Contributions of improvisation techniques to interactive environment design

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This article will present and discuss the concept of improvisational interactive environment as a methodological approach to interactivity in the design of electronic mediated environments. It will analyze methods and techniques of improvisation in interdisciplinary fields of art and science, evaluating the contributions to the practice of interactive environment design.

1. Introduction

The practice of improvisation has been adopted by several artists as an open process oriented to explore innovative procedures and achieve original results in different areas. It can be understood as a spontaneous behavior marked by intuition, adaptation and extremely contextual relationship between players, audiences and environments in real time. For contemporary theorists on interaction design, these aspects are extremely relevant and may be useful for the development of digital systems with more engagement with human behavior. For architects and designers it can be useful to develop better environmental projects, with better synergy with users, accuracy with natural surroundings changes and adaptive feedbacks with context's behaviors. Improvisation techniques may be a good reference to overcome deterministic, linear and pre-defined systems, and also push forward traditional models of interactive automation and reaction.

A primal aspect about interaction on contemporary design practice is the enhanced complexity of digital systems both in terms of: scale (video mappings, displays, urban screens); capacity of apprehend external information (sensors, cameras, microchips); and advanced programming (learning systems). According to Malcolm McCollough (McCollough 2004: 14), the saturation of reality with these devices causes an unprecedented condition of immersion and at the same time demands a theory of place[1] to guide interactive design.

The notion of *place* and *environment* establishes a straight connection with some theories of architecture, leading to a scope of reflection that includes phenomenological aspects, spontaneous arrangements, symbolic values, social connections and fully integrated contextual solutions. Indeed, it is more than practical approach, it is as behavioral approach, which includes all these aspects above and many more.

According to Michel de Certeau, the experience of spaces in our everyday life is strongly non-linear, negotiated, tactical, and intermingled with improvised actions and practices (Certeau 2011). Certeau dedicates many analyses to deduce that in everyday life human behavior responds to an open logic based on circumstances, and this reflects on our environment.

In this way, is very important that interactive digital systems employed in environmental projects adopt spontaneous behaviors to drive its conception. Many authors and artists consider improvisation a spontaneous behavior and several examples can be found in music, theater, dance, happenings, and even in some electronic performances with cybernetics systems, by Gordon Pask and John Cage. It is important to show some references and clarify the different types of improvisation methods, but is also important to analyze what kind of interaction it generates and in which environmental circumstance it can be used.

2. Improvisation as environment condition

For architects, the idea of environment cannot be separated from its users. Inside an environment we may have innumerous places endowed with many forms of appropriation by the practice of its users. To Certeau these practices are extremely dynamic, heterogeneous, spontaneous and full of improvisations (Certeau 2011). However, is imperative to point that it doesn't means random behavior, but rather tactical behavior. To Certeau, tactical behaviors appear in everyday routine, in the streets, places where humans reinvent themselves, where they find contradiction, build relations, and play with the improbable. This kind of mixed environment agglutinates phenomenological qualities, and does not resume a place as a 'space with functions'.

Tactical behavior may be associated with the notion of a *living* performance. Rasmussen seems to agree with the assertion that *living* could be understood as a sort of performance, considering the architect the one who must 'set the stage, which must be adaptable enough to accommodate unforeseen improvisations' (Rasmussen 2002: 12). Jane Jacobs use similar metaphor when talking about the inherent vitality of cities streets movement: 'the ballet of good city sidewalk never repeats itself from place to place, in any one place is always replete with new improvisations' (Jacobs 1972: 50).

These points of view that consider the environment as something formed by contradiction, spontaneity, improvisations and driven by its users behaviors, were oriented in the opposite direction to modernist architectural thinking based on determinism, rigid and geometric organization, control and standardization of places. Robert Venturi wrote Complexity and Contradiction in Architecture questioning the 'selective and exclusive kind of architecture' elaborated by Mies Van Der Rohe, and his 'less is more'

1 "I have assembled arguments from architecture, psychology, software engineering, and geography to build a theory of place for interaction design" (McCollough, 2004: xv)

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doctrine. (Venturi 1995: 17). Venturi said that in this ideology 'there is no room for the fragment, for contradiction, for improvisation, and for the tension these produce' (Venturi 1995: 17).

Contemporary architectural thinking is strongly influenced by these theories of complexity, ambiguity, difference, and for the importance to acknowledge human environment as a place for exchange, socialization, appropriation and contextualization. We believe that these notions of living environment cannot be neglected in any project develop to mediate human interactions. Thereby, thinking and designing interaction environmental systems should overcome the superficial idea of linearity, automation and reaction, the same way architectural theories overcome geometric and deterministic spatial thinking.

Next, it will be presented and analyzed how improvisational behavior occurs in artistic fields, showing some important features techniques such as memory, dialog, cooperation, environment perception, spontaneity, etc.

