Design Games as a Framework for Design and Corresponding System of Design Games

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Abstract: Borrowing from Wittgenstein, we devised a concept of ‘design games’, for a better understanding of the design process. A design game is the elusive basic unit of a design process. When we characterize design process with blurry components and indefinite stages, we can model design as a complex, collaborative process, where the designers’ biological states lose importance. This approach, may give rise to a better conception of design, where human-human, human-machine, machine-machine, or process to process interactions are inevitable, thus a thorough framework of collaboration might be defined. Moreover, if we start from this conception to produce a design framework, we may obtain a model for design automation studies. The loose pattern of design games, when combined with the possibility of all the agents’ being non-humans, seems us to indicate the road to ‘creative design automation’.

Keywords: Language games; design games; collaborative design; agent-based design; design automation.

Transferring and adapting from Wittgenstein

In ‘Philosophical Investigations’, Ludwig Wittgenstein introduces his famous concept, “language games”, in order to address the countless multiplicity of similar acts, their un-fixedness, and their being ‘part of an activity’ (Wittgenstein, 1999).

We interpret this concept as a criticism towards the idea of language as a homogeneous and unified system. In Wittgenstein’s conception, language should be understood together with the activities that it is part of and that it is utilized in. Wittgenstein’s argument is based on the existence of a number of different language games, rather than a unified language system. These language games do not necessarily contain particular rules, and they are not separated by definite borders. Yet, they share resemblances to some extent. According to this conception, any language appears to be consisting of an indefinite series of somehow distinct, procedural and pragmatic groupings of conventions. In this regard the primary question could be stated as follows: is language a kind of system that does not have a definite overall frame or structure, hence classified as ‘open’, but composed of loosely related elements, which obtain their meaning only in relevant contexts?

This paper aims to discuss the specifics of design activities from a particular position where
Wittgenstein’s argument regarding language games is adopted. Therefore, this particular concept and its potential interpretations are applied to design activity in general. Common attributes of language and design games could be discussed as follows:

First, a language game may be a specific region of the particular language, just as a design game is a specific region of a design activity, with its own tools and techniques and indefinite relations to other design-games.

A ‘design game’ has a becoming that involves its relationship to other design games situated on the same plane. Here design games link up with each other, support one another, coordinate their contours, articulate their respective problems, and belong to the same design process, even if they have different histories. In fact, having an infinite number of components, every design game will branch off toward other design games that are differently composed but that constitute other regions of the same plane, answer to problems that can be connected to each other, and participate in a co-creation. A design game requires not only a problem through which it recasts or replaces earlier design games but a junction of problems where it combines with other coexisting design games. ("Détournement" from Deleuze and Guattari, 1999, p18)

Secondly, the concept of the language game is based on the totality of the language composed by a family of language games, while the universe of design activities is composed of several families of design games:

"... Instead of producing something common to all that we call language, I am saying that these phenomena have no one thing in common which makes us use the same word for all,— but that they are related to one another in many different ways. And it is because of this relationship, or these relationships, that we call them all 'language" (Wittgenstein, 1999, p65).

"Consider for example the proceedings that we call “games”: I mean board-games, card-games, ball-games, Olympic games, and so on. What is common to them all? —Don’t say: “There must be something in common, or they would not be called ‘games’” — but look and see whether there is anything common to all—”. For if you look at them you will not see something that is common to all, but similarities, relationships, and a whole series of them at that. (...) we see a complicated network of similarities overlapping and criss-crossing: sometimes overall similarities, sometimes similarities of detail." (Wittgenstein, 1999, p66)

“I can think of no better expression to characterize these similarities than “family resemblances”; for the various resemblances between members of a family: build, features, color of eyes, gait, temperament, etc. etc. overlap and criss-cross in the same way.— And I shall say: ‘games’ form a family. And for instance the kinds of number form a family in the same way. Why do we call something a “number”? Well, perhaps because it has a—direct—relationship with several things that have hitherto been called number; and this can be said to give it an indirect relationship to other things we call the same name. And we extend our concept of number as in spinning a thread we twist fiber on fiber. And the strength of the thread does not reside in the fact that some one fiber runs through its whole length, but in the overlapping of many fibers." (Wittgenstein, 1999, p67)

Sometimes a specific language game may be developed as a simpler version of any real language-in-use in order to be utilized for pedagogical aims; while a simple design game in the form of a short term experiment or workshop is a usual constituent of the design tutor’s repository. And finally, language games may appear as fictional and simpler examples of language in use, while a design game may be conceived as a pure and clear cut design act that is usually defined simpler than our real design activities. This simplified type of design game may be the most important one for us, because it enables us to theorize, model, and create design, though always to a limited extent:

