A Language for Empathy-Based Design

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ABSTRACT

We introduce a design language to guide the theoretical and practical thinking around empathy and experience design. We start by identifying the lack of a comprehensive framework for empathy-focused design existing between and within the fields of design, cognition and human behavior. Based on these studies, we present a working definition for empathy, in order to facilitate understanding, discussing and designing for it. Further we propose a design language to guide the concept of designing for empathy. Finally, informed by this new design language, we present three stories around projects we have developed in an effort to provide the public with a curated, although open-ended, experience of empathy to improve the quality and depth of human interaction with the higher objective of advancing individual and societal well being.

1. INTRODUCTION

In a world where despite all advancements in law, science and technology, there still is intolerance and fear, enriching human experiences are becoming precious and rare. Positive human experiences are some of the most psychologically rewarding and they can be achieved through empathy [30]. The needs for affection and belonging are part of the Maslow pyramid of needs, and they are something that every human experiences. Through empathy, people can share and alleviate these needs and bring a positive impact on their daily lives. Empathy is one of the most important human traits that allow us to connect with and understand our fellow humans on a personal level and create a more tolerant and humane community on a societal level. Empathetic experiences enable us to transcend the mundane by creating enriching encounters and building meaningful relationships. But is difficult to talk about empathy and especially to try to design for empathy if we lack an established taxonomy and definition. Because of its vagueness, the word is overused, misused and misunderstood [**?**, 36, 35, 12, 11]. Also, we do not fully understand the neural mechanism of empathy. Is it a genetic trait evolved over millions of years for humanity to survive or is it a learned behaviour, or perhaps both as one has to be genetically able to learn such a behavior. But, if the latter is valid – meaning if empathy is a behavior that can be learned – then we can create experiences that teach and trigger empathy for the emotional and psychological benefit of the user. However, It is really hard to go from the word to anything that can be applied. But it is an important humanistic research challenge to work on making this abstract concept into something more tangible so that it can be better understood and recognized. And the ones who first need to understand and recognise applied empathy are the people who create and design experiences. In the creative process of designing experiences — from artists creating shows, installations, pieces, performances; to architects conceiving buildings, spaces or pavilions; to engineers designing trains and public spaces, etc. — much thought is given to the reception of the work by the users. Different aspects of this reception are often taken into account such as security, enjoyment, addiction, efficiency, productivity or ergonomy. Here we defend the importance of designing for another aspect: the empathy and human connection provided through the experience. But is it even possible to consider empathy as a resulting product of an experience?

If many researchers and philosophers believe that the sources of empathy must be found in ourselves [22] or in an evolutionary process [7], empathetic behaviors are nevertheless triggered by and developed through life experiences. Therefore the qualities of this human connectedness will depend not only on individual characteristics but also on situations, culture or training, and this allows us to think that, through specific situations, it is possible to make people more empathetic. This possibility of nurturing a higher sense of human connectedness among humans supports the potential of empathy-based design. But isn't it the role of society to keep an eye on our interpersonal interactions? If most of our societies have indeed evolved to provide individuals with the sense of a rule-based "social contract" stating the necessary interconnection of individuals, these rules are often directed more toward the proper functioning of the hive rather than toward the building of meaningful human connections. In this context, I argue that in order to design for empathy, one has to take some distance from social constructs so as to create an experience that increases the quality and depth of human interaction, and thus betters the individual and societal well being.

One first obstacle when embarking on such a task is the heterogeneity of meanings the word "empathy"has between and within fields. In this paper, I propose a taxonomy of empathy and introduce a design language to guide the theoretical and practical thinking around empathy and the design of experiences. The taxonomy aims to bridge the gap between the idea of empathy and what it really is. The purpose of the design language is to guide empathy-focussed design for the artists, designers, architects, etc. aiming to increase their public's empathetic behaviors.

Even though the human is at the core of our work, tech-

nology is central to it as it is our medium to both understand and create experiences. New technologies will come into play when understanding the notion of human connection and establishing the taxonomy of empathy. It will also be used for evaluating the work and impact of crafted situations on users. Most practically it will be used in the design and production of the situations and finally at the core of the experiences themselves. New and old technologies will help us understand how to change specific parameters of a situation to lead the interaction a little bit more toward an empathetic connection. The projects presented in the "Stories" section focus on experiences that bring us out of our everyday life and that make us change perspective on something very familiar (our voice, breathing or evolving through space). Technology plays the role of mediation to create estrangement.

