Interaction Design in Sports

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1. INTRODUCTION

Interaction design, the discipline concerned with the behavior of interactive products and the way users interact with them, has only gained attention in the domain of sports recently. This is not surprising, as early investigations into the use of computers were mainly concerned with supporting job efficiency in business environments, with a focus on cognitive tasks supported by mouse and keyboard input (Harrison et al., 2007). Gradually, interaction design moved beyond the mouse and keyboard paradigm and investigations into other areas of human life began. Computer programs appeared that helped users create exercise programs or functioned as virtual coach that accompanied exercise in the living room or gym, however, they were still mainly operated with button presses. Emerging interactive art pieces were amongst the first that used new computer interfaces to allow people to interact with technology in novel ways. Artworks encouraged the museum's visitors to use movements of the entire body to experience the art piece, challenging prior assumptions that computers are limited to mouse and keyboard as input and screens as output mechanisms (Dinkla, 1994). Interaction design in a non-art context followed suit and began to explore embodied interactions (Dourish, 2001) that put the human body in the centre of the experience with technology (McCarthy and Wright, 2004).

This shift from designing intelligent machines to embodied experiences that focuses on how the user experiences the environment and other human beings is an exciting new area of interaction design. As movement is an elementary component of this approach, it would seem plausible to propose that sports and exercise could contribute to this trend while simultaneously also benefit from it. Unfortunately, so far, the use of interaction design for sports applications has mainly resulted in interactive products that follow the old paradigm, accompanied by input devices designed for this paradigm. For example, current prevalent computer applications that deal with sports aspects, such as analysis software for performance enhancement, social network sites that allow finding sports partners, or mobile phone applications that allow to track exercise progress still rely on button presses and are mainly supporting the analysis or post-experience of the sports activity, rather than enhancing the experience itself.

To facilitate a new outlook on supporting sports activities through interaction design thinking, we propose “Exertion Interfaces”: these are computer interfaces that require intense physical effort, but have the potential to facilitate novel experiences not possible without technological augmentation. Exertion Interfaces are at the core of our investigations, as they represent a body-centric approach of designing interactive systems that appreciate the exertion nature of sports activities, hence our explorations have taking it as starting point to initiate research.

With this chapter, we are aiming to introduce the reader to the opportunities and challenges an investigation of both interaction design and sports creates. Our goal is to inspire thinking into what types of interactive systems the future can bring if computers are designed to enhance, not just augment, the sports activity, and what novel experiences they can support. By utilizing the advantages of both disciplines, interaction design and sports, exciting new ways of supporting human experience lie in front of us, and this chapter is aimed at giving a glimpse of this future.

2. Overview

We begin by outlining theoretical underpinnings that can inform the design process for interactive sports experiences. Then we describe the concept of Exertion Interfaces that came out of interaction design in the domain of sports. We then demonstrate examples that utilize this concept.

Combining fitness activities with interactive entertainment technology has led to the field of “Exergames”, and the corresponding section investigates this phenomenon from a sport and from a computer game perspective. Next, we describe novel sports experiences interaction design can facilitate, for example networking advances can support sports people in exercising together despite being geographically apart, and we describe two systems we have developed to demonstrate the feasibility of this approach. We present “Jogging over a Distance” as such an example that supports remote joggers through an audio interface to motivate one another. “Remote Impact” is another system we developed that provides opportunities for stress relief and fitness between distributed participants. We conclude by detailing remaining issues and opportunities in order to further advance the field of interaction design and sports.

3. Theoretical Background

The theoretical background for interaction design in sports has come to the fore in the growing realization of a more significant role of the body in human-computer interaction, contrasting the previous focus on fine-motor control using the hands and fingers on keyboard and mouse. A theoretical stance known as “embodiment” has emerged (Dourish, 2001), which strays from a cognition-centric approach that sees the mind and the body as two separate entities, as has been the dominating view in interface design from the early beginnings of human-computer interaction (Carroll, 2003). Embodiment theory aims to focus the lens of the designer on the human body as interpreted in the world, which also has implications on how designs should support social aspects of interaction, as it is the social interactions that give meaning to the body's actions.

Such considerations stem from a phenomenological approach, described by Merleau-Ponty as a theory of 'body-subject': this means that the world and the human body are intertwined and mutually 'engaged' (Merleau-Ponty, 1945), hence design should always consider both simultaneously.

