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# Shattering the black box: Technicities of architectural manipulation

**Stavros Kousoulas**

## Abstract

This article attempts to reverse a fallacy often met in architectural theories and practices: that of a supposed input which through processes of what one can broadly call translations generates a built output. The input–output fallacy produces an architectural black box that treats both architectural thinking and doing as a mere process of projecting, representing and annotating 'properly' what will later be executed. On the contrary, a manipulative account of architecture as an active process of ecological engineering will pave the way for not only reversing the fallacy but also towards a particular understanding of architectural practices: architectural technicities and their reticular, affective potentials. Drawing on the theories of Gilbert Simondon, André Leroi-Gourhan, Gilles Deleuze and Felix Guattari, I will examine how architecture can be genealogically approached as a reticular technicity which evolves by a reciprocal concretisation of its technical objects and a generalisation of its active practitioners: no longer the application of transcendental design rules, of symbolic deductions or statistical inductions but rather abductive heuristics of affective techniques; no input nor output but practices of sensorial amplification via material manipulation and vice versa.

## Keywords

Abduction, concretisation, Leroi-Gourhan, Simondon, technicity

## Introduction

Most of the times, especially since its digital turn, architectural thinking implies an absolute 'black box': one that receives digital inputs and produces spatial outputs. However, how does the input–output fallacy operate? What is happening in that 'black box', the one that so readily processes all sorts of inputs and happily produces the outputs we architects desire? Even more, where is that box located and when can one trigger it? Is it at will, is at the click of a button or a mouse gesture? First and foremost, does it exist? To debunk the fallacy, I will attempt to overturn its most basic premise: the one that assumes the primacy of inputs and the necessary, fully linear in terms of causality, almost magical, manifestation of outputs. To do so, let us briefly focus on a recent, drastic paradigm shift in neurosciences. As neurobiologist Björn Brembs

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claims, there has been a '[…] dramatic shift in perspectives from input-output to output-input'.[1] What does this shift stand for?

To better understand it, one must first highlight a fundamental distinction. It is a distinction connected to forms of learning and, as I will claim, applies to machine learning (ML) as well, under its many variations and its many implementations. Philosopher Gilbert Ryle distinguishes between the symbolic and discrete, propositional knowledge of *that* and the performative and continuous knowledge of *how*.[2] To use the example of architectural theorist Andrej Radman, one cannot learn to swim by reading a manual: one needs to enter into an assemblage with water and try different ways of propulsion through bodily movement, developing eventually a *style*.[3] Between these two forms of learning, one can distinguish two drastically different forms of cognition; one that is performing on the basis of an input–output paradigm and one that, as will soon be clear, is embedded, extended, affective and *abductive*.[3] Already in the early days of artificial intelligence (AI), philosopher Hubert Dreyfus has argued that the input–output fallacy consists in both an epistemological and ontological error. Epistemologically, the claim of early AI pioneers, especially those of the symbolic paradigm like Marvin Minsky, was that all activity can be mathematically formalised in the form of predictive rules, while ontologically they assume that reality consists of a set of mutually independent facts.[4]

Returning to contemporary AI practices, symbolic computing is being vastly replaced by the much more promising connectionist approach where actual training adopts a formative role, approximating a form of knowledge (and cognition) of *how*. Artificial neural networks (ANN) perform based on pattern recognition and completion, not storing symbolic representations but merely patterns of synaptic strengths, simulating the original pattern of excitation when stimulated.[5] While early applications of ML in architecture were focused on design generation, shape recognition and space exploration, nowadays the use of ML is gearing towards the creative use and synthesis of patterns instead of their simple analysis.[6] With patterns understood as data, ANN within architectural practices do not currently aim in form generation but in the proliferation of design alternatives via the determination of constraints through the network's training process; essentially a process of both data recognition and recreation, focused on the prediction of patterns that can be compossible with the designer's intentions. Examples such as the Generative Performance Oriented Design, the design and production of the Lace Wall, the Spirit/Ghost project or WeWork are indicative in that direction.[6,7] What binds them together is precisely the understanding of patterns as data and more specifically the proper prediction of suitable, well-fitted data that can optimise the architectural design. However, there is something even more profound that brings together not only various forms of ML applications but also links them to the fallacies of symbolic computing: a fundamental disregard for the role of the environment (as a set of relations) in any design process. Contrary to the claims of many within architectural theory (Mario Carpo being one of the most prominent), I will argue that what is crucial is not the adequate prediction of patterns, forms or rules but rather the abductive invention of novelty.[8]

