Digital aesthetics.
The primacy of codes, experience, movement and affect.

A critical discussion on the complex and atemporal overlapping realities forming the world we live today.

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Introduction

The origin of the word "aesthetic" dates from the late 18th century (in the sense 'relating to perception by the senses'): from Greek aisthētikos, from aisthēta 'perceptible things', from aisthesthai 'perceive'. The sense 'concerned with beauty' was coined in German in the mid 18th century and adopted into English in the early 19th century, but its use was controversial until much later in the century (Oxforddictionaries.com, 2015).

Aesthetics means perception or capacity to sense, and there is an enormous important discussion about laws and norms of operation and how they operate in the level of perception and cognition. This discussion regards the capacity to manipulate, to modulate and to interviewing into the immediate perception of the real which is the way to enter your capacity to act or to be acted upon.

Aesthetics in terms of relationality, the ontology of the relation that comes with theories of affect by Brian Massumi and other authors. Perception and cognition do not come from nowhere, there is always an impact of a force onto another form. Before it being symbolical, intentional or representational, it comes from an impact of a physical sensation.

Other authors such as Michele Emmer, Matthew Fuller, Gian-Carlo Rota, James McAllister and others, argue on a more practical level that aesthetic lies on the body and eyes of the receiver and try to explore and exemplify the entity of beauty amongst mathematicians and the ones from the scientific field in comparison with visual artists.

The primacy of codes

Elegance

This constant necessity of rationalizing aesthetics through laws, rules and set of behaviours, in an attempt of quantifying it focusing on a set of properties found in the object by the observer in contrast with an affective idea of aesthetics based on immersive perceptual experience constituted of impacts, translations, emotions and cognition is what drives this essay to try to highlight some important topics and relevant discussions around these topics and try to see where the tension is.

Affective aesthetics theories argue that we can not talk about an aesthetic of the machine due to the fact aesthetics is all about perception, sensation, affective immersion, and the machine itself does not have a body. The affective theory argues digital systems and computational systems are only working on probabilities, encoding information and, therefore, are never able to come up with something unpredictably new.

This essay brings the discussion and tries to understand what an aesthetic based on the primacy of the code and mathematical entities could be since computational modes of processing information are determined by probabilities, predetermination and rules framed within itself.

The command line is a way to establish a conduct and the capacity of commanding our perception and capacity to act in the world.

In his paper Elegance, Mathew Fuller presents the topic interpreted from Donald Knuth's Literate Programming where he suggests that the best programs can be said to possess the quality of elegance. Elegance is formed by four criteria: the leanness of the code; the clarity with which the problem is defined; spareness of use of resources such as time and processor cycles and implementation in the most suitable language for its execution. This definition of elegance is very similar to the ones taken in design and engineering where in order to achieve elegance use of materials should be barest and cleverest (Fuller, 2008, 87).

At the level of programming we should also think about those contexts where in order to become more adequate, the process of coding finds itself affected by other external elements. In work conditions, programmers might be concerned with elegance even under other imperative situations such as cutting of costs, in terms of following a certain common criteria of satisfying the needs of the final user no matter what it takes, in the clearest way possible and the constant onus of clarity to peers and one's collaborators. Elegance in many occasions is taken as justification instead of opening new doors in a more fluid process, remaining to work as a set of parameters against which a program can be calculated (Fuller, 2008, 88).

Fuller suggests the idea of elegance is based between the machine and the talents of the programmer and by having the context of the activity already fed by a problem definition within the practice itself.

In this scenario, the context of elegance in programming is selfreferent and static, like if we were working inside a black box system where the possibilities are limited by its own constraints.

As a program complexity increases it becomes exponentially difficult to keep the truth of means of answering it. At a certain level of complexity, a threshold of elegance is crossed and the possibility of procedurally calculating an expected result gets fairly inaccurate. The elegance of a piece of code then is arguably not definable at a mathematical level (Fuller, 2008, 89).