Research on affect in human-computer interaction also brought attention to the emotional aspects of interactive design. This should be an area of interest for interaction designers who are interested in designing for sports, because bodily interactions can support a more emotional engagement with an activity. "An emotion begins as the perception of the bodily change", and moving around in an exercise activity can generate the perception of increased heart rate and sweating (Lehrer, 2006), which in turn can lead to a more emotional experience. In the case of an exertion computer game, this can have an effect on the experience: In order to prepare a participant for an upcoming physical interaction, the brain triggers a wave of changes in the physical viscera, such as quickening the pulse and releasing adrenaline. Once the activity has started, these effects are exaggerated. Supporting this constant interaction or loop between brain and body in interactive systems (in contrast to mouse and keyboard interactions) is believed to facilitate more emotionally engaging experiences (Lehrer, 2006). For the interaction designer, this means that incorporating sportive activities into an interactive experience might lead to more affective experiences, which the design should not only accommodate but also utilize to enhance the experience.

4. Exertion Interfaces

Our own research work has lead to the development of the concept "Exertion Interfaces". This work presents our approach to create awareness of the many benefits and opportunities that are available when considering interactive design for sports activities. The definition of an "Exertion Interface" states that it is "an interface that deliberately requires intense physical effort. [It] can be expected to be physically exhausting when used for an extended period of time." It requires skill, which "might take a short time to pick up, but a long time to master" (Mueller et al., 2003). An interface that facilitates Exertion is an input mechanism in which the user is investing physical exertion. If the exertion intensity is too high, it will result in physical (muscle) fatigue (Borg, 1998). The physical effort invested is linked to diminishing performance capacity; however, it is also associated with a state of activation, or arousal, which can have a positive effect on performance (Borg, 1998). This effect is based on an inverted U-hypothesis, which states that performance improves as arousal level increases up to an optimum point. For example, excitement associated with competition or performing in public has a positive effect, but if too stressful, the result can be detrimental (Weinberg and Gould, 2006).

5. Exergames

A new field has recently emerged entitled “exergaming”, an amalgamation of the words “exertion” or “exercise” and the word “gaming” borrowed from computer gaming. Exergaming aims to utilize the motivational effects of computer games and combine them with the physical health benefits of exercise.

This field emerged from a growing realization that traditional computer entertainment with its gamepad interactions is considered to be contributing to a sedentary lifestyle with negative health effects (Graves et al., 2007). Instead of replacing computer gaming with more healthy exercise, supporters of this trend believe that replacing the game interface, most often mouse, keyboard and gamepad, with an Exertion Interface, does not affect the appeal of the computer game; hence the argument is that the intrinsic motivation to play such games is utilized to facilitate exercise. It is anticipated that the result is an engaged gamer who can continue pursuing his/her favorite entertainment activity, however, he/she will simultaneously participate in health-promoting exercise. The engaging gaming experience is hoped to distract the gamer from the negative aspect of exercise, such as fatigue, resulting in a physical workout on a more subconscious level as a “by-product”. Physical education teachers have provided anecdotal evidence how such exergames have been able to attract children that were previously reluctant to participate in sportive behavior, because these systems “were like computer games, not sports” (comment on the Exergaming Research Collaboration mailinglist (ERCollab: Exergaming Research Collaboration)).

6. Adding Exertion to Existing Gaming

Early systems that appeared on the exercise market that were targeted at computer gamers were Exertion Interfaces that plugged into existing game consoles to replace the joystick or gamepad interaction with a more physically effortful one. Typical examples are stationary exercise bikes or treadmills that offer a connection to a computer: sensors measure the speed of the wheel (or belt etc.) on the fitness equipment, and the computer converts this data into commands previously performed with the gamepad that came with the now attached game console (Gamebike). The faster the user pedals on the bike, the faster the car in the computer game goes. In order to access additional game functionality, the equipment is often outfitted with supplementary buttons that allow for controlling existing games that often rely on more sophisticated input actions, such as complicated button sequences hard to achieve with basic steering commands on an exercise bike. Some of these interfaces take a simplistic approach to encouraging exercise: only if the user engages in physical activity (regardless at which speed), the computer game becomes active, however, if the user stops exercising, the game pauses (Gamercize).