3. Improvisation in arts: important references

Etymologically improvisation is rooted in the Latin world (*in*) *providere*, which means 'done or said without any preparation or planning, unforeseen' (Zingarelli 2008) and was initially associated with poetry and musical plays invented suddenly. In fact, deeper analysis shows that many improvised performances do have a level of preparation behind, a structure, or some combined rules that guide and anchor the action. This is called idiomatic improvisation, and refers to a establish vocabulary that preexist the performances and are constantly retrieved by artists. In the case of jazz music, Paul Berliner explains that 'involves acquiring a complex vocabulary of conventional phrases and phrase components, which improvisers draw upon in formulating the melody of a jazz solo' (Berliner 1994: 95). Put differently, it is a set of pre-defined memories that might be combined freely in performance's timeline depending on the performer's will. This is very important to clarify that idiomatic improvisation is a dynamic process of crossing references and, in this case, has nothing to do with pure randomness.

A common technique of idiomatic improvisation in jazz was quotations. Molson comments that jazz musicians might choose to incorporate elements from any of the musical traditions with which they were familiar. The important point of quotations was the creation of a chain of association that engaged the musician's community in an intermusical context of influences (Molson 1996: 127). However, the application of quotes wasn't based on mirroring or resemblance, but on transformation of the reference, conforming a personal and unique shape of the thing resembled. The application of quotes reveals how dependent of memories and references is idiomatic improvisation.

Some authors describe jazz improvisation as 'conversation' (Molson 1996: 73), commenting how musicians develop their skills by interacting with a community of other musicians in a continuous dialogic system. Molson quotes Bakhtin's internal dialogism to explain this dialog as multiple semantic meanings that vary according to one another and the socio-cultural context (Molson 1996: 87). Bebop musicians frequently met each other in jam sessions to interact in an extremely competitive, free and dialogical environment. At that time, jam sessions could be considered a model to collective interaction behavior, also incorporating cooperation, interdependency and proximity between musicians, audience and environment.

The same dialogic situation occurs in improvisational theater. Spolin observes that improvisational theater is extremely social and demands intense cohesion between actors in the course of performance. It demands also training, reinforcing the idea on the necessity of previous vocabulary to idiomatic improvisation. But what is especially interesting in improvisational theater is the actor's ability to perceive the environment according to three levels of experience: intellectual, related to learning the patterns of environment; physical, relative to the sensorial perception of the environment; and intuitive, relative to the way you respond to instant events (Spolin 2008: 04). The spontaneity is a fundamental ingredient to improvisation actors, and it is a consequence of practice and training as is shown in several methods of learning theater improvisation.

These two basic examples demonstrate that improvisation may have a systematic but flexible and adaptive structure behind the scenes, responsible to coordinate and orient the behavior of performer. The idiomatic improvisation is comparable to a ruled-based system, where artists can perform in a field of possibilities.

However, some performances may have no control, no structure and no rules, what is called non-idiomatic improvisation (Bailey 1993: xii). Non-idiomatic improvisation is most usually found in so-called free improvisation. In movements such as free jazz, developed in the sixties, the investigation was radical in terms of language and also oriented to a more empirical level of sound experience. Berliner commented how musicians made use of unconventional parts of the instrument to create new sounds, textures and dynamics (Berliner 1994: 128-135), playing outside the constraints of harmonic form, using atonally, and commonly being called noise-players. Back in the forties, Lee Konitz became a reference in free improvisation music with a composition called 'Intuition', recorded without 'no plan at all'. Konitz defined this free improvisation experience 'very difficult to really make a fine art out of, but as a procedure, it's one of the very, very important ones, I think, in playing together' (Berliner 1994: 338).

Non-idiomatic is a very procedural method of improvisation. If in one hand idiomatic improvisation has memory and previous references as fundamental database for performers, in the other non-idiomatic improvisation uses what Costa defines as 'a very short memory' (Costa 2009: 86). Costa also interprets free improvisation as a field of virtualities, 'a sort of indiscernible continuum of temporary sound states more or less consistent'.

Based on a deleuzian background, the author considers the *will* the necessary condition to the practice of free improvisation: 'the musician is the medium'. Taking as a given condition the fact that free improvisation is not supported by any reference system, and configure itself as a process of *making* or physical experimentation, it becomes evident that is the *will* that pumps the process (Costa 2008: 90).

4. Improvisation with electronic systems

Some relevant experiments with art and technology were developed in the decade of 1960 with the objective to support improvisation. Based on synesthetic methods, the Gordon Pask's Musicolour Machine was an electronic system elaborated to interact with a dancer in real time. Pask conceived this system sustaining the idea that an 'aesthetic potent environment' was primordial to encourage humans-machine interaction. The basic elements of input and output, a microphone and an image display, were connected to a central processing unit, which converted analog sound signals to digital images projected on screen. Independent inputs analysis filters were responsible to manage the process of transduction.