The phenomenology of mathematical beauty

Professionals from different fields of work such as musicians and painters are likely to be embarrassed by references to the beauty of their work. It is easy to observe the inclination for mathematicians to enjoy discussions of the beauty of theorems and mathematical proofs.

On the other hand, artists normally stress the technical aspects of their work rather than aesthetic characteristics (Rota, 2005). Mathematicians though make casual observation of mathematical beauty of their favorite pieces of mathematics.

In the paper "The Phenomenology of Mathematical Beauty"(Rota, 2005), Gian-Carlo Rota tries to uncover the sense of the term "beauty" as it is abundantly used in the mathematical field. Rota introduces an idea of the objectivity of mathematical beauty, showing that the beauty of a piece of mathematics is dependant upon schools and periods.

It's time-based following an idea of a sort of "fashion trend". A beautiful theorem which is appreciated today

can be overtaken by a new one tomorrow which depending how successful this new theorem is it becomes the new "standard of beauty" to be considered from then.

Mathematical beauty is strongly linked to mathematical truths based on properties of objectivity which mean it is inevitably context-based.

According to Rota, any attempt of developing an estimation or a working frame on what would be labeled as mathematical creativity would be a serious error due to the fact that it is impossible to measure creativity of any kind of "bounty word" because these are devoid of identifiable content. It seems the same could be applied for the concepts of mathematical beauty.

One can characterize a mathematical paper, or a piece of software code only after it has been understood.

"Creativity" is what Rota proposes to call a "bounty (generous) word". These are kind of words that states and promises properties that can not be restricted or measured (Rota, 2005, 127). "Happiness" is another good example of a bounty world. The question starts to raise when thinking: Could "aesthetics" also be considered a bounty word?

The thin line between Elegance and Beauty

It is important to try to stipulate a difference between the concepts of mathematical elegance and mathematical beauty. The elegance of a theorem of a piece of code is often related to the way it is organised and the way it has to follow a set of rule and properties in order to achieve elegance in the presentation.

Mathematicians and programmers tend to organise their

materials in a fashion that everyone will agree are elegant. Elegance generally comes tangentially related to its content (Rota, 2005). For instance, it is possible to have the same piece of code presented in an elegant or inelegantly way.

Rota states it would be an error to pretend that the appreciation of mathematical beauty is what vaingloriously feel it should be, namely, an instantaneous flash (Rota, 2005, 130). The beauty of a theorem would be best appreciated if always presented in the context of a theory. According to Rota mathematical theorems are are strung together and presented as precious stones that can only be appreciated by those who are familiar with them (Rota, 2005).

The truth of a statement does not enlighten us to the sense of the statement. Enlightenment is what mathematicians are constantly looking for when asking if that piece of theorem could have some practical use (Rota, 2005). It could be true or false such as the theorem itself, depending on the context where it is applied.

Mathematicians often say a theorem is beautiful when they appear to mean a theory is enlightening and how they understand that specific resolution for a problem that "makes sense" (Rota, 2005). The constant search for the perfect world of "true and false" free from errors and disappointments could be limiting and act as a global constraint within the practice itself since in a way we are not opening doors for true experimentation.

Further in this paper, Brian Massumi discusses some important topics on how we could manage these external factors and find freedom within a world ruled by the power of laws.

It might be possible to connect this insight to Fuller's idea of the "elegance of disequilibrium", where elegance does not have to rely on the construction of a code (Fuller, 2008, 91). Does enlightenment or the finding of

"beauty" have to rely on a logical procedural thinking, or true beauty could only be found in the unexpected?

In "The Logic of Sensation" (Deleuze, 2003), Gilles Deleuze mentioned that only a few painters have developed the experience of chaos while fighting to limit and control it at any price. It seems to be out of this beautiful chaos that "geologic lines" first emerge; and this geometry or geology must, in turn, pass through adversities in order for colors to arise, for the earth to rise toward the sun (Deleuze, 2003, 111).

Beauty as aesthetic properties

The subjectiveness of mathematics combined with its objective and practical aspects is what constitutes mathematical beauty. This phenomenon attracts many philosophers as well as mathematicians. How is it possible to claim if an entity is beautiful or not?