## Abductive leaps

Following media theorist Steven Shaviro, one should no longer be content with the outdated stimulus/response model which implied that organisms are calibrated to passively respond to prior stimuli and accordingly accumulate knowledge by means of conditioning.[9] On the contrary, organisms are active testers of reality. According to Shaviro, they are always engaged in testing their environments with ongoing, variable actions first and only later evaluate the sensory feedback.[9] This is the exact opposite of the input–output model. It is output that comes first, *modulating* the persistent and ongoing probing activity of any entity. The reversal of the classic stimuli-response model already destabilises many of the misconceptions regarding the relationship of any body with its environment. Active engagement and persistent entanglement in favour of passive responses or secondary reactions to environmental inputs. For Shaviro, the reversal of the typical model stands for the primacy of processes of *speculative extrapolation* on behalf of living organisms.

Speculative extrapolation can be understood in terms of what philosopher Charles Sanders Peirce has called abductive reasoning. Following Peirce's distinction between deduction, induction and abduction might be the most productive way to comprehend the limits (and the potentials) of AI.[10] For Peirce both deduction and induction never invent: they both repeat, predict and reproduce quantitative data. With contemporary AI being a form of pattern recognition, it is an exaggeration to even call it *intelligence*, granted that one understands intelligence as the discovery and invention of new rules (not merely the prediction of the established ones).[10] As Peirce claims,

> […] the only thing that induction accomplishes is to determine the value of a quantity. It sets out with a theory and it measures the degree of concordance of that theory with fact. It never can originate any idea whatever. No more can deduction. All the ideas of science come to it by way of abduction. Abduction consists in studying facts and devising a theory to explain them.[11]

With Peirce's distinction in mind, one can understand both forms of AI as forms of deduction and induction, respectively: old-fashioned symbolic computing is a form of automated *symbolic deduction*, while connectionist ANN are a form of automated *statistical induction.*[10] As media theorist Matteo Pasquinelli underlines, the tension between symbolic deduction and statistical induction is already indicated in the clash between Marvin Minsky and Frank Rosenblatt (one could, as mentioned already, add Dreyfus as well).[10] As Rosenblatt himself claims, ANN assist in the '[…] solution of problems through inductive logic'.[12] The statistical induction of ANN, even in the impressive efforts of researchers like Béchir el Ayeb, will always approximate what Peirce named *weak* abduction. They both fail to automate inventive, *strong* abduction. The reason lies in the structure of a typical ANN: an input layer, hidden layers (hence the term 'deep' learning) and an output layer. Interestingly, the input layer is often called *retina*: since the first Perceptron, ANN were conceived by imitating the neurons of the eye and not of the brain. In other words, ANN are extremely sophisticated recognition machines, able to achieve extremely efficient visual pattern recognitions and induce their most efficient application. They do indeed move beyond symbolic representations since it is not an image that is memorised but its statistical dependencies (i.e. as used in automatic translations or self-driving cars); however, their goal is always that of optimisation and not of novelty. Even the cases where they reach their limits, such as those of 'over-fitting' or *apophenia*, highlight the fact that ANN tend to '[…] spiral around embedded patterns rather than helping to reveal new correlations'.[10]

If ANN fail to perform across categories, it is because they are not trained to do so: to induce in the best statistical terms, there is the need of a high homogeneity between their training and test dataset.[10] Their universe needs to be a closed universe in order to generalise on unknown data. In other words, the environment of ANN is one that leaves no room for abductive manipulations; there is no possibility for contacting an *outside.* However, as has been clear already from the time of second-order cybernetics, it is only far-from-equilibrium systems that can potentialise the production of anything novel. As Pasquinelli puts it, it is the excessive 'pressure' of the external world that forces machinic logic to mutate.[10] To allow for the possibility of an outside, one needs to abductively place it in contact with a metastable system. Not in terms of an a priori classification (as in symbolic deduction) or an a posteriori synthesis (as in statistical induction) but in terms of an a praesenti abduction. However, despite its risks, abduction is not an arbitrary practice; while its accuracy cannot be guaranteed, it must set off from a compelling reasoning and maintain a consistency throughout its deployment.[9] Any form of strong abduction is a practice of indeterminacy; a leap from and towards a structural consistency while synchronically testing novel operations via the disruption of metastability. Within architectural minds and practices, it is moments of encounter which trigger abductive leaps and potentialise the formation of space. These encounters mark the manipulative processes where an architect tests its environment. What is crucial, and in a way particular to architectural practices, is that architects not only test their actual environments but they also test a virtual ecology, made of the intensities