2. DESIGN LANGUAGE FOR EMPATHY-BASED DESIGN

2.1 A Taxonomy of Empathy

Because empathy is both a resource of society and compositional of our social world, this concept appears as an hermeneutic thus needing a clear phenomenology (the same way that language both shapes our thoughts and is the result of them). For Theodor Reik (1948) , "The word empathy sometimes means one thing, sometimes another, until now it does not mean anything at all" [36]. So let's start with its genesis:

Empathy is constructed from the Ancient Greek word composed of (en, "in, at") and (pathos, "passion" or "suffering"). But the use of the word is actually very recent. First introduced in english languages by Edward Titchener (1867–1927)[44] in 1909 as a translation of the german word "Einfühlung" invented in 1873 by Robert Vischer in the context of connection of a subject with an art piece. The words was then used by Théodore Lipps [29] in his philosophy of mind and popularised by Freud. Looking at the ngram of the word it only became widely used in the 1940s and interestingly, its rise (parallel to the one of the word compassion) accompanies the fall of the word sympathy. Researchers generally agree on the definition of sympathy as the understanding of someone else's emotional state by emotional contagion. But there is more polemic about the meaning of the word empathy. In this work of defining empathy I will often refer to Gerdes' work on conceptualising empathy [12] that presents a great overview of the previous definitions of empathy from the social and cognitive standpoint.

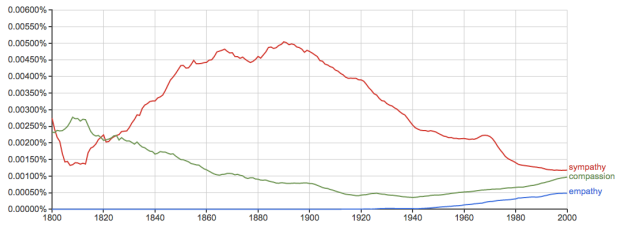

Figure 1: use fo the words "empathy", "sympathy" and "compassion" in percentage of books between 1800 and 2000

Besides the meaning of the word, I will also explore the nature of empathy. Is it an ambient interpersonal process (Carl Rogers) [40]? A skill (Carkhuff)[5]? An symptome of other-directed intentionality (Stein)? A feeling? A contagious affect? An evolutionary organ? A neurological function? Etc..

In this taxonomy, I will introduce three axes to guide our understanding of the many facets of empathy. The first axis, which I call the **consistency axis**, marks the connection between empathy as a dispositional trait or as a situation specific process. The second axis, referred to as the **consciousness axis**, introduces the duality of empathy as both affective/visceral and cognitive/intellectualised. The third axis, which I call the**awareness axis**, differentiates behaviors of self-awareness and behaviors demonstrating awareness of the other to tackle the problem of biased empathy. For each axis, the two components are not considered as opposites but simply as enabling us to map the study space.

Consistency axis: dispositional <–> situation-specific

Figure 2: consistancy axis

Our first question will be whether someone IS empathetic or does one ACT with empathy? In other words, should we consider empathy as a dispositional trait of an individual or it is situation specific. This distinction is important in terms of assessment as a person's trait can be measured in the laboratory and used to compare individuals, backgrounds or time evolution and empathy training. However, learning about empathy in terms of specific situations could help us both in the design of experiences for connection building but also in gaining awareness on the biases and contexts that will trigger empathy. In the philosophical domain this is very present in the battle between Kant in one side [37] – for whom empathy has to be a dispositional trait and its presence or absence determines the result of one's struggle with oneself to choose between what is right and what is wrong in the absolute moral sense – and the Utilitarians on the other side, represented by Smith or Hume, for whom empathy is a situation specific state following the rule saying: "that an act is right if and only if it leads to the greatest total amount of well-being" making any decision relative. In parallel, Hoffman considers empathy as a dispositional ability separating people in types or categories (innocent bystander, transgressor, virtual transgressor, multiple moral claimants, caring versus justice) [22]. While others like Duan believe it is situation-specific cognitive-affective state [8].