There is now a range of controllers that are aimed to facilitate exertion when playing existing video games. The Bodypad (Bodypad) supports body activity as input control through pressure sensors that are strapped onto the hands and legs, replacing the button presses. The Powergrid (InterAction Laboratories Inc.) uses isometric force, in contrast to the pushing and pulling of weights most other exercise equipment affords. The user exhibits force against a sturdy metal pole that does not move, however, sensors inside measure the applied intensity and convert it into game control commands. This approach can probably be compared to the idea of a large hard-to-move joystick. The exercise bike in “Virku” takes the exercise bike-systems a step further by adding a feedback channel: the digital world reacts to the physical effort the user puts in, but the virtual world also affects the exertion activity in return, e.g. riding uphill increases the required pedaling effort and downhill decreases it (Mokka et al., 2003).

Exercise bikes that are computationally augmented have made it into commercial fitness gyms (Williams, 2008). However, despite the growing popularity of these devices, research has still to investigate the proposed benefits of this approach: does the by-product of the gaming activity, the exercise, offer the anticipated health benefits if it is only ’added’? Or can the distraction that the game affords lead to longer exercise sessions? Does the exercise reduce the enjoyment players have with the game, i.e. would gamers swap back to the gamepad once the novelty effect wears off? These questions should give some indication of the many open questions this area still faces, but also provide an insight into the many opportunities that lie ahead.

7. Enhancing Existing Sports Experiences

Other designers have taken a different approach, and did not start off by looking at games, but investigated ways how to improve existing sports activities with interactive technology. The assumption is that by augmenting sports with interactive technology, the experience can be made more exciting to participate in. The advocates of this approach assume it can result in performance enhancement and hence increased fitness (Ijsselsteijn et al., 2004). In contrast to the previous genre, the starting point here is not a game that experiences augmentation, but a sports experience that is augmented with technology.

Although using the same physical platform as some of the examples above, “Netathlon” offers a different experience (riderunrow.com). This commercial product allows a rider on a stationary exercise bike to cycle through a virtual park, displayed on the screen mounted on the handlebar.

Although being inside, not exposed to the weather and any possibly dangerous road conditions, the cyclists can still enjoy a changing scenario, making the ride less monotonous and more enjoyable, the company claims. This is an example of how technology can been designed to enhance an existing experience, while the exertion activity, cycling on an exercise bike, remains the same. Being immersed in a virtual environment, in contrast to a mere display of speed data, can not only lead to faster pedaling speeds, it can also make the participant not realize how much more effort she or he put in and how much further she or he cycled (Ijsselsteijn et al., 2004). The system also extends the range of possible co-cyclists, as it supports social interactions, so that riders in different locations can ride with one another: they see their friend's avatar on the screen and can try to keep up (riderunrow.com).

8. New Sports Experiences

The use of exertion in interactive systems can provide immediate opportunities in terms of design, but might also require new conceptual thinking first in regards to our understanding of computer entertainment. The Dance Dance Revolution system (DDR Freak, 2008) is such an example. It is an arcade game that consists of a dance platform that detects the user's footsteps. The fast-paced display of instructional arrows on the screen serve as dancing instructions, and the user follows them in sync to music in order to score points. This approach has led to a novel entertainment experience that sparked new design thinking in terms of interface and gameplay and how they can feed on each other: Is it a game? Or is it a sport? The Norwegian Dancing Organization (Twist, 2004) considers approving the dancing activity facilitated by the game as a dance sport. The game as well as the input mechanism exist only because of each other, they form a unity that is very different to what existed until then.

The EyeToy Kinetic (eyetoykinetic.com) is a personal training workout game which tracks a user's body movements using a webcam to offer a personalized workout program. Such vision-based approaches do not exclude other enabling technologies, as the Dancing Stage Fusion (Konami Europe) demonstrates: it is a commercial game that combines the use of a Dance Dance Revolution dance mat with a webcam, demanding more sweat from the players by making them dance not only with their feet, but also their hands.

Kick Ass Kung Fu (Hämäläinen et al., 2005) is a very large scale version of a martial arts game in which the players' actions are exaggerated on an oversized projection screen in order to teach them about martial arts moves. This affords a new experience as the body movements can be replayed in slow motion to study them further.