inherent to the openness of metastable spatial systems. The encounter with a space yet to come – a subjectivity yet to unfold – is an encounter with materiality that is neither fully empirical nor solely speculative, while being able to remain abductive and pertain to real constraints.[13]

## A manipulative account

Environmental manipulation, in that sense, is always an abductive process. Following philosopher Lorenzo Magnani, humans can be considered as active chance seekers, constantly involved in a process of producing and taking advantage of opportunities within the environment.[14] At the heart of his argument, Magnani proposes that the chance seeking attitude of humans is in fact what makes them *ecological engineers.*[14] In his words,

> […] humans like other creatures do not simply live in their environments, but they actively shape and change it looking for suitable chances. In doing so, they construct *cognitive niches* through which the offerings provided by the environment in terms of cognitive possibilities are appropriately selected and/or manufactured to enhance their fitness as chance seekers. Hence, this ecological approach aims at understanding cognitive systems in terms of their *environmental situatedness.*[14]

Magnani claims that when one approaches cognition in these terms, then one has to conclude that *information* is by no means stored solely internally – that is in memory – or merely available externally, but, and that is crucial, it has to be extracted and then picked up upon occasion.[14] The architectural minds are therefore always extended: not only offloading and storing information in their environments but also actively manipulating the environment in order to produce new forms of information. Niche construction is therefore both ecological and cognitive, affecting environmental manipulation on various levels, from the genetic to the cultural. As a matter of fact, what can be traditionally named as cultural niche construction and involves the production of artefacts presents better chances in actively and immediately influencing the ones responsible for its production, albeit not always for the same reasons and intentions that lie at their origin. Precisely due to their spatiotemporal persistence and durability, as well as due to their manipulative potentials, artefacts – to which architecture has to be included as one the most important – shape not only the production of new subjectivities but also the information that potentialises them. Magnani claims that '[…] niche construction is related to cognitive processes which are abductive in themselves, because it formulates hypotheses about the *chances* offered by the environment and the possible subsequent active *changes* in terms of niche'.[14]

Why is it, however, that manipulation becomes of such importance? As philosopher Reza Negarestani claims, manipulation is able to account for materiality.[13] Negarestani underlines that if one wishes to examine what a system is then one cannot do so without also studying what a system can do. More so, what a system can do is never exhausted in the appearance of what it seems to be doing.[13] A system, according to this line of thought, should be identified and studied according to its functional organisation and behaviour: systems do not present any form of totality but only forms of functional integration.[13] In terms of functional integration, a system's functional range is not to be attributed directly to one of its parts or properties but rather to the relations that any given system participates vis-à-vis another system. One needs to actively intervene at multiple levels and eventually intuit the reciprocal affectivity of a system's actions, not only in relation to the one intervening with it but also in relation to its own, system-specific organisational levels. Put simply, in order to examine a system one needs to manipulate it. Comprehending material tendencies involves the deployment of an epistemology which is heuristic and manipulative at the same time. Any concept of materiality which does not consider a multi-level account of material manipulation fails not only to

explain materiality, but even worse presents materiality as a metaphysical curiosity, referring necessarily to either a symbolic a priori or a statistical a posteriori.[13]

Negarestani proposes that manipulation is what affords any explanatory account of materiality and not merely a descriptive one. Therefore, he suggests that the manipulationist account of explanation, where any given X explains Y, only if one manipulates X therefore leading to the production of Y, makes intervention and explanation synonymous.[13] What one is manipulating when aiming to account for any instance of material production are the metastable forces which condition that production itself. It is at that exact moment that '[…] engineering comes to play because […] it is the armamentarium of complex heuristics and manipulative modes of inference for interaction with the material organization or the system under study'.[13] Technology, therefore, is a method of abductive inference which remains plastic enough in terms of error and trial in order to remain indeterminate enough so as to interact with open and intensive systems.