Research in neurology informs us on the roots of empathy and its (almost) universal distribution among humans. The first discoveries in this domains were the mirror neurons showing sensory somatic resonance between people: instances when the neural activity of an observer shows the same patterns than the individual who is observed (in ac-

tivities such as eating, feeling physical or emotional pain, etc) [38]. This system is also shown to be quite primitive both evolutionarily and ontogenetically. (we will come back later on the link between those two). But if empathy is present from an early age in all human being, it is not always expressed and can (should?) be trained. Research on functional neural plasticity underlying the augmentation of empathy shows the possibility of training the right kind of empathy to avoid empathic distress and empathy fatigue (that would decrease helping behavior [2]) One extreme example of the possible effect of training on the neurology of empathy is the MRI studies of trained meditation expert and Buddhist monks [15]. In those types of studies that Ekman would call "of extraordinary" individuals with high training in meditation are analysed in terms of neurology, cognition and social behaviour and also neurologically measured while performing love-kindness meditation. Ekman defines the concept of extraordinary people as the people who realise fully their humanity by presenting out of the ordinary characteristics of goodness, selflessness, presence and amazing power of attentiveness and concentration. In the Buddhist perspective, empathy is present in everyone but it will not be expressed all the time, it will manifest when meeting with circumstances that triggers it. Saxe and al. work on interfering with someone's moral judgement and inner model of mind through transcranial magnetic stimulation (TMS) shows that the location of some aspects of empathy (sometimes called mentalizing: explicitly considering targets' states and their sources) is now very well identified in the brain and can be accessed non-intrusively to bias people's moral decisions [41].

Work from Gottman on "glimpses" of behaviors [16] and by Nalini Ambady on slices of expressive behaviors (ie: very brief observation of behaviors) demonstrate that individual impressions from very short interaction generally are proven accurate and consistent with results on longer observations of the same individual [1]. In other words, the way people react in short interactions is consistent with how they act in general. And this means that the situational empathy might actually be a manifestation of the dispositional empathy of that person. This smoothes the distinction between dispositional and situation-based empathies.

In the introduction of his book "Empathy and Moral development" [22], Hoffman recounts an anecdote he often encounters when talking to people about the field of moral development: to convince people that morality isn't only an affair of social judgment, religion or traditional family life, he would bring up the evolutionary argument: "But when I say humans could not have survived as a species if everyone cared only about himself, they pause, think about it, and then say something like "You might be right.' The evolution argument carries weight, as though it were self-evident that hunters and gatherers had to help each other to survive, so humans must have helping genes." This evolutionary arguments acts as an argument of authority with the general population and for us would lean toward the "dispositional trait clan". It is true that Darwin himself was interested in expression and perception of emotions among the fauna as evidenced by his book "The expression of the emotions in man and animals" [7] and brought us the first landmark of evolutionary use of the connection of mental states between individuals of a species. But once again, for Hoffman, empathy is a skill that can be trained, that is potentially not always expressed, and is only a "fragile glue" supporting the social canvas. Informed by this historical and multidisciplinary review we can consider empathy as dual between an innate and a trained part. We can either consider that empathy is a skill, that can be learned and improved or we can distinguish between several types of empathy: dispositional empathy and situation based empathy. A third possibility is to consider like the Buddhist that it is the same empathy that is always present but not always expressed.

We are not adopting one viewpoint over another but are embracing the diversity of uses of the word and turning it into a comprehensive cartography of the field. We can summarize those different discoveries and facets of empathy on the first axis:

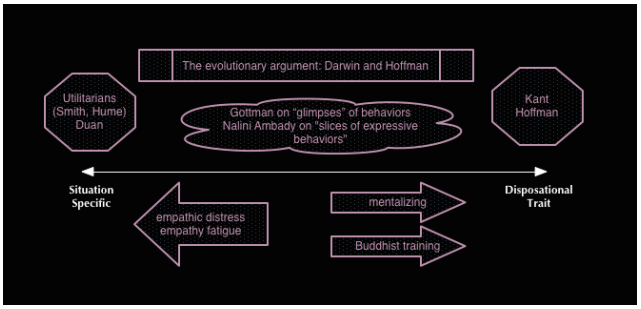

Figure 3: illustation of phenomena on the consistancy axis

Consciousness axis: affect <–> cognition

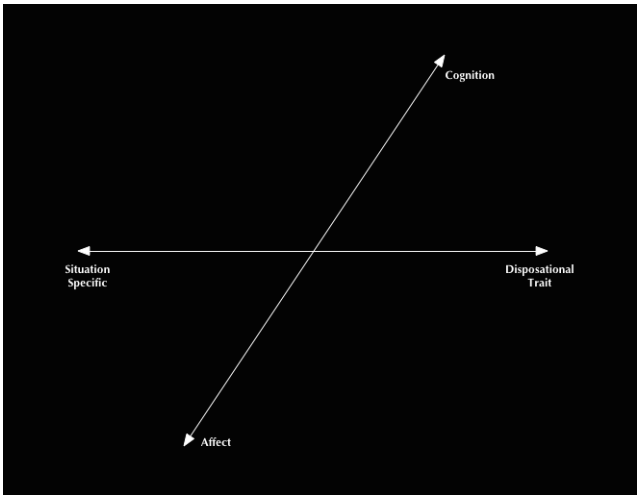

Figure 4: consciousness axis

Is empathy a purely instinctive affective reaction or is it the result of conscious decisions? If empathy refers to the reactions of an individual to the experience of another, then those reactions are of very different types. Since 1759 Smith establishes in his "Theory of moral sentiments" [42] that they could be part of two broad classes: on the one hand the cognitive/intellectualized reactions and in the other hand the visceral/affective reactions. But what part of the empathy process is instinctive/affective and which part is cognitive/ conscious? The discovery of mirror neurons was a proof of the existence of an unconscious process acting in the direction of social coherency. In the same way, research on the origins and neuronal roots of social music making emphasizes the causality relationship between group actions,

perspective and intentions [45]. Though personal experiences or being a human and being capable of making choices as well as research on trained mediators seems to support a conscious part in empathetic behaviors. This brings us to consider the distinction between two broad classes or empathetic responses: the cognitive intellectualized type and the affective visceral type. Even though some researchers focus on only one type of response (Stotland for visceral [43], and Dymond for the intellectualized [9]) most researchers now agree that complete empathy requires those two components. Moreover, those two components have already been mapped in the neurological topos and shown to be quite independents from each other meaning that an individual can score high on one of them without necessarily rating well in the other. Some research field also includes a third type of empathy called pro-social concern [47] or compassionate type [10].

Because in this work we try to create human connection without specific objective of aim other than the potential associated emotional well being, we will not consider "pro-social concern" as an inherent component of empathy for now but we would instead argue in favor of two other factors related to the interaction one individual develops within himself: self awareness and emotion regulation. I propose the idea that these two have the potential of modulating the two primary factors: affective sharing and cognitive perspective taking.

We summarise different perspectives on this axis in the following figure:

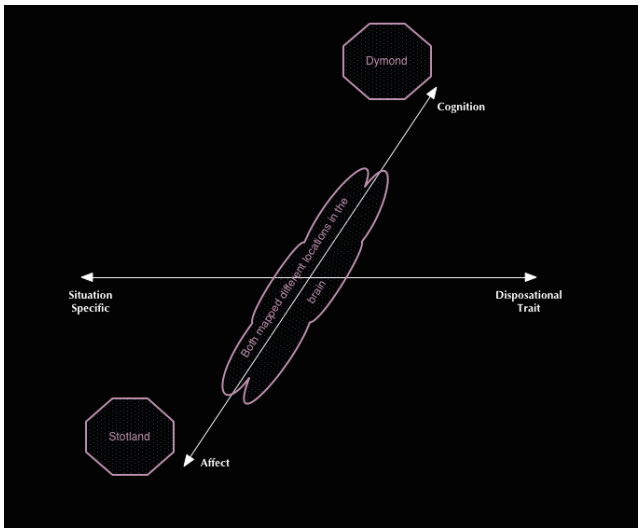

Figure 5: illustation of phenomena on the consciousness axis

Self-other awareness axis self <–> other

In the context of empathy, many concepts come into play when tackling the question of self-other awareness We will describe a few of them that are useful for understanding the mechanisms at stake with the aim of establishing a hierarchy of values and complete our map for deconstructing the empathetic journey. This deconstruction is necessary in order think more concretely about applying empathy: as a result we will propose a method that takes empathy step by step to make it a constructive process.

