Device Boundaries: Posture in Interaction Ecologies

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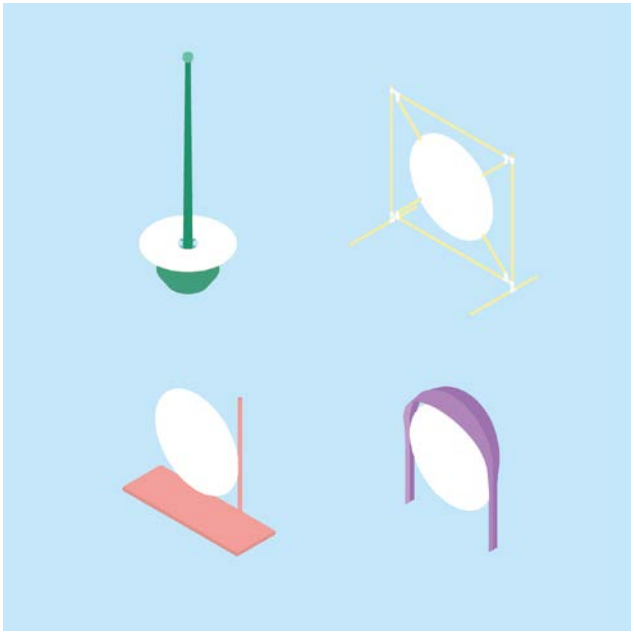

Figure 1 Device Boundaries project, illustrations of possible configurations.

Abstract
The number of interactive artifacts that surround us is in constant increase. These device-species constitute new ecologies with the humans. The communication inside these ecologies though is very restricted. The multiple users and devices involved can, and I claim should, assume different roles that are yet to be defined. The traditional model of single-user single-device is becoming obsolescent in the contemporary distributed communicational space. To explore this complexity I developed a project that tries to bring these issues together: a multi-user, multi-device ecology constituted by some originals devices and some commercials devices. According to the application in use the roles of people and devices changes. This experimentation helps to discuss the issues raised here, and in previous studies. In particular it shows the weaknesses and strengths of this ecology, a possible path for future applications and it helps in the definition of a relational quality and the use of roles as a tool of thought.

Author Keywords
interaction qualities; distributed user interfaces; cross-surface interaction; collocated interaction.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

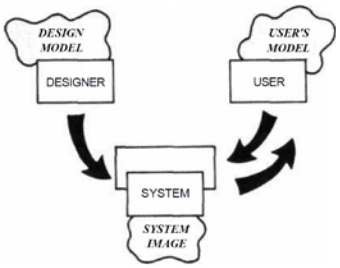

Figure 2: "Conceptual Models". This model from Norman [4] appears in the influential best seller "The Design of Everyday Things" [5].

Figure 3 Membrane prototype. The prototype is made by a structure in wood and a circular display in elastic textile.

Introduction

In the last ten years, with the introduction in the market of smart objects, or better, mobile internet devices (MIDs), we populated our lives with an enormous quantity of *asocial* technical species. Supposedly "smart" phones, tablets and more recently other wearables are designed in a user-centered fashion. The commonly adopted model refers to the one proposed by Norman (Figure 2) in which a single user is facing a single device. For the time being it was a model worthy to use. The interaction qualities, or use qualities, as introduced by Löwgren [2] were also focused on the single relation user-interface. Today the communicative capacities of the devices and their simultaneous use goes way beyond this one-to-one equivalence and so the need for an improved model and relative qualities. A recent research of Lundgren [3] propose a framework of qualities for collocated interaction (Figure 3) and highlight the need for a reflection that goes in the direction of a more inclusive paradigm. The four perspectives assumed (social, technological, spatial and temporal) gather the different thirteen qualities. This first attempt define an overview of possible qualities opening the possibilities for further studies. In this general perspective I introduce the concept of *posture* in device ecologies and a project called Device Boundaries to evaluate the concept introduced. Device Boundaries is an experimental ecology that involves multiple users and multiple devices. The roles of both species are fluctuating according to the context and the application. The posture quality of artifacts analyses the relations between different species with different roles.

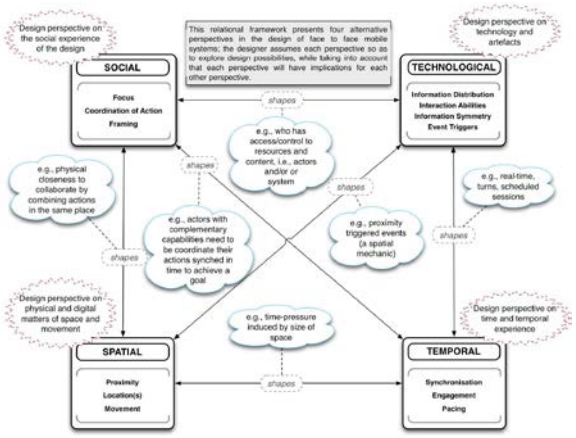

Figure 4 Framework for designing mobile experiences for collocated interaction (diagrammatic representation) [2].

Device Boundaries Implementation

Device Boundaries is a project developed to probe the different positions of artifacts and humans in an interaction ecology. The aim is to define a general purpose tool but for clarity some possible applications (used for testing) will be explained. The project involves different devices both original and commercials. The artifacts involved in the project are: Antenna (central control system), Membrane (textile touch-display), Smartphones.

Antenna

Antenna is the "brain", the central control system made by a Raspberry Pi with a Wi-Fi antenna, a memory and a battery. It works as a bridge for the other devices providing a web-server for the access to the applications.

Figure 5 Arcade Pong Application on Membrane.