A common interpretation is to say the entity has the property of beauty that the observer has perceived. In his paper "Mathematical Beauty and the Evolution of the Standards of Mathematical Proof", James W. McAllister (McAllister, 2005) regards beauty as a value that the observers project into the objects, not a property that resides in the objects.

Two factors determine whether the observer will project beauty into an object: the aesthetic criteria hold by the observer and the object's intrinsic properties (McAllister, 2005).

If an object holds properties that are valued by the observer's aesthetic criteria, the observer will project beauty into that and see that object as beautiful. These projections of beauty could be triggered by any kind of property but what tends to actually trigger the observer's attributes of beauty normally are small families of properties.

These "aesthetic properties" is what evokes the observer aesthetic response, and it is very important at this stage to distinguish the act of projecting a value of beauty from the object's intrinsic mathematical properties which motivate such projection by mathematicians (McAllister 2005).

Considering different individuals can hold different aesthetic criteria McAllister proposes it is strictly incorrect to say that a mathematical entity has beauty, as though this were a property encountered in the object. Rather, a mathematical entity has certain aesthetic properties, such as simplicity and symmetry (McAllister 2005).

Two different individuals might disagree on the aesthetics properties of the same object. Allowing observers to have different opinions about the same object is how it is possible to start having a more open conversation about aesthetic merits and also understand what other authors on affective aesthetics theories regards.

It is also very crucial to notice how aesthetic properties tend to follow a sort of fashion based on how successful a theory is. For instance, the more empirically successful theory is, the more it is going to be accepted as the next model of "what is beautiful". In a process McAllister describes as "aesthetic induction" new evidence and conceptions of mathematical beauty evolves from there, indicating a shift from a procedural model based on aesthetic values to aesthetic properties (McAllister 2005).

The basis of the evolution of aesthetic mathematical criteria is governed by an aesthetic induction of the preferences and practical utility of mathematical constructs. The problem emerges when we verify that is very difficult to build a scientific theory of mathematical aesthetics and the ability of grasp this beauty is limited to a sort of "sixth sense" (Emmer, 2005, 253) and an inmate and technical ability of the mathematician, which makes formulating an overall convincing theory of it extremely difficult.

The extreme motivation to find beauty in their own work and practice as something unique based on the elitist base of their activity is what produces truths only appreciated by a few (Emmer, 2005).

Aesthetics and Mathematics

In the paper "Aesthetic and Mathematics: Connections Throughout History" (Emmer 2005), Michele Emmer investigates the theme of how mathematicians feel their activity is highly creative and possess a special beauty.

Many mathematicians describe it is actually due to the presence of aesthetic criteria that many of decisions are taken when writing proofs to certain theories and suggest that as in the arts field, each detail of a theorem is not discovered, but composed. In fact it is notable the artistic ambition among the mathematical community, however, the question of mathematical beauty can only be answered by those who have studied the subject.

New areas of mathematics have brought many interesting questions regarding the meaning of proving as well questions related to aesthetics in connection with computing. However the consideration of aesthetics in mathematics started much early the computational era, therefore, it is very important to try to understand the

reasons and motivations behind mathematics and the aesthetics. This can help clarify the attitude toward an aesthetic of the new computing medium (Emmer, 2005).

Emmer shows us relevant books where it is possible to identify through history how humans tend to assign beauty to objects that please senses trying to identify elementary properties which qualifies beauty by the sum of these possible aesthetic properties. This unending effort of trying to quantify beauty might be the tension point of this essay.

As Emmer mentioned the great mathematician, John von Neuman, describing a mathematician's work, he says: "Any discussion of the name of intellectual effort in any field is difficult, unless it presupposes an easy, routine familiarity with that field. In mathematics, this limitation becomes very severe, if the discussion is to be kept on a non-mathematical plane" (Emmer, 2005).

The primacy of experience

Affect in image perception

In his paper "On the Autonomy of Affect" (Massumi, 2005), Brian Massumi talks about a first experiment researched by Hertha Sturm where they used three versions of the same film and tested how the same group of nine-year-old children perceived it in different ways.