In the Theaetetus, Plato describes Socrates' efforts to de-

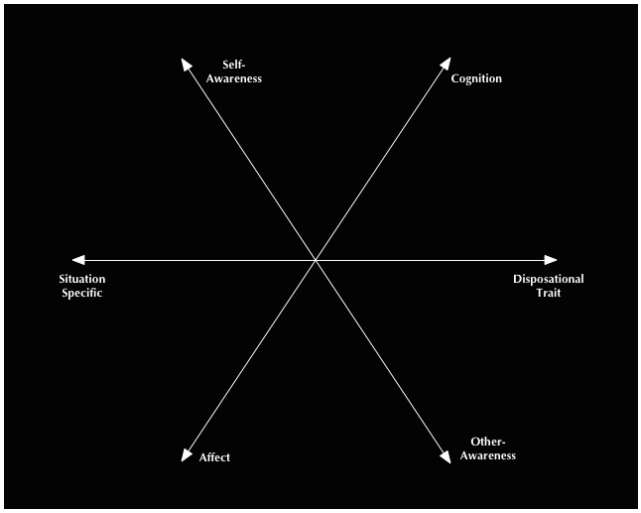

Figure 6: awareness axis

fine true knowledge. One of the protagonist's queries in this dialogue is to wonder "why should we not calmly and patiently review our own thoughts, and thoroughly examine and see what these appearances in us really are?" In other words: the first step to understanding is to understand oneself, and the search for empathy, its meaning, origin and objectives are not exempt from this principle, especially if we consider that the knowledge of the "other" starts from the projection of our own feelings and experiences on them. But there are many ways of turning to oneself. One of them is to bootstrap empathy to apply it toward oneself, maybe one of the hardest thing to do in our hard-working high-achieving modern world.

In Western culture, empathy often involves the object and the subject to be distinct, and rarely we will hear about empathy for oneself. This is reinforced in several latin based languages and when one turns empathy onto oneself, it is often associated with negative connotations such as self-pity or contempt. This is very different in certain Eastern perspectives, especially the Buddhist philosophy, for which the words for benevolence, compassion and empathy can refer both to feelings directed toward someone else or directed toward oneself. This aspect of Western culture can be understood by the fact that empathy is regarded as a way to "facilitate interpersonal relationships and not as a way to perfect our inner nature" [15]. Once again we are brought back to our argument of evolution and effectiveness. For the following part we will admit that the self-self and self-other connections play a central role.

How does a "self" relate to an "other" and in which direction is the connection established? For the Buddhists the question in somewhat wrongly formulated because both "self" and "other" belong to the same entity and are only pieces of the same puzzle [34]. For Levinas, the philosophy of the "other" comes first in order to conceive of the self [28]. Actually, the philosophy of the other is prior to any philosophy: one cannot think oneself and one cannot think anything is one does not start from thinking "the other". For Gurwitsch the directionality of the self-other connection comes from the other toward the self and is conveyed by perceivable physical qualities such as the modification of facial muscles [20]. For Lipps it is only by drawing from our inner experience that we are able to deduct the inner world of someone else from the perceived input [29].

In his self-perception theory, Pr. Daryl Bem proposes two postulates:[4] “When we want to know how a person feels, we look to see how he acts. Accordingly, it looks possible that when an individual himself wants to know how he feels, he may look to see how he acts, as possibly suggested anecdotally by such statements as ”I guess I’m hungrier than I first thought.” It was from this line of reasoning that the first postulate of self- perception theory was derived: Individuals come to ”know” their own attitudes, emotions, and other internal states partially by inferring them from observation of their own overt behaviors and/or the circumstances in which this behavior occurs. The second postulate of self-perception theory suggests a partial identity between self- and interpersonal perception: To the extent that the internal cues are weak, ambiguous or uninterruptable, the individual is functionally in the same position as an outside observer, an observer who must necessarily rely upon those same external cues to infer the individual’s inner state. ” This quote from Bem adds an additional level of complexity and blurriness in the process of understanding the “other” as not only is my understanding of him/her informed by my own projection of my own life experiences on him/her but also I base my understanding of myself on the projected image of others on me. All those different layers exist at the same time and awareness of all those phenomena is mandatory to get a clear picture of “where I stop and where the other starts” to accept our differences and not impose our views on others.

The awareness of someone’s relationship with the other is another source of polemic among researchers. Is one better at empathising when the line between one’s self and the other is blurry? Or does one need cognition and a clear distinction between the self and the other in order to perform accurate perspective taking? Indeed, distinct recognition of the unicity of the other is important to acknowledging a part of inaccessibility of the other’s “inner world” to us and this is mandatory to make sure of the accuracy of the empathetic connection. The concept of biased empathy gives us an idea of the risks of lacking awareness toward others and basing empathy solely on one’s own experience. In fact, what is surprising when trying to quantify empathy it is not the lack of, indeed there is a real profusion of empathy, everyone is capable of experiencing it, but what is surprising is how quickly it fades out when you extends out the circle of family and friendship. It is this phenomenon that we call “biased empathy” by opposition to “unbiased empathy” where the feeling of connection can be potentially applied to any object. This is at stake in any tribal attitude or even nationalism, politics, etc. Biased empathy creates connection between people from a same group tied together. But if this connection is based on similarity between members it is also symmetrically based on the opposition to another group by the phenomenon of the “common enemy”. The cognitive aspect is lacking in those situations and emotion regulation, perspective taking and the search for a more englobing sameness factor is necessary.
The following figure summarises the different ideas emerging in the context of the connection self-other:

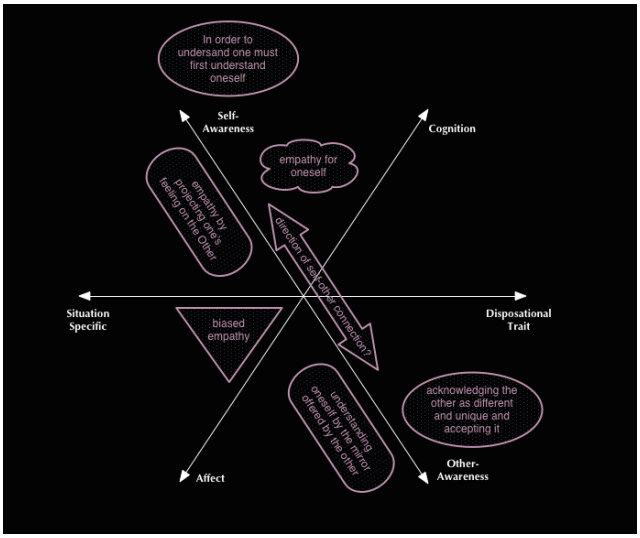

Figure 7: illustation of phenomena on the awareness axis

2.2 Illustration

2.2.1 Turning the wheel

How to make empathy a productive process? From this visual taxonomy we can display not only the empathetic footprint of an experience but we can also consider the movement and dynamics generated by the experience. Many different dynamics can occure but here we will we will propose a guiding method that takes empathy step by step to make it a constructive process.
Our journey starts from an affect which is a deep, ancient part of the brain. When creating a strong experience, to make it more impactful than a simple lecture, the designer has to touch on the visceral aspect of an individual. And this happens at some particular point in time, during a specific initial situation. But the next step is to have the participants extract themselves from this initial affect and situation through self-reflexion that bridges the visceral and the cognitive. The cognitive being the aspired result of self reflexion. From the touched part of cognition the designer can guide his participant into an empathetic transformative process that will make a lasting change in his dispositional traits toward others. Finally the objective being to make other-awareness into a second nature. On the cartography we can observe that this journey consists of turning the wheel clockwise to guide the participant through five steps of transformation from an empathy that is visceral and can be biased into a more accurate other-aware form of empathy. .

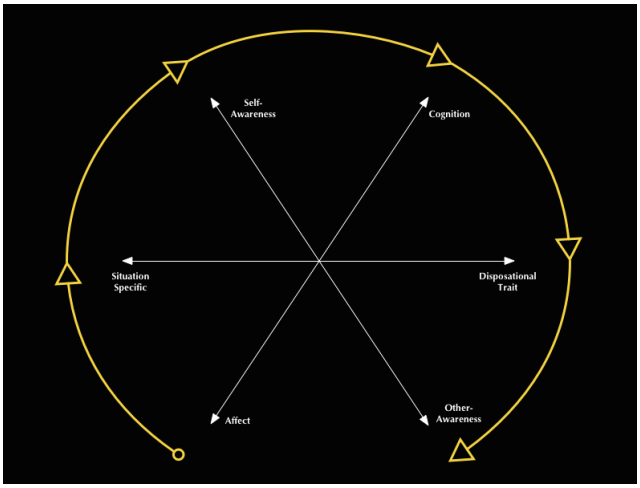

Figure 8: illustation of an experience of turning the wheel as a practive of empathy

3. STORIES

Now that the field of empathy has been mapped into a more comprehensive design language, how can this be used to help creators embed more empathy into their works. To help answer this question,I will share three project stories taken from my work. The first story is an example of mechanical device created for transforming dyadic (two persons) interaction. The second story is an instance of software design to be used by small groups of two or more people. The third story depicts the stake behind the design of an architectural space to increase empathy within the crowd. Those experiences have in common the search for the sameness factor between humans and to express a concern/care for egalitarian framing.