## Architectural technicities

For philosopher Gilbert Simondon, the aim of any form of technological thinking should be one that does not focus on fixed properties and functional attributes but rather on the genealogical – therefore temporal – evolution of technical objects. The autonomy of technical objects separates them from the moment of their invention, the one that actualises a *technical essence*, while as soon as they are actualised, technical objects formulate their own, specific and continuously specified genetic phylum, what, as we will soon see, Simondon calls *concretisation.*[15] Simondon, going one step further, claims that '[…] even if there were no scientific advances during a certain period of time, the progress of the technical object towards its own specificity could continue'.[15] This is a statement of great importance for architectural theories since it enables us to understand how the cries for a so-called autonomy of architecture fail to even grasp the very notion of autonomy: if there is any, it lies precisely in an in-between, the one that K. Michael Hays so eloquently has described as '[…] between the efficient representation of pre-existing cultural values and the wholly detached autonomy of an abstract formal system'.[16] An autonomy, however, which is to be located not in the fixity of the terms – be it culture, technology or architecture – but rather on the evolution of the very technicity of each one of them.

If one aims to avoid reductionism, then, Simondon advices us, one should also study beyond the technical objects to '[…] the technicity of these objects as a mode of relation between human and world'.[15] The autonomy of each technical object – or better said, each technical *individual* – lies in its relational technicity, since '[…] technical objects result from an objectification of technicity; they are produced by it, but technicity is not exhausted in objects and is not entirely contained in them'.[15] One should move from architectural objects to an architectural technicity which operates in terms of *reticularity*: located within assemblages, reticularity is the immediate relation of events and actions that occur in a given structure which, however, is understood in terms of its potentials for action, not in its extensive and formal outlines, and has to be studied in ethological, that is affective, terms. Becoming, according to Simondon, is defined as '[…] the operation of a system possessing potentials in reality'.[15] It is the disruptive agency of these potentials that pushes future states of the system into being.[17] Practices of spatial indeterminacy, a technicity in their own right, not only disrupt metastability but also engender architectural reticularity – and not autonomy – by relating it to its own future. Therefore, the problem of the manipulator and the manipulated, the subject and the object, the body and the environment, the coder and the code, becomes a technical and temporal one, which, in the relationality of the event itself, no longer deals with the application of transcendental design rules, but rather with the abductive heuristics of affective techniques, no input nor output but practices of sensorial amplification via material manipulation and vice versa. Thus, one could understand technology as prosthetic but, nonetheless, not on the basis of a lack that technical objects come to cover. On the contrary, technical objects

could be conceptualised in an affirmative way, meaning that they could be seen as '[…] as basic life expressions, and as exuberant forms of invention, expansion and transformation'.[9]

## Give architecture a hand

Let us focus now on a technical object all architects are more than familiar with: a *stilus.* A *stilus* is any writing utensil, any other small-sized tool used to either mark or shape, the digital pens used nowadays to assist software navigation and design or even the pointed needle on vinyl records. A *stilus*, however, is not only a technical object but it is also part of a reticular technicity, a mode of relation between humans and their environment. It should not come as a surprise then, that the very root of the word style, again a familiar term for architects, comes directly from *stilus.* To belong to the same style, therefore, refers directly to the tools shared and not to the intentions.[18] A style then is a technicity, the various objects listed before being the technical objects produced by, and, reciprocally and reticularly, producing it anew. Any architect is always *of* the style, meaning that she is always of the technicity, of the assemblage. She is never '[…] the origin, but the effect of her style: the author does not have a style, it is style that has an author'.[19] In the era of neural networks, one would be mistaken to place them apart from the practices they embody and the actual practitioners, the actual bodies that perform them. The know-how of contemporary architectural practices, to remember Ryle's distinction, lies in the style, in the technicity that determines the potentials of a shared becoming. How do both technical and physical individuals determine each other?