Nintendo made a move away from the traditional gamepad as input controller for their game console by utilizing accelerometers in their wireless handheld remote to control the virtual actions on the screen with the “Wii” (Wii). In order to hit the virtual tennis ball, the player uses the controller like a racquet, contributing to new experiences in the living room as described by many blogs: many users have appropriated the system for fitness training, and players document their exercise achievements and weight loss online for motivational purposes (wiinintendo.net). The success story of the Wii changed the way people play computer games, but also how users understand computer gaming. With the advent of hardware accessories such as the Wii Fit Balance board, interactive fitness games became a household phenomenon, and they are seen as an opportunity to reach a large user group that might be susceptible to obesity issues. Improved sensor technology is being developed for the Wii as well. For example the WiiMotionPlus uses additional sensors to be attached to the Wiimote in order to more accurately detect arm movements. This development addresses early criticisms that claimed that successful Wii play can be achieved with fast wrist movements and does not require full-body interactions, turning Wii play into a more traditional gamepad experience.

9. Persuasive Role of Exertion Interfaces in Interaction Design

Interactive technology has been known to be able to persuade people to change their behavior (Fogg, 2002). While there is an increase of health issues due to the sedentary lifestyle in the Western world, designers have begun to utilize interactive systems to persuade people to exercise. There are hundreds of websites that are created to influence people to increase their daily physical energy expenditure and adopt a healthy diet. Users are able to enter their personal data, such as weight and height, and experiment with what happens to their body shape and health if they eat (or stop eating) certain foods and participate in or refrain from exercising.

Interactive systems that track a user's progress and monitor performance are also offering enhanced feedback when compared to a human coach, as the feedback the athlete receives is always available, anytime and unbiased, however, the personalization is limited to what the user feels comfortable entering. Systems such as speedometers and step-counters provide simple feedback to the user on his or her performance, however, modern advanced interactive systems offer much more personalized, context-aware feedback: sports watches (garmin.com, 2008) with in-built heart rate monitors and GPS consider the user's physiological condition, environmental data and previous workout history to support an optimal training effect.

An illustrative example of an interesting interaction design to persuade people to change their exercise behavior has been proposed by Lin et al. (Lin et al., 2006). Their system is based on the belief that caring for a virtual character can be more motivating than looking at numeric performance data. Instead of comparing step-count numbers from a pedometer that measures physical activity, each participant has to take care of a virtual fish that swims in a shared aquarium, together with fish from other users of the system. The health of the fish corresponds to the step-count of the owner and is updated once a day. Through the use of the virtual shared aquarium the developers provide a feedback channel that can be considered richer than conventional textual data while utilizing a social peer-pressure approach through which users are meant to feel more motivated to keep their fish in a healthy state.

9.1. *The Role of Interaction Design to Motivate People to Continue Exercising*

Once users are persuaded that exercising and sports participation can have positive effects on their health, and a lifestyle change has been initiated, it is important to keep them motivated so they continue their newly adopted behavior, because maintaining this change has been proven to be difficult (Lin et al., 2006). An increase in sports activity is expected to result in an increase in fitness, and participants might not feel challenged after a while, which is associated with a decrease in motivation. To understand this relationship better, the concept of “Flow” has been adopted in interaction design to create more adaptable systems. Flow describes the optimal zone between a player’s abilities and the challenges the player faces during an exertion activity. If this zone area is missed, boredom or anxiety occurs (Csikszentmihalyi, 1990). Interactive design has the potential through a constant interaction between analyzing performance and adjusting exertion requirements to keep athletes in this zone, or at least for longer than non-adapting systems. However, many task dependencies exist: for example, if a tennis professional faces a hobby player, he/she might get bored with the tennis match very quickly, on the other hand, if the same player is required to run a marathon, and the hobby player is an experienced long distance athlete, he/she might experience anxiety regarding this task. The optimal flow zone is different for each person and activity, hence the design of interactive experiences that support and facilitate entering and staying “in the zone” can be challenging (Chen, 2007).

9.2. *Motivational Support Through Peer Comparison*

The worldwide phenomenon DDR was different to traditional computer games at the time for two reasons. Firstly, it made the players sweat by encouraging physical activity, and secondly, it was installed in a two-person setup, so players could dance together at the same time, leveraging a social aspect in computer-augmented exertion activities. So far, most other exertion arcade systems concentrated on single-player experiences.

According to theory, users show increased performance through heightened arousal if another person is present and is involved in the same task, however, this is only true in gross-motor tasks that are familiar to the participants (Hagger and Chatzisarantis, 2005). Early experiments supported this theory in the domain of sports: cyclists on exercise bikes cycle faster if they are doing it with others (blueyonder.co.uk). DDR utilized this effect through its two-player mode: the social benefit of dancing together is known from traditional dancing, and the combination with exertion gameplay was possibly a contributing factor to the game's commercial success.