Pask experiment had significant adaptive and contextual features, and is this way produced relevant results as an improvisation environment. Taking as conceptual reference Edmond Couchot`s notions of 'second interaction', the Musicolour Machine had both endogenous and exogenous levels of interaction. Endogenous interaction is the system's ability to acquire information and learn (Couchot 2003: 32-34). Each one of the Musicolours's analysis filters had independent attributes capable to identify sound patterns and adjust itself, or in Pask words 'listen and learn' (Pask 1971). Exogenous interaction is the system's ability to interact in real time with an external agent, capturing spectator actions such as displacement, accelerations, gestures, sounds, vocal commands, presence, etc (Couchot 2003: 34-37). Pask was worried in create a system with variability of responses (outputs), different levels of abstraction, ability to adapt its programs (filters) to context information variation, and provide tacit feedbacks in a dialogical engagement (Pask 1971). Pask wanted, in fact, to create a machine that could improvise at the same time as the dancer, producing a reciprocal feedback between both, a very avant-garde idea to his time.

Haque views Pask's notion of 'underspecific goals' as the key feature to foster adaptation and to establish an authentically interaction environment:

> The reasoning behind Pask's interest in underspecified goals is that if a designer specifies all parts of a design and hence all behaviours (sic) that the constituent parts can conceivably have at the beginning, then the eventual identity and functioning of that design will be limited by what the designer can predict. It is therefore closed to novelty and can only respond to preconceptions that were explicitly or implicitly built into it. If, on the other hand, a designed construct can choose what it senses, either by having ill-defined sensors or by dynamically determining its own perceptual categories, then it moves a step closer to true autonomy which would be required in an authentically interactive system. (Haque 2007: 58)

The human-machine interaction process in Musicolour Machine potentially allows the emergence of synergy, a mutual participation condition in which both sides may change the other's inner structure.

Another group of artists interested in exploring the potential of electronic systems in produce improvisational performances was formed by John Cage, Merce Cunningham and David Tudor. Sharing the same concerns about spontaneity, indeterminacy and chance, they developed in 1967 Variations V, an interactive dance project. The environment structure was based on:

> Twelve antennas dispersed around the stage with a certain radius of action. By being invaded by the movement of dancers, sounds were triggered. In their bases, there were solar cells, obtained by Billy Kluver and Bell Laboratories, which could fire various types of sound. All sounds achieved by the interaction of the dancer's movements were controlled by the musicians, who determined the duration, the possibility of repetition, indentations, distortions, etc., using a variety of equipment such as oscillators, recorders, radios short wave, among others. Images produced by Stan Vanderbeek and his assistant, Tom DeWitt, showed parts of bodies, movements and elements of everyday life as a car, building, flying man in space, and other visual references of that time. Many images have passed through the process of distortion under the care of the pope of video art, Nam June Paik. (Santana 2002: 95)

Variations V was a representative example of improvisation performance that included not only electronic devices but also media technology. It was a real time performance based, similar to Pask's Musicolour Machine, in synesthetic elements and the conversion of analog inputs (movements, pressure, sounds) in electronic outputs (sounds, lights, images). Nevertheless, Pask's system was able to reconfigure itself, while Cage's performance was oriented by chance and indeterminate filters. In fact, they had different goals in executing these systems. Pask was motivated to create an autonomous computer improvisational behavior through learning systems, while Cage was searching emergent random stimulus to foster performer's improvisation.

The conception of improvisation was, to John Cage, significantly different from, for instance, jazz idiomatic improvisation. He was opposed to the idea that improvisation should be oriented by memory, intuition and previous references from the performer. His opinion was:

> What I would like to find in an improvisation that is not descriptive of the performer, but is descriptive of what happens, and which is characterized by an absence of intention. It is at the point of spontaneity that the performer is most apt to have recourse to his memory. He is not apt to make a discovery spontaneously. I want to find ways of discovering something you don't know at the time that you improvise. (Konstelanetz 2003: 236)

Cage had the intention to destabilize the performer always surprising him with unexpected situations. Both projects, in its specific ways, could be understood as dynamic ruled-based per-

formances with improvisation interaction strategy embedded, and are significant to thinking more engaged environmental systems today.

5. Conclusion

Technically we are accompanying a great leap forward in terms of electronic systems development, but it is necessary to discuss more how these devices will affect our daily life and the places we live. The contemporary thinking of human's environments is strongly attached to dynamic and adaptive behaviors. The notion of contextualization has an increasingly role in orienting our practical, social and phenomenological experience of life. Human behavior is tactical, convenient and guided by several improvised actions that reflect directly in our environment. Many art expressions emerged in the second half of twentieth century incorporating improvisation, spontaneity and adaptation as guidelines to its practice and ideology. It is time to architects and designer explore critically how to built electronic interactive environments less reactive, automatic, controlling and more intuitive, sensitive and adaptive to the improvisations of human behavior.

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