3.1 Fleur Pulmonaire

Fleur Pulmonaire is a tool for non-verbal dialogue that reflects on your own breathing while also offering a window on another person's respiration. It is a kinetic sculpture that represents a flower with undulating petals. Half the petals undulate with the breathing of each participant creating a choreographic duo.

Figure 9: Fleure Pulmonaire device (Photo by Benjamin Bloomberg)

At the point in time when I started working on this device, I had been working on the human voice for three years (thesis). I was interested in the voice as a medium for human interaction that contains much more than the verbal content itself, including, as we shall see, the rhythms of breathing. Indeed, we know, for instance that when talking with somebody, many characteristics of our voice adapt to the other person, this prosodic alignment concerns aspects of the voice such as pitch, breathiness, texture, amplitude, etc. [18]. The way those parameters adapt to the other person highly depend on the social dynamic between the interlocutors. For example, an employee will go most out of his/her normal ways when talking to a supervisor. In the intimate context, prosodic alignment along with the way to use one's voice with a spouse has even been shown to be a reliable metrics to predict of divorce rate [17]. Those phenomena are deeply rooted in visceral behaviors and are situation-specific by definition. And the voice is not the only unconscious psychophysiological medium of human interaction. There might actually be plenty of such mediums of which we are unaware. Breathing is a common denominator to most living creatures (experts still not agreeing on the definition of "life") and I believe that human breathing, its study and its use in new experiences, can be a tool for empathy building. To explain why, I need to present some of the science behind breathing and its connectivity to emotions.

Since William James' peripheral theory of emotion [24], many researchers have established the bidirectionality of the relationship between emotions and physiology. In the domain of facial expression, it has been showed that the manipulation of facial expression does act on emotional states [26, 31] Even though the effect of facial feedback explains only around 13% of valence changes, the findings are statistically significant. When looking at breathing, studies have also shown a statistical correlation between the manipulation of breathing patterns (rate, volume and their variability) and feeling states [3]. We also know that variations of respiration have an effect on cardiovascular changes and skin conductance. We will try to understand the mechanisms at play in such phenomena.

Breathing can be both voluntarily and automatically controlled by the contraction of the diaphragm, which extends the chest creating a difference of pressure and thus the absorption of air (inspiration). Then, when the diaphragm relaxes, air is expelled from the lungs. At rest, healthy adults typically breathe at 12-20 breaths per minute. Right after birth, babies breathe at 30-60 breaths per minute, and this rate goes down with age. When talking, inspirations are fast and short and exhalations are very slow and synchronised with the flow of speech. The oxygen intake is computed via the Respiratory Minute Volume (RMV). At rest, typically the tidal volume (volume of air inhaled or exhaled during one breath) is only about a sixth for a male and a fourth for a female of the entire inspiratory reserve volume. (0.3L for 3.1L for males and 0.3L for 1.9L for females). This ratio shows the very high potential for respiratory pattern variation.

Different research linking breathing rate, Heart Rate Variability and mental states show that vagal activation is greater at a slower pace and regulation of breathing patterns can bring calming and relaxing effects [6] but also help with the management of pain [25]. Those positive results are interesting in terms of empathy and human connection as several unconscious mechanisms in human interactions tend to synchronise the respiratory patterns such as yawning, singing [33] or even conversing [39].

Indeed physiological rhythms are involved in social interaction [27] and breathing is one of the most fundamental rhythm of the body. On interpersonal influences on breathing researchers have been studying the relationship between breathing rhythm and the 'oscillating rhythm of conversation' known as turn-taking [23]. This relationship is thought to go both ways, breathing adapting to the rhythmic organization of conversation, but dialogue also being constrained by the limits of respiratory rhythm [19]. Changes in listener breathing often follow in the direction of speaker breathing but it is not shown that it completely mirrors it. McFarland found marks of anticipation of turn taking in listening breathing patterns – characterised by shorter inhalation time – when the speaker is about to finish his turn. But a lot is still to be explored in the role of breathing in conversation. How does the synchronisation occur? Who takes

the lead? Is it linked to power dynamics and social status in the dyad as is the case with prosody variability? Can awareness of the phenomenon influence the valence level of the conversation?