9.3. *Motivation by Self*

Motivational support can also occur by comparing one's performance with set targets or one's own prior performance. The Forerunner 405 watch (garmin.com) tracks one's running performance together with location information in order to offer motivational support by providing ongoing access to prior performance: the user can run against his/her own performance from the previous day. A runner animation shows the user how far she/he has run compared to the same route previously, and if she/he has to speed up in order to improve on the last performance.

9.4. *Asynchronous Motivation*

Running against your prior performance is one form of asynchronous interaction for motivational support. Other systems aim to provide motivational feedback by providing access to the results from other players to create a competitive environment. The Apple-Nike+ system tracks pace data of joggers and allows to compare the results after the run online to challenge one another for distance or pace goals or to reach a certain mileage in a collaborative effort, supported by a text chat that allows for motivational chants (apple.com). Related systems are Chick Clique (Toscos et al., 2006) and Shakra (Consolvo et al., 2006), which use mobile phone technology to share step-count from a pedometer to inform peers about progress to motivate one another.

10. Networked Exertion Interfaces

In recent research, we have begun to explore how interactivity can facilitate a sports experience between geographically distant athletes. Several examples mentioned above allow remote players to exercise, but they either lack a communication channel to support social interactions and hence limit the social health benefits sports can facilitate, or they fall short in facilitating a shared synchronous experience between the participants, as known from traditional sports. Our approach of “Networked Exertion Interfaces” aims to change this in order to facilitate similar physical and social health benefits known from traditional sports, while simultaneously providing people with the opportunity to engage in sports activities with others that are far away.

Such an approach not only offers to support and maintain social bonds between families and friends that are living apart, it can also enable sports participation of users that live in hard-to-reach areas where the social structure and access to equipment and sports clubs is limited. Some people might be disadvantaged because their favorite sport is not being played in the country they are living in. Others cannot find partners at their skill level. Networked Exertion Interfaces can help these disadvantaged users by offering them a sports experience despite their geographical location.

The authors in “Beyond Being There” make an interesting point on this matter: they have investigated telecommunication technologies such as videoconferencing and come to the conclusion that most design approaches aim to reproduce existing collocated experiences via electronic means to bridge a physical distance. They argue that this will fail, as technology alone will never be able to create an experience that will be as good as a face-to-face interaction. The suggestion is to go “beyond” this approach and offer something new that is not available in a collocated setting that entices users to participate despite the technological shortcomings. “Jogging over a Distance” aims to offer such an opportunity.

11. Jogging over a Distance

Initial investigation of jogging behavior revealed that joggers often run with others (O'Brien and Mueller, 2007). The top reasons for running with others are: socializing, motivation to run faster, motivation to participate, and to have fun. Many social joggers value the ability to have conversations with their partners while exercising and use their running sessions not only for weight control, but as a way to stay in touch with their friends (O'Brien and Mueller, 2007).

For casual joggers, being able to hold a conversation can also be an indicator that they are running at a suitable pace: not too fast and not too slow for an optimal health benefit. This is often referred to as the “Talk Test” (Porcari et al.). While social jogging can motivate people to run faster and farther than solo jogging, partners should have roughly the same physical capabilities in regards to both speed and distance (O'Brien and Mueller, 2007). In addition to the challenge of finding a jogging partner with a desirable pace, some runners run alone because they have yet to find a jogging partner. This challenge resulted from people moving away or, through training, becoming faster than their jogging partner (Mueller et al., 2007b).

Figure 1. Jogging over a Distance.

Jogging over a Distance lets you go running together with someone who is far away [Figure 1]. You can talk to and hear your running partner similar to jogging side-by-side through a headset. The system tracks your exercise intensity via heart rate relative to your running partner and adjusts the sound in your headphones to make it sound like you are falling behind or running ahead. The aim is to encourage the jogger to exercise harder through the motivation of the other person.

11.1.1 Experience

Each jogging partner puts on a pair of headphones and wears the prototype in a waist pack. While each partner jogs, the sensor collects data on the performance and a computer positions the remote audio of the conversation in a 2D sound environment around the recipient's head.

As each jogger talks, their voice as well as any ambient sound is picked up by a microphone and sent to their partner's system. The incoming audio is then modified by the computer to place it onto a spatial 2D audio plane positioned around the jogger's head, delivered through the headphones. The jogger hears the remote location's audio either coming from the front, from the side, or from behind, providing audio cues to motivate. As one jogger speaks, their partner hears the localized audio and is able to detect if she/he is "trailing behind" or "in front".