The first version of the film was the wordless original one, the second version was the first voiced-over dubbed "factual", describing step-by-step all the action as it happened, and the third version was called the "emotional" one, which was largely the same as the second version but included at crucial points, words expressing emotional tenor of the scene.

Something strange happened when the children were asked to rank specific scenes of the film both on a "happy-sad" and " pleasant-unpleasant" scale. It ended up that the "sad" scenes were rated the most pleasant ones. The sadder the better (Massumi, 2005, 23).

The conclusion emphasised the primacy of the affective in image perception. They could observe that the primacy of the effective is marked by a gap between content and effect. Apparently there is no logical connection between the strength of a content and its duration (Massumi, 2005). What they mean is the existence of an intersubjective context. This indexing determines the qualities of the image, and the strength of the effect could be called its intensity.

What happens at this stage is that there is no relation between qualities and intensity, or, if a relation could be found that would be of another nature (Massumi, 2005).

Intensity

The level of intensity is characterised by a crossing of semantics which in this case says sadness is pleasant, connecting what normally would be indexed as separate.

There is here a disconnection of signifying order from the intensity and a different order operating in parallel. It is said the gap is not only between content and effect, but also between the form of content and intensity.

This disconnection between form/content and affect intensity enables different levels of connectivity, a different difference in parallel (Massumi, 2005).

Intensity is embodied in the body and autonomic reactions at the level of the skin and is qualifiable as a static emotional state. It is a state of disruption, a hole in time. It can not be considered passive because it is filled with emotion, and it is not yet activity because the motion is not of the kind that can be directed (Massumi, 2005).

Intensity is the unassimilable eternity, and it has to do with transformational stages and all the accumulation of stages, moods, etc. Sense experience is the overlapping of specific sensorial motion responses. Emotional is qualified intensity. Only when you recognise it, it becomes motion, then it becomes representational, then conceptual and cognitively recognisable. We might have to rethink the regime of the optical.

The superiority of the analog

In "On the Superiority of the Analog" (Massumi, 2002), Massumi introduces the idea that virtual world is inaccessible of the senses and it can not be felt in its effects. Its appearances are in the twists and folds of formed content, in the ins and outs of imagining. This applies if the image is visual, aural or verbal. No kind of image can render the virtual.

Brian states the best way to approach the virtual is by thinking of it topologically (Massumi, 2002, 134). Topology is the science of self-varying deformation, where it is possible to create continuous transformations based on geometrical figures on into another, where all the possible variations are actually versions of the same topological figure.

A topological unity multiples in and of itself. This is the only superposition that the unity of the figure can be grasped as such, in one virtual image centre of the figure. You can see it as an image because you can figure it that way in the imagination level.

Imagination is the way of thought that we can best differentiate the vagueness of the virtual (Massumi, 2002, 134). Digital technologies have a connection to the potential and the virtual only through the analog.

For instance, the words and letters on this paper were processed inside computer software through codes and algorithms. Codes, not words.

Deleuze exemplifies very well this process when giving the example of digital synthesizers (Deleuze, 2003, 116). Their operation passes through a codification, through a homogenization and binarization of the data, which is produced on a separate plane, infinite in principle, and whose final sound output will only be produced as the result of a conversion-translation.

It's only when the words are printed on the screen that we can read it and transform the alphabetical figures into figures of speech, then into thought, then into feelings and emotions. This is all part of an analog process. Brian seems to be very critical about this relation saying digital is electronic nothingness, pure systematic possibility that always circuits to analog (Massumi, 2002).

By the superiority of the analog, Massumi does not contradict this the closing call to think the two digital and analog together. Analog and digital must be thought together even by saying the analog always folds ahead.

This is a key concept presented in this essay that might help us to avoid any further discussions on digital versus analog.

An affective dimension

On movements and freedom

What are the many possibilities of freedom we have in the new and virtualized world that frame our lives? In "Navigating Movements" (Massumi, 2002), this question is raised and suggests we should start talking about hope and the affective dimension of our experiences.