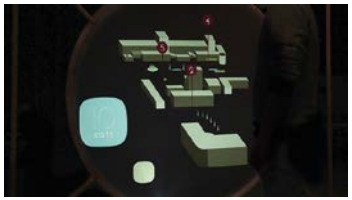

Figure 6 Feline colony Application on Membrane.

Membrane
Membrane is a device constituted by a projector, a large textile display and a Microsoft Kinect. A notebook with Microsoft Windows 7 was used for the test of the developed applications (Figure 5). One of the possible configurations was developed for the tests (Figure 1). The pressure of fingers on the screen create a deformation that is read by the sensor bar making the simple textile interactive.

Smartphone
Two Android 4.2 smartphones (HTC and Samsung) were used with a custom software developed in Processing.

Device Boundaries is designed for public spaces (as a street or a square) in order to encourage the contacts between the people and superimpose on the physical community the digital world. In such conditions any personal device can come into use getting connected to the system. The activity developed in the public space is by definition exposed to the common and the role assumed by the person can widely vary. A person can be deeply involved in the use of the interface, can just observe from far, be a bystander, develop new application for the system or do maintenance. The posture towards the artifacts and the other people changes radically. In the same way, the technical individuals can play different roles: the phone can be used exclusively as a controller thanks to its touch-screen and sensors, the *membrane* can be or not interactive, can be on and off according to the state of the system; the *antenna* can be active, passive, provide data, or even disappear from the ecology. During the design process attention on cost and feasibility of the project was taken into account, considering that the system could be implemented spontaneously by the community with a bottom-to-top philosophy.

Applications

Some applications were developed for trying the system and its limits. The contents are chosen by the typology of activities in the public sphere defined by Jan Gehl [1]. The two applications developed were focused on *social* and *optional activities*, intending for these respectively the play and the care of environment (in particular the cat community).

Arcade Pong
Arcade Pong is a game clearly inspired by the old videogames as Pong (1972) and Arcade Volleyball (1988). The game is played as a tennis table match in which the two players synchronize their smartphones with the system and use them as rackets. The *membrane* display positioned in between the two players shows the position of the “ball”. The single screen plays with size giving the illusion of perspective (Figure 5).

Feline Colony
Feline Colony is an application to keep tracks of the cat communities in a specific neighborhood (Figure 6). The problem of wide feral cat communities is diffused in Turkey were the application was developed but emerged in the recent Australian news [4]. The preservation of the community in its own limits and its sustainability is a complex activity that includes: sheltering, feeding, health caring and population control. In the interest of cats, humans and environment, I developed an application that provide support for these necessities. A database of the

existent community and their information is created for the purpose and accessibility to the system is given by the sole use of *Membrane* interface or remotely on the smartphone screen (Figure 6).

Posture

The posture quality of interaction ecologies is a property that evaluate the roles of the species involved in an action. The relationships among humans and technical individuals are explored and mapped verbally and visually. We can explain diagrammatically the ecology analysis of the two examples presented (Figure 7 and 8).

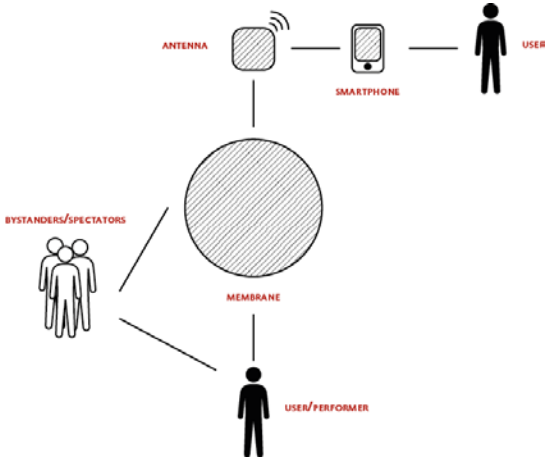

Figure 7 Feline Colony Posture Diagram. The diagram shows the relation assumed by the species in the ecology. A user adopt her/his smartphone to access the applications while independently another user adopt membrane becoming a performers for the bystanders.

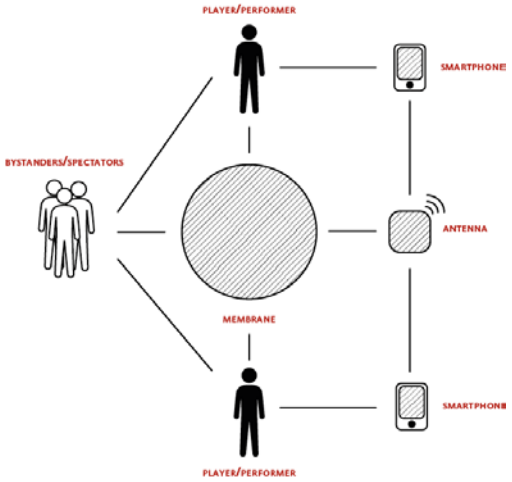

Figure 8 Arcade Pong Postures Diagram. The players user their smartphones as controllers, the bystanders observe the players becoming spectators and making them performers, the Membrane display is both functional to the players and performative for the bystanders.

Conclusions and Future Work

I believe that the *posture* quality, and the relative diagrammatical representation, can help designers in their work for a better development of device ecologies. This concept enriches the framework introduced by Lundgren [3] trying to provide a theoretical answer to the actual device *asociality*.

The project *Device Boundaries* on its own can be developed further to reduce the number of components required. The ecology can be fragmented in more independent elements and constitute a headless system. Finally, a more horizontal hierarchy can improve the flexibility and increase the possible applications of the project.

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