Similar to a collocated setting, the audio cues runners when to increase their intensity or slow down, however, by exploiting the distributed environment, runners of different physical ability are able to run together by adjusting a baseline variable, which is rarely achieved satisfactorily in a collocated setting: either one runner gets exhausted too quickly, or the other participant does not feel challenged enough.

Jogging over a Distance support joggers' desire for socializing as well as motivation to optimize their fitness experience despite the fact that the jogging partners can be in two geographically different locations. The distributed characteristic is an advantage of the system compared to jogging side-by-side: it supports achieving exercise goals together although participants are having different physical abilities.

12. Remote Impact – Shadowboxing over a Distance

Another system that offers a novel sports experience via interactive technology between distributed participants is "Remote Impact – Shadowboxing over a Distance" (Mueller et al., 2007a). The examples discussed so far investigated physical interactions beyond mouse and keyboard. They either focus on everyday moderate intensity body movements, such as step-count, or limit the interactions to specific (arm-) movements, such as supported by the Nintendo Wii. Interaction design in this area has barely touched on more extreme physical interactions, such as vigorous brute force prevalent in contact sports. Contact sports, sports in which the rules allow physical contact with other players, are often associated with intense physicality. Sports such as American football, ice hockey, wrestling and boxing are characterized by their explicit support for bodily collisions that facilitate intense force. Although these sports can be dangerous for the participants' health, they are very popular and many players enjoy participating, despite the risks (Anshel and Russell, 1994).

With this prototype, we hope to add extreme physical activities to the space interaction designers consider. In doing so, the opportunity arises to contribute to general fitness, stress relief and weight loss.

12.1. *Remote Impact*

Figure 2. Remote Impact

The gameplay of Remote Impact [Figure 2] is as follows: The two remote players enter the identical interaction spaces. They are facing a sensitive playing area, on which the shadow of the remote person is projected. In addition, their own shadow is also displayed, in a different shade of grey. These shadows appear to be created by a light source behind the players, i.e. if the players get closer to the interaction area, their shadows increase in size. If the players face the interaction surface, it appears as if the other person is standing next to them, because the shadows show the silhouettes of two people. The players can also talk to and hear each other through a voice connection between the locations. Once the game starts, both players try to execute an impact on each other’s shadow. Players can punch, kick, or throw their entire bodies against their projected opponent, and the system recognizes when there has been a hit or a miss. Players can dodge hits by ducking or moving out of the way, just as in traditional contact sports. Hitting the opponent harder scores more points. The player with the most points wins the game.

13. Conclusion

We have presented a selection of typical examples to highlight the role interaction design can play in sports activities. Starting from a position that values the benefits physical exercise can offer, we have outlined how interactive concepts have begun to support participants in their sports activities. We have introduced the concept of Exertion Interfaces to draw attention to the opportunities and also challenges such an approach facilitates.

Interactive systems can persuade people to exercise. From simple websites to complex wearable sensor systems, such systems are designed to provide enhanced feedback that is context-dependant, personalized, cheap and always available, sometimes challenging the role of human trainers, but also often augmenting it. Exergames are an emerging trend that aims to introduce sports into computer game experiences and make exercise more appealing to a traditionally sedentary audience.

Emerging frameworks in human-computer interaction suggest considering the role of the body in interaction design more explicitly, but also acknowledge a need for awareness of a social aspect. We have presented Jogging over a Distance that makes use of social support mechanisms humans utilize for motivation. The prototype uses technological advances to support runners in geographically distant locations by allowing them to run together, being aware of each other's performance to "push one another" to run faster and further.

Remote Impact - Shadowboxing over a Distance is a networked Exertion Interface game that affords a 'full-body contact'-like experience between geographically distant players. The game encourages extreme physical exertion and, unlike traditional video games, it recognizes and registers intense force. The physical intensity of the game is aimed at contributing to general fitness, stress relief and weight loss while at the same time allows for socializing and creating new friendships over a distance in an entertaining sportive way.

We hope with this introduction to the topic of interaction design in sports we have excited the reader to the many opportunities that lie ahead in this field, and encouraged researchers and designers to investigate this area further and create more exiting designs that support our goals of increasing fitness and well-being.

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