At this point, it is important to avoid thinking of hope in connection to an expected success (Massumi, 2002, 2). In this case, we have to consider hope as something different from the concepts of optimism and pessimism or any kind of projection of success.

We bring here the idea of hope in the present (Massumi, 2002, 2) where we don't have how to project any utopian dream to the future and together with that we also avoid disappointments and any paralysing reactions coming from pessimism. The moment of "now".

When we start talking about hope in the present, we bring together all the vagueness surrounding every situation we live. A kind of uncertainty that can actually be empowering in that particular context once you get rid of any idea of possible success or failure and that open new doors to the unknown, to the try and see of all the possible experiences ahead.

The present is never a closed door, but actually a 'threshold of potential' (Massumi, 2002, 3).

The idea of affect and hope comes together with the margin of taking action in every present situation. The concept of being on the moment of now explains its importance of it when we understand why focusing on the next experimental movement is more important than any big utopian idea you might have (Massumi, 2002).

It is wise to understand affect beyond any personal feelings or opinions and not make the confusion of it with 'emotion' in the most common sense. The way Massumi defines the word 'affect' comes from Spinoza and the idea of the capacity of a body to affect and be affected.

These are not different capacities but they actually always go together. Every time we affect something, let's say you push the table top using your hands, it's said the tabletop is also reacting to it and pushing you back, therefore you are also being affected by it (Massumi, 2002). Here we are only using this analogy because we want to bring attention to the body and what a body is as we go along, in a constant flow of changes. The capacity of the body of affect or be affected is not something fixed.

That makes us think every affect is doubling and it's all about the intensity. The experience of affect and being affected is taken to a next level by an experience of the experience. This gives the body a depth dimension across all its transitions such as memory, habit, reflex, desire and in tendency.

Emotion is the way the depth of that ongoing experience registers personally at a given moment (Massumi, 2002, 4). It is important to note the depth of the emotion of a specific situation is not perpetual or something static, but a selection of memories that punctual activates certain reflexes and tendencies.

On potentiality

No emotion is capable of covering all the possibilities of our experiencing of experiencing but is said that for every different emotion all the habits, old memories, tendencies, they are not totally absent because a different selection of them is sure to come at the next step.

They are always still there, but virtually - in potential. Massumi makes us understand that affect as a whole is the virtual co-presence of potentials.

The virtual is like time. It's unaccessible because it's infinite. It's populated by potentials, and there is no actual. Nothing exists there, only the potentiality of existing exists there.

Potentiality is what we can not access, but it actually exists. Apparently Massumi criticises the digital aspect of it, which is based on standards, goals, rule sets, efficiency, productivity, and an idea of a final idea product which commonly occurs in most of programming tasks. If a production process only sticks to the digital aspects of the idea, it's easy to skip many important stages of the creative process and focus your thoughts on the expected result.

What happens is a jump from the "how" straight to the "what". That's the backwards way of creation. That's a different question and it's related to a different type of response. When Massumi is talking about analog/digital sort of dichotomy, he is driving us at this possibility of the virtual thinking of space, as creation, as basically living in the virtual to tack into a potentiality.

This potentiality of affecting and being affected as we move through life bring us to the second way of considering how affect has to do with intensity. This constant vague sense of potential is the 'freedom' each one of us fights fiercely to have at our lives, but it's never

actually there but only in the virtual. The more potentials we have available to us, the more intense we see our lives, even if we never have freedom, we are always experiencing a degree of freedom on every potential decision we take (Massumi, 2002, 5). If we focus our attentions on the openness of the situations we live, we will never be slaved by any situation. It's never all about us or entirely personal. It's never contained in our own emotions and thoughts. in affect we are never alone (Massumi, 2002, 5).

Freedom and constraints

If we want to re-think freedom as a vague sense of potential, a well given example is the idea of 'walking as controlled falling' (Massumi, 2002, 9) that Laurie Anderson, among others, has used.