“We can also think of the whole process of using words in as one of those games by means of which children learn their native languages. I will call these
Becoming and ‘repetition’ of the design game

Conceived in a rather simple ‘traditional’ fashion, a design game is the utilization of one or several fictional ‘tools’ and ‘techniques’ by fictional ‘agents’. These are the three main components of a design game. ‘Tools’ are narratives, as active and relatively stable components of machinery of constant becoming. ‘Techniques’ are also specific parts of this machinery, concerning the management or organization of different tools. In this conception there are also activators, the gamers, the agents; though this does not necessarily mean that gamers ought to be human beings. Understanding of each design process depends on how the operational characteristics of agents, tools and techniques have been defined. Although these narratives are never completely arbitrary, there is, nevertheless, no obligatory reason to describe the tools, techniques and agents as separate components.

In spite of all the vagueness that is associated with the concept of a design game, it still seems possible to conceive it as the elusive ‘basic unit’ of the design activity. What relates design games to each other is not their appearance in a linear, hierarchical design process one after the other, in their specific and predetermined position. Design games do not constitute a definite system. Rather, they are dispersed inside an infinite design universe. They should be created, each time they are to be utilized in the formation of a new design process, and must be put in all new relationships with new games, in new ways, i.e. in new contexts. Only when they appear in all-new contexts, they establish their meanings, thus, their meanings correspond to their utilization.

games “language-games” and will sometimes speak of a primitive language as a language-game.” (Wittgenstein, 1999, p7)

In order to define a sound framework, distinctions between language and design games should be clarified. It is not our aim to define the sphere of design as a kind of language that has its syntax and grammar, or to define it with an implicit structure, or as a system of hierarchies. On the contrary, we are aiming to re-define this sphere without definite hierarchies, pre-defined structures, or systems. Therefore we use the concept of ‘family resemblances’, following Wittgenstein, in a similar vein yet differently, as indicating a possibility of a communication or collaboration between different kinds of design games. In addition, we also intend to address relations/interactions between agents that are defined together with the games that they play. There is ambiguity, uncertainty, and overlapping as well as incongruities on the borders that are _at best, artificially_ formed between the design games:

Design games, which have only consistency outside of any definite coordinates, freely enter into relationships of resonance, either because the components of one become ingredients of other heterogeneous components or because there is little difference of scale between them at some levels. Design games are centers of vibrations, each in itself and every one in relation to all the others. This is why they all resonate rather than cohere or correspond with each other. There is no reason why design games should cohere. As fragmentary totalities, design games are not even the pieces of a puzzle, for their irregular contours do not correspond to each other. They do form a wall, but it is a dry-stone wall, and everything is held together only along diverging lines. Even bridges from one design game to another are still junctions, or detours, which do not define any systematic whole. They are movable bridges. From this point of view, design can be seen as being in a perpetual state of digression or digressiveness. (Dé-tournement from Deleuze and Guattari 1999, p23)
When design activity is defined as an ever-changing universe, which has a place for every act, whether important or not, without any pre-determined hierarchy, design process can be redefined in a rather unrestricted way. If design, rather than being conceived as a unified act, is considered as constantly being produced by an infinite number of diversified, singular design games, then, design procedures may be freed of being conceived as inseparable parts -as absolutely stable entities- pertaining to definite stages of design, while potentialities of hitherto unnoticed acts in the process might be discovered; if not created anew. This understanding does not correspond to a state where the multi-layered progression of design process from preliminary to detailed is neglected.

With this conception of an inevitable singularity of every design game, we are faced with a further task to explain relative ‘stability’ of ‘entities’ and their potential reappearance. To be carried through time seems to be the main characteristic of the flow of becoming. We distinguish two types of continuity: ‘singular lines of continuity of entities’, and ‘reappearance via stored patterns’. ‘Things’ (or ‘entities’, as a human agent, a preliminary design solution, a computer system, a physical model, a computer model, a drawing, a presentation document, a sketch, a pattern, a brain, a neural network, a compact disc etc.) are in a constant process of gathering and dispersing. This is the meaning of their relative ‘identity’ over time and also their continuity. Relevantly, ‘reappearance’ in time (of a pattern, a design game, an event...) does not mean a ‘repetition’ in the strict sense, but to be reconstituted, as a unique new appearance, according to relatively continuous patterns (or ‘genetic codes’). This means they have to be ‘saved’ via relatively stable (continuous) ‘pattern storages’ (a brain, a DNA, a neural network, a compact disc etc.).

