

# Exertion Interfaces for Sports Over a Distance

**Florian Mueller**

MIT Media Lab and Media Lab Europe  
20 Ames St  
Cambridge, MA 02139 USA  
floyd@floydmueller.com

**Stefan Agamanolis**

Media Lab Europe  
Sugar House Lane, Bellevue  
Dublin 8, Ireland  
stefan@mle.ie

**Rosalind Picard**

MIT Media Lab  
20 Ames St  
Cambridge, MA 02139 USA  
picard@media.mit.edu

## ABSTRACT

Technology has an established pedigree in helping to foster bonds between people over large distances. Most solutions provide some kind of medium for communication but do not adequately support the challenging task of getting people who don't know each other to interact in the first place. This paper suggests that an *exertion interface*, which requires intense physical effort from the participants, will create a better social bonding experience than traditional computer interfaces. To test this assertion, we created a system in which two remotely-located participants can play a soccer-like sports game against each other. The results generated will inform the creation of future interfaces that encourage bonding between remote individuals.

## Keywords

Exertion interface, physical interface, sports interface, social bonding, computer mediated communication, interpersonal trust, funology

## INTRODUCTION

People enjoy social contact, but unfortunately in modern society, they increasingly lack opportunities for interaction. [1] Many tools from the domain of computer-supported collaborative work are trying to address this issue, but they are mainly targeted at users who already know each other and have a reason to communicate, usually related to the execution of a specific work task. As a result, these tools often fail to encourage the participants to interact socially with one another, outside of the context of the work assignment. On the other hand, media spaces and similar environments have demonstrated the ability to support informal communication. [2] However, these tools often do not adequately address situations in which people do not know each other and the discomfort of interacting with strangers.

Games and sports can be helpful in facilitating social introductions. Sports clubs, for example, not only function as a place to exercise, but also as a social space.



**Sports over a Distance**

**Figure 1**

We assert that a game or sports environment can be a valuable augmentation of what current collaborative tools try to accomplish in terms of social interaction. If strangers meet over a networked environment for the first time, a game can “break the ice,” as it provides rules to follow, an activity or experience to share, and something to talk about.

In addition, our hypothesis is that if the game or interaction requires some physical activity, it will work better at fostering bonding than one that lacks it. Physical activity encourages social interaction, fosters friendships, and affects one's overall well-being and quality of life. If physical exertion can put the user in a heightened state of arousal that supports bonding, it makes sense to leverage the same kind of arousal in a distributed setting.

## BACKGROUND

The concept of fun in human-computer interface design is a growing area of inquiry. [3] Researchers in this field purport that leisure activities, based around the concept of social engagement, could be suitable environments to create bonds between people that have to work in a team. Such “entertaining” interfaces could serve as an initial starting point in building strong collaborations, before more traditional CSCW interfaces are utilized to perform the particular task at hand.

InTouch [4] is a telepresence application that connects people by creating a sense of a shared physical object over

a distance. A more physical activity is the Virtual Tug-of-War [5], where two groups of high-school students were involved in a tug-of-war at schools 13 miles apart from each other. NetGym [6] describes two physically separated exercise bicycles in a virtually connected gym with a highly physical interface in which you cycle with an avatar representing the remote user. If you move too far away from each other, you basically cycle alone.

### EXERTION INTERFACE

We define an *exertion interface* as an interface that deliberately requires intense physical effort. Exertion interfaces can be expected to be physically exhausting when used for an extended period of time. Many such interfaces have existed in the physical world for a long time, such as the use of balls in sports. The proposed system is intended to serve as a framework to test whether or not an interaction with a distributed exertion interface functions better at introducing people to each other and creating social bonding than a more traditional point and click interface.

### GAMEPLAY

Our prototype sports game is a cross between soccer, tennis, and the popular computer game “Breakout”. The players, who can be miles apart from each other, both throw or kick a ball against a local, physical wall. (Figure 1) On each wall is a projection of the remote player, enabling the participants to interact with each other through a life-sized video and audio connection. The experience is much like being on a tennis court – each player occupies his/her part of the field and the wall represents the net or boundary between the players, over which they communicate. The two players can talk to and see each other at all times. This setup facilitates the social interaction and encourages conversations such as challenging the other person or discussing winning strategies.

Semi-transparent blocks are overlaid on the video stream that each player has to strike in order to score. These virtual blocks are connected over the network, meaning they are shared amongst the locations. If one person hits a block, this block and the corresponding block on the other side disappear, revealing more of the videoconference of the other player. The goal is to hit every block before the other player hits them. The player who hits the most blocks wins the game.

### IMPLEMENTATION

Two identical “courts” are set up in physically distant locations. Microphones that are attached behind the wall are coupled with a real-time multi-channel signal analysis engine to determine where the ball strikes the wall. The shorter the time it takes for the sound of the impact to travel to a particular microphone, the closer the impact was to this microphone. This data is transmitted over a network and synchronized with the other end. A camera, aimed at the player, is mounted just above the projection and protected from stray impacts.

### SCENARIO

Ideally, we would hope to see a system like the one we have prototyped used in a similar way to how traditional sports games function in social relationships. When new members arrive in an organization or business, team-building activities are important in forming new relationships and getting a feel for how one’s colleagues think and work. These activities in turn affect the overall health of the organization. They might be formally arranged, but more often they take the form of one person asking another out for a friendly game of tennis, table tennis, golf, etc. Such a first-time encounter might spark a regular sports relationship with the other person, and with time, a new friendship.

Our system aims to enable this kind of social relationship to develop when the participants are physically distant, perhaps even on opposite sides of the world. Instead of a traditional gym or sports club, players might go to a “virtual sports club” in their geographic area and engage in new kinds of “sports over a distance” that incorporate exertion interfaces like the one in our prototype.

### FUTURE WORK

We believe that an exertion interface, which requires intense physical effort from the participants, will create a better social bonding experience than traditional computer interfaces. This hypothesis is being evaluated in user studies that aim to measure, among other things, pre- and post interpersonal trust conditions, comparing the described exertion interface game prototype to a related game without exertion. The results generated will inform the design of future interfaces that encourage bonding between remote individuals.

### ACKNOWLEDGMENT

We wish to thank Tom Walter for his help with implementation and testing. Sponsors and partners of Media Lab Europe and MIT Media Lab have supported this research.

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