It is in this context that Fleure Pulmonaire was built as a tangible medium embedding the presence of breathing in everyday life. It is designed to be used by two people in "silent conversation". It is composed of a base containing two stepper motors each linked to one rod. The visible part is composed of thin wooden drop-shaped petals linked alternatively to one or the other rod. The motors are respectively controlled by custom-made breathing sensors. The whole system is symmetrical and follows an egalitarian principle. When one user breathes in, the petals corresponding to his motor/rod bloom up in real time, following precisely the speed and amplitude of the breath; when the person breathes out, the petals come back down accordingly. As the system is built for two people to use together, this results in a choreographic dance of the two entwined layers of the flower. Coming back to our design language, we start from an affect occurring in a specific situation and bring awareness not only of one one's own behaviour but also of the differences and similarities the other's behavior. No cognition here is demanded from the users, as the journey is purely experiential. But the public and tangible aspect of the device is designed as a tool to practice non-duality.

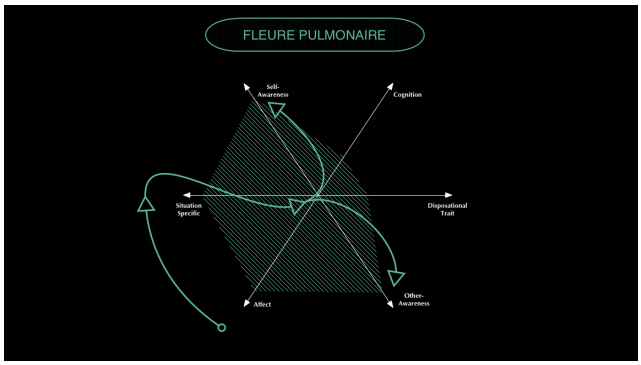

Figure 10: Empathetic footprint of the Fleure Pulmonaire experience

Hence, the experience provided by Fleure Pulmonaire not only brings awareness of the unconscious, visceral, situation-specific phenomenon occurring through breathing in conversation but also offers a reflection on the connection of all living beings through the shared air medium and on the synchronism of physiological and social rhythms while bringing respiration to the foreground as one common experience of all living creatures.

3.2 SIDR

SIDR stands for "speaker identification based on deep-learning for real time contexts". We can consider each of our individual voices as a flashlight to illuminate how we project ourselves in society and how much sonic space we give ourselves or others. Thus, turn-taking computation through speaker identification systems can be used as tools to understand social situations both in terms of specific situations but also to explore patterns that are symptoms of dispositional traits. Such systems can be used in different contexts from work settings to bring more awareness on individual participation during meetings, to research studies to the measure of the emotional intelligence of groups, etc.

In 2015, I was working on analysing discussions and understanding the unconscious phenomenon occurring in verbal group interaction I had been looking for a tool to collect data and give real-time feedback to members of a discussion group about individual participation in the discussion. I soon realised that no such tool was available, and previous researchers have been relying on the use of individual microphones for participants or have been post processing video footages, generally in a low tech manner by having students manually labelling the shots. Working with colleague Clement Duhart, we developed SIDR: a deep learning-based, real-time speaker recognition system designed to be used in real-world settings. The system is based on the Tidzam platform, a web-based software for the geo-localization of living forms from multi-sourced live audio captured in the TidMarsh Environment developed by Duhard.

Figure 11: SIDR interface (Photo by Rebecca Kleinberger)

The SIDR system is specialised for human voice, only requires one low-quality microphone and is robust, resilient to noise, room acoustics changes, different languages and overlapping dialogues. During the initialisation phase the system has already learned the two concept of "nothing" and "I don't know" (very useful and novel implementation from Clément Duhard) then the first user has to provide a sample of about 30 sec of his/her voice. This can be done by reading a standardised list of words The next step is to generate the unique vocal footprint of the user1, this takes about 2 minutes. After this step, the system can recognise in real time when user 1 is talking. After repeating the process for each user, the system knows the probability of each person talking, in real time, continuously during the discussion. The current interface displays the individual probability curve of each user taking, the name of the user with higher probability and also the agglomerates result since the beginning of the interaction.

We soon realised that this software could be more than a tool and by making people aware of what happens quantitatively during interactions we could create powerful empathy machines. The system could be used as it is to display all the real time data during discussion to not only enable individuals to raise their self-awareness on the vocal space they are using but also to consider themselves in context with the others. The system could be derived into different more subtle applications. Considering the question of ethics and judgement that could be triggered by displaying everyone's participation, one could imagine a system only providing individuals with their own participation rate so as they could self regulate to make the interaction