as a versioning through responses to various impulses within the unanticipated, collaborative and discursive performance of metaplay, and in the play of processual uncertainty.

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Notes

1 The authors are listed alphabetically in the spirit of collaborative enterprise and in recognition of their equal contribution to the development of both theory and practice in the making of *Hoverflies*.

2 The *Emergent Objects* project team also included: Mick Wallis, Joslin McKinney, Sita Popat, David Hogg, Christopher Baugh, John Bryden (all University of Leeds), Alec Robertson (De Montfort University), Sophia Lycouris, Jamie Billing, Philip Breedon, Tracy Cordingley, (Nottingham Trent University, UK), Rich Walker and Matthew Godden (Shadow Robot Company Ltd.; http://www.shadowrobot.com/). Further information on the project can be found at:

http://www.emergentobjects.co.uk/.

3 From the Greek, 'skenographia' literally means scene writing or writing within the stage space. The term is used in contemporary theatre practice to denote a holistic approach to design for performance.

4 This research acknowledges a rich history of ludology and references the ludic-society www.ludicsociety.net as a pertinent contemporary manifestation of this current.

5 Workshop one (Palmer) introduced a playful performance devising processes through the use of objects, photographs and memory. Workshop two (Bayliss) was held in a children's playground in an attempt to observe, remember and experience the physical act of swinging through the air through means of playful ethnography. Workshop three (Sheridan) focussed on the physics of swings and demonstrated an augmented harmonograph that transposed the acceleration of two pendulums swinging in opposition into digital images and sounds. Workshop four (Hales) used the making of motion machines to develop notions of the algorithmic and the generative outside of computer science, drawing on fluxus, kineticism and vorticism. See also Atkinson and Hales (2004) on 'pataphysics and generative art.

6 The *Hoverflies* exterior installation in December 2007 involved construction expertise from Robin Watkinson and Litestructures Ltd. The swing seats were produced by Tom Lloyd (Dreamtime Film). The three-dimensional sound design was by Martyn Ware with technical installation by Asa Bennett (The Future of Sound;