We can visualise every step we take works with gravity so we don't fall. It is the same idea of affecting and being affected, and it is not something natural, almost unconscious, but it is actually a great introduction for us start talking about freedom and its constraints (Massumi, 2002, 10). This makes us think that the potentiality of freedom and our ability to move forward when walking isn't necessarily about escaping from constraints but actually is how do we deal with that.

When walking we are always dealing with gravity and equilibrium. To take a first step you have to throw off equilibrium and intentionally let your body enters the stage of fall, then you cut it and regain balance.

The only possible way to move forward, in this case, is by playing with the constraints, not avoiding them (Massumi, 2002).

There is always constraints in terms of the limitations on the self and the freedoms that are possible. Freedom is not about escaping constraints. It's about breaking these same constraints into degrees of freedom. We can not escape the constraints.

Language and experience

It is similar with language. If we consider language in the traditional way as the correspondence of a letter or a word with a symbolic meaning attached to it and on the other end a matching perception to it, then we clearly see the model of a stem based on pointing out things you want other people to recognise (Massumi, 2002, 10).

However, language always leaves a room for discussion between significant and meaning. There is always the feeling that language can never fully express the uniqueness of every experience that comes along and, the exact details can never be translated by linguistic expression (Massumi, 2002). That's partially because each one of us even if living the same situation will never have had the same exact experience of it. It's the endless attempt to argue every single nuance of the experience because there is just too much there we are not able to completely articulate with words.

Language is a capture of experience, the codification of it and the normalisation of it which gives us the capacity to make it communicable all 'singularities of experience' in a neutral frame of reference (Massumi, 2002, 11).

Experiencing this potential of change and the uniqueness of every different situation is about navigating movement. It's about being immersive in an experience and it's about bodily attuned to opportunities in the movement, going with the flow (Massumi, 2002).

It's more like surfing a situation instead of commanding it or programming it. Experiences are not objects, they are us and we are our situations. We are moving together and we are our own participation.

Conclusion

As Fuller suggests there is a clue to elegance within multiscalar domains that is produced in most computing work. Elegance does not necessarily have to depend on structural or an aesthetic of code. Elegance also manifests by means of disequilibrium. "Elegance exists in precision madness" (Fuller, 2008, 91).

The problem lies on the fact that translation becomes a rule. Effectual experience, understood as every possibility in the world, gets transformed to a shock of the system, and this shock of the system responds by a need of formalisation of the "Why". The code comes out and develops into a translation. The translation develops into a logic and this same logic into a rule. Which prohibits the others to do experience something else, to experience a possibility of infinite possibilities.

It is in the complexity of the relations betweens zeros and ones that new behaviours occurs. These emergent behaviours are not pre-programmed. In an evolutionary

understand of computation we can see its large scale of interactions amongst many level of computation and the algorithmic structure allowing the emergency of an unpredictable behaviour.

Decisions are taken according to how external factors and variables are affecting the algorithmic patterns. Others can argue that algorithmic patterns are limited to the technical limitations within the system itself. However when exposed to an environment of a large amount of data plus input from human users the behaviour of the pattern changes and adapts in relation to the input receive, the values and possibilities coming from the environment outside.

There are certain benefits of a digital environment, such as image compression for instance. That brings us to another future discussion of feeling when in the realm of the digital we are losing some important information along the process. What we actually experience is an interpretation of the original colors. It's a translation of the total infinity of color combinations we might be able to perceive. A digital translation of the infinite virtual.

Let's not discuss if it's right or wrong and get stuck on the dialog of digital versus analog, but try to feel what is the acceptable amount of lost by formalising a type of digital process. Here we are not saying translations, in general, are bad, because in a lot of occasions we need to have this translation.

Maybe recognising the elegance of a binary translation of the real is to think if it's really sufficient. What affect allows us to do is to challenge the idea of the normalisation of the real and think if that's sufficient enough for the sake of our purpose, our result, or we are trying to communicate.

In conclusion, the relation between affect, the virtual and the primacy of the code and its technological creations seems not to lie not only on the simple sum of the factors but on its complex potentiality and atemporal overlapping realities and behaviours resonating to infinity and forming the world we live today.

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