If *stilus* and style share a common thread, what about the hand? Anthropologist André Leroi-Gourhan provides an account of a particular form of technicity, one directly connected with the use of the hand. In his book *Gesture and Speech*, Leroi-Gourhan examines the *anatomical* technicity of the human hand, positing its development within the reticularity of body and environment.[20] Focusing on the discovery of the fossils of the *Zinjanthrope* in Kenya in 1959, Leroi-Gourhan argues against the myth of the so-called ancestral monkey, the originating link between humans and simians. The myth of the ancestral monkey conceived evolution, and walking upright in particular, as a cerebral initiative. Traditional evolutionary theories – including both Darwinist and Lamarckian approaches – conceptualised this initiative as a gradual enlargement of the brain, up until the moment that the brain, having reached a critical point, made the monkey 'think' of walking upright and use tools.[21] The discovery of the *Zinjanthrope* suggested otherwise: the fossils belonged to an adult *Australopithecus* and next to the remains, stone implements were found. The *Australopithecus* could walk upright, its face had a retreated mandible, and most importantly, its brain was of a very small size.[21] What the discovery of these fossils suggested, was that the brain, contrary to the common belief, was the one that got benefited from walking upright and not its originating cause.

As the discovery of the *Zinjanthrope* suggests, the anatomical technicity of human beings is present in even the most primary human forms. It was on the basis of this technicity that the brain developed, consequently leading to the required protrusion of the skull in the form of the forehead.[21] In simple mechanical terms, the bipedal posture advances the recession of the mandible, having as an effect the protrusion of the forehead. The brain therefore, for Leroi-Gourhan, is fully contingent and incidental, since its development is strictly connected with the shortening of the face and the stress release that occurs when the mandible shrinks.[20] In this sense, Leroi-Gourhan claims that the necessary condition for language is bipedalism. When an animal moves on all its four limbs, then the potential for grasping and picking objects from its environment cannot but occur only from its mouth. Therefore, the mouth itself can only afford a certain amount of actions, ones that certainly do not involve the anatomical refinements of talking. These refinements can only appear if the mouth is *freed* from the task of functioning as a grasping organ: it literally needs to be given a hand. Bipedalism frees the hands from walking and simultaneously enables the mouth to speak, creating a new form of anatomical technicity, composed of new relations of speed and slowness, movement and *stasis* in the animal itself, altering radically the ways it relates with its environment. The hand is now *digital*: it can

point, count, chunk and acquire. The hand can finally make and hold the *stilus*, relating now not only to the surface of the earth but also to *any* surface. One is unable to conceive in isolation the hand, the mouth, the face, the head and all parts of the body we now call human since they are all but consequences of *coincidental freedoms*, emerging in relation to one another.[20]

The amplification in the degrees of freedom of the limb-now-known-as-the-hand is an example of what Leroi-Gourhan names *generalisation* or *de-specialisation.* The evolution of the hand and the tools that it uses has its own genealogy, and it formulates its own technical culture. While the early humanoids, like the *Australopithecus*, used their stone-made tools in a similar fashion as to animals using their claws, humans nowadays use their tools in both spatial and temporal distance.[20] There are degrees of freedom also within the prosthetic artefacts themselves. This is precisely what Leroi-Gourhan has in mind when he uses the concept of generalisation: while other animals follow an evolutionary path which was highly specialised and, essentially, internal, humans evolved by externalising through technology. Following such an evolutionary account, we come across a captivating conclusion. Namely, that the distance between '[…] the incorporated technologies of *Australopithecae* […] and the detached technologies of *Homo Sapiens* […] is a distance produced by a series of steps installed within technological sequences themselves'.[20] Therefore, one should no longer '[…] presume a "natural" human being who eventually thought "artificially" and began to make tools'.[20] Humans have never been natural; they have always been as artificial as the various ways in which they manipulate their environment. In other words, there is an asymmetry between technicity and consciousness: technicity is responsible for consciousness and not the other way around, making any conceptualisation of the former based on the latter a reductionist one. If, however, technicity is responsible for consciousness, then what is responsible for technicity?

## Concretised abstractions

While modes of affective technicity are present in a quite broad field, one that includes both human and non-human agents, there is an element of human technicity which is quite distinctive. The distinctive element of human technicity is none other than the technical products themselves, the artefacts that the abductive environmental manipulations produce or what Simondon calls the individual technical objects. In his words, '[…] the individual technical object is not such and such thing given here and now (*hit et nunc*), but something that has a genesis'.[15] We have briefly seen why Simondon wishes to exchange a static understanding of technical evolution for a dynamic one, able to provide a genealogical account and not merely a reductionist description of fixed attributes and their respective functional application. How is it, however, that any technical individual comes to be? For Simondon, the genesis of an object is a process of refinement, which, nevertheless, should not be examined in terms of usefulness or profitability since such external criteria do nothing more but obscure the technicity of the object itself.[22] In other words, there should be an immanent understanding of the technical objects, able to account for their genesis and evolution without referring to properties which are attached to them from the outside – in an input–output fashion which conceives them as functional mediators.