Reconstituting, in relevant situations, some ‘stored’ design games is a standard behavior of the human designer (such as, a specific exploration by sketching, a singular process of creation via modeling, a study of detailing via producing scaled drawings...) But in each new context, on the basis of these prevailing patterns, the problem, and the process will be continuously re-defined. This means, tools and techniques for reaching the solution state are not only chosen rather freely from a repository, but their usage patterns are also continuously updated.

An up-to-date conception of design process

As early as 1983, Schön (1983) characterized professionals’- including the designers’- behavior as a constantly renewed dialogue with the current situation characterized by complexity, uncertainty, instability, uniqueness, and value conflict. Where both the body of knowledge and techniques that are used, and the expectations of the society that is served are in a state of constant change, it is better to refrain from defining design with clear cut schemes. Rather than an application of a pre-defined technical knowledge to specific cases, the unique situation constantly ‘talks back’ and the professional re-defines his/her activity (Schön, 1983). We cannot regard most of the areas of designing as predefined activities (as in some of the rather well-defined engineering problem solving processes), but, with their ‘wicked’ problem areas, undefined solution procedures, and potential products with unexpected qualities, design processes defy anticipation. Nevertheless, design activity can still be characterized as a ‘problem solving’ activity, where the ‘transformation’ is intended to have some desired results, though these are very broad and couldn’t be precisely defined before the process is ‘experienced’ (Figure 1).

Lawson considers the idea of the design process as a definite sequence of activities ‘rather unconvincing’. While it is reasonable to argue that for design to take place a number of things must happen (a brief assembled, the requirements studied and understood, one or more solutions produced and tested against some explicit or implicit criteria, and the design communicated to clients and constructors), the
Moreover, if we start from this conception to produce a design framework, even though at the expense of major simplifications, we may obtain a model for design automation studies. First, defining a better cooperation between humans and machines may gradually give way to more ‘clever’ design tools. But there is another potential of this model: the above defined loose pattern of design games, when combined with the possibility of all the agents’ being non-humans, seems to indicate the road to ‘creative design automation’.

**Simplified model and a ‘more simplified’ model**

First, we devised a complex model, where we simplified ‘becoming’, in order to grasp and represent it. The dotted wavy lines represent time-flow of becoming. Entities that emerge and disappear in this flow aren’t distinguished from the flow. Here we can, not altogether arbitrarily, discriminate areas pertaining to some relatively unified processes, like specific design processes, which are indicated by permeable dotted borders. Each one of these processes is extended over a period, occasionally overlapping with the others. In each distinctive design process, a series of design game areas may be narrated. These are drawn out by continuous thin lines. Further fictions, as tools, techniques and agents may be devised (the unique symbols) (Figure 2).

When we define design process with blurry components and indefinite stages (as with ‘free-floating’ design games), we can model design as a complex, collaborative process, where the designers’ (agents’) biological states lose importance. This means, an agent may be a person, a machine, a program, a tool, or a natural process like wind, or flood. This approach, may give rise to a better conception, in terms of contemporary realm of design, where human-human, human-machine, machine-machine, or process-process interactions, thus a framework of collaboration might be better defined.

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proposals in many forms, drawings, transactions, models, or any components of these which are being transformed by the design games.

**Evolutionary computing and an evolutionary proposal**

With this conception in mind, we theorized a collaborative design system based on evolutionary computing approaches.

“Evolutionary computing is a special flavour of computing, which draws inspiration from the process of natural evolution. That some computer scientists have chosen natural evolution as a source of inspiration is not surprising, for the power of evolution in nature is evident in the diverse species that make up our world, with each tailored to survive well in its own niche. The fundamental metaphor of evolutionary computing relates this powerful natural evolution to a particular style of problem solving - that of trial-and-error.” (Eiben and Smith, 2003, p1) While there are many different variants of evolutionary algorithms, “the common underlying idea behind all these techniques is the same: given a population of individuals, the environmental pressure causes natural selection (survival of the fittest), which causes a rise in the fitness of the population.” (Eiben and Smith, 2003, p15)