Contrary to such accounts, Simondon advances a process of examining the evolution of technical objects which is internal: what is broadly called as refinement is in fact a process of *concretisation.* While human evolution involves a constant generalisation via the external de-specialisation of the species through its technicities, the technical objects, assisting in that generalisation, follow a process of perpetual – yet peculiar – specification. In his words,

> […] there exists a primitive form of the technical object, its abstract form, in which each theoretical and material unit is treated as an absolute that has an intrinsic perfection of its own that needs to be constituted as a closed system in order to function.[15]

What Simondon is claiming is that any technical object is located between an unstable event – the coming together of parts – and a consistent, stable structure – the parts when in operation. Different objects possess different degrees of concretisation, the levels of which determine the technicity of a given technology. The degrees of concretisation are, themselves, composed out of the relations of the parts which constitute the technical object. Technical objects do evolve in a way which is quite close to evolutionary modes reserved for biological entities. As Simondon points out,

> […] just as in the case of phylogenetic sequences, any particular stage of evolution contains within itself dynamic structures and systems which are at the basis of any evolution of forms. The technical being evolves by convergence and by adaptation to itself; it is unified from within according to a principle of internal resonance.[15]

Let us imagine for a moment the most abstract house at any given context, urban or other. I am aware that there is the risk of generalising, however, I consider it important in order to grasp Simondon's point. Once the abstraction of the house is there, let us focus on each of the elements that it is made of: from the structural parts, bricks, concrete and slabs that hold it together to the networks of tubes which transfer energy and water throughout it, to the openings in its surfaces, its doors and windows. It goes without saying that I do not aim at providing an evolutionary account of each of these elements, and that is precisely the point: each of the elements that this abstract house consists of has its own independent history, its own genealogy that needs to be unravelled. In other words, even in this abstract house, each of its parts fails to explain their coming together when examined in isolation. Technological, and consequently, architectural invention implies the formulation of a consistent and coherent system from disparate parts. The house assemblage that emerges from the combination of these disparate elements is an example of concretisation.

Simondon claims that after the industrial revolution, the concretisation of technical objects gained even greater speed, managing now to alter and manipulate the very needs that made it emerge. In his words,

> […] the object has acquired its coherence on the industrial level, where the system of supply and demand is less coherent than the object's own system. Needs are moulded by the industrial technical object, which thereby acquires the power to shape a civilization.[15]

Not only one can no longer distinguish between architecture and the ones producing it but on the contrary, it is architecture that is producing us as much as we are producing it. To 'shape the city and be shaped back by it' is no longer a euphemism. It is at this moment that one comes across architectural autonomy again, seen as the specific concretisation of technical objects produced through modes of reticular, affective technicities. Contrary to formalist misunderstandings, it is not architecture that is autonomous but the concretisation of architectural assemblages, understood as a process in possess of an internal necessity. As Simondon claims,

> […] the principle of process is none other than the way in which the object causes and conditions itself in its operation and in the feed-back effect of its operation upon utilisation. The technical object, the issue of an abstract work of organisation of sub-sets, is the theatre of a number of relationships of reciprocal causality.[15]

The relationships of reciprocal causality that Simondon is mentioning are in fact the operational modes of reticular technicity. In the theatre of environmental manipulation, the one that produces cognitive niches – a humble house being one of the most important – the hand and the *stilus* not only solve problems, but, most crucially, they pose new ones through their abductive inferences. Simondon, in the same passage, underlines that it is these relationships that

> […] make it possible for the object to discover obstacles within its own operation on the basis of certain limits in the conditions of its use: in the incompatibilities that arise from the progressive saturation of the system of sub-sets there is discoverable an indefiniteness in limitations, and the transcending of these limitations is what constitutes progress.[15]

Architecture, aiming in invention and not in prediction or classification, needs to be abductive; and for its abductive inferences to become a leap, it needs to constantly attempt environmental manipulations. The reassurance of a 'black box' is a false relief from the necessity to explain causality, to account for the agency of a reticular technicity; it is essentially an unwillingness to pose new problems: a retreat to an apparent stability, be it in the closeness of symbolic deductions or in the homogeneity of statistical inductions. Simondon warned us for the risks of such closure, since,