First a set of candidate solutions are created and a fitness measure is applied to each. Based on this fitness, some of the better candidates are chosen to seed the next generation by applying ‘recombination’ (applied to two or more selected candidates – parents- and results in one or more new candidates –children-) and/or ‘mutation’ (applied to one candidate and results in one new candidate). Executing recombination and mutation leads to a set of new candidates -the offspring- that compete with the old ones for a place in the next generation. This process can be iterated numerous times until a candidate with sufficient quality (a solution) is found. Many components of such an evolutionary process are stochastic (Eiben and Smith, 2003). While mostly applied in engineering problems, there are various applications of evolutionary approaches in design and arts (Frazer, 1995; Janssen, 2004; Bentley, 1999; Bentley and Corne, 2002).
Our hypothetical system
We foresee a kind of open collaborative design system, most probably, but not necessarily, administered by a central computing agent. This system incorporates any process either as an agent, a tool, a design game, or an object. But then a specific design game in turn may be held as an object, a tool or an agent; and vice-versa. All of these entities are interchangeable.

What is interesting here is the possibility of thinking any phase, or any operation (including the administrating operations, where an open and decentralized network replaces a central administrator), as a design game itself, and any design game may be incorporating a series of evolutionary tools, and each operation may be in the form of an evolutionary cycle in itself, incorporating other cycles, to infinity.

A particular design process may start with a ‘brief’. The first design game to be played is ‘choosing for the initial population’. The administrators make both deliberate and random selections from inventories, to choose a series of agents (persons, computer applications, mechanisms, or hybrid machinery) and tools (conventional tools, computer applications, natural forces etc.) and gather them as individual ‘bundles’ of design games. Then through each of these design games, and in accordance with the initial brief, from a case-base of solution objects, both relevant and random items are chosen, for gathering the initial population to start the evolutionary cycle. Here not only the candidate solutions, but also the games that constitute them are competing.

Starting from this initial population, each evolutionary phase in the cycle (mutation, recombination, evaluation, selection...) may be run in the same fashion, as a competition of ‘coupled teams of’ transforming design games and resultant solution objects. So in a general scope, competition is not only amongst a series of specific solutions in their different phases, but amongst whole design processes, and further, amongst ‘individual competitions of whole design processes’, and so on!

Considerations and conclusions
In these series of different levels of competitions, given enough computing power and time, not only specific designs, but from analyses of recordings of evolutionary processes (‘protocols’ of any process would be attainable), successful or unsuccessful ‘designing tendencies and patterns’ could be obtained. In reality, we may anticipate starting with tentative systems, with more human participation, with little meta-knowledge and guidance, and gradually shifting weight towards automation and more and more guided search. This approach may create a learning system, where the curve of learning and success might steepen through time.

The system must be kept open to possibilities. A conception of design process, that is non-hierarchical, complex, and to an extent, random, finds its counterpart in the proposed complexity and restricted randomness of this approach; which might be a way to learn to emulate the creative results of conventional design processes. We do not have enough space here to discuss the issue of creativity, but if creativity is a product of a heaping of ideas and components over a period (as it seems to be suggested by an interesting design protocol analysis of Cross (2006), where an observed ‘creative leap’ is identified not as a leap, but rather as a new combination of ideas previously created within that specific session), then, at a specific phase of the evolutionary cycle, while a population of alternatives may be regarded as collected ideas and components, an openness and randomness would yield new combinations.

If the system is fed effective techniques that are previously known (i.e. knowledge; embedded in the formation of tools, agents, and case-bases) the desired results might be obtained even faster. For example, although that is not a rule, effective design processes tend to consist of ‘phases’. The initial state is characterized by unrefined attributes, and the process proceeds towards a product with detailed and precise characteristics. Different tools and techniques are thought to pertain to each phase. But
even not fed by a ‘knowledge’ of phases, and if this ‘phase approach’ is effective, proposed system might ‘find / reach / produce’ not only a knowledge about relevant games for relevant phases, but also of their possible effective sequences. Furthermore, a series of previously unknown, unimaginable techniques might be obtained, and this could be an evidence of the system’s ‘creativity’.

A very problematic act, evaluation, might as well be conducted by design games as ‘immanent’ to the system. Evaluation by a series of competing design games may give way to multiple simultaneous fitness topographies, or parallel ramifications of multiple evolution cycles, whereby effectiveness of each approach could be tested and compared. Thus effective evaluation strategies may also be learned through the process.

A very simple evolutionary design system might comprise agents (as virtual designer characters and human designers with their embodied techniques), a minimum number of tools (pertaining to each of the required different design tasks) and an administrator (which directs and articulates the process).

Through the course of time, more comprehensive systems might be foreseen, which not only automate most of the preparatory design processes, but potentially include manufacturing processes as well.

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