> […] because of its very nature, such a transcending of limitations can only be arrived at by a leap, by the modification of internal disposition of functions, by a rearrangement of their systems; what was an obstacle should become a means of achievement.[15]

There is a keyword in Simondon's quote: function. We have seen that Simondon openly opposes to any account of technological evolution which takes a utilitarian perspective and that is precisely his way to introduce functionality as a crucial factor in concretisation: the functions of an object ought to be examined from the perspective of the internal disposition towards functionality that the object's affective technicity imposes. It is not a matter of how useful a technological object can be – for whom is an immediate question, much more complex than it initially appears – but rather is a question of immanent consistency, a faithfulness to the operation of an abstract machine. This faithfulness is the reason that Simondon claims that technical evolution is no different than biological one. The moment when a technical object reaches a high level of concretisation is the moment when it affords multi-functionality.

In a paradoxical sense, the object becomes more concrete as it becomes more abstract – one should always remember that the opposite of the concrete is the discrete, not the abstract. The abstract house of my previous example is concrete precisely due to its ability to present such a complex level of abstraction, one that is made by the multi-functionality of all the other technical objects that it is made of: the tubes where warm water runs, the dinner that is being prepared in the stove, the windows which allow visual but not thermal contact. It is not only the house that becomes multi-functional but also each of these elements. A wall supports loads, protects from outside temperatures, connects appliances to networks of electricity and communicates while it is a blank canvas for any form of the resident's interventions. In other words, its affective capacities, its potentials to affect and be affected, have been amplified at such degrees where one can speak of a high-level wall technicity. This is why any technicity is primarily an affective one. The effects of the wall exceed by far and in ways never imagined the initial problem that they were meant to confront.

## Conclusion

Why is therefore an abductive account of contemporary, automated architectural practices important? Precisely because architecture, contrary to the common belief, occupies itself with a constant problematisation instead with providing solutions to problems. The ability of architecture to problematise is what differentiates it from other disciplines, especially those that one could classify as engineering. Following architectural theorist Jeffrey Kipnis, on one hand engineering has a subjugating effect while, on the other hand, architecture has a liberating one.[23] Engineering subjugates differences precisely because it needs to do so in order to respond to the problems it faces, while architecture liberates difference in order to problematise the field of a constant production of subjectivity. Engineering, aiming to respond in a seriality of 'if … then' deductions aims to deliver the greatest good for most people, and in order to do so, it needs to eliminate

differences, both in the initial formulation of its problems and to its potential responses.[23] Quite the reverse, architecture offers emancipatory potentials by amplifying the problematic field and eventually creating new existential niches via the manipulative abductive interferences of a myriad 'what … ifs'.[23]

Accordingly, the problematic field of architecture and its technical individuals, the field of the hand and the *stilus*, should be examined on the differentials that constitute it as an assemblage and on the technicities that it affords and produces. Put succinctly, between each finger and each pencil, each hand, mouse and click, each hammer and drill held, lies a difference which produces the singularities of any technology, the ones that determine it – through concretisation – while, reticularly, determine us back – in our generalisation. In their own right, digital architectural practices could also be approached in terms of their technicities: it is in the concretisation of ANN and in the reticular generalisation of their users, coders, trainers and designers that the potential for inventive, abductive inferences can emerge. Any account that would focus on each of them apart, either appraising or condemning them, assuring that computation will suffice to save us or that architecture is either analogue or not at all, is an account that is fundamentally misleading. For as long as the computer and the architect stand as two distinct terms, the automation of strong abduction (and the immensely productive potentials it might offer) will remain the philosopher's stone of AI. On the contrary, one might need to come in terms with the most obvious conclusion: we are already part of the neural network. Not as trainers, in supervised, unsupervised or other forms of ML, but as the necessary *germ* that links them to an outside. We, as one, are the style of ANN, the technicity that, when liberated from its agitations, can abductively put past, present and future in contact. In other words, architectural technicities provide the genealogical framework necessary to avoid any taxonomisation that would all too easily break in parts or bring back together that which is fundamentally neither a priori nor a posteriori, but always a praesenti. The hand of the architect and its – digital – tools are never undetermined: they are unassignable, to anything in specific, yet fully determinable through the differential relations of the elements that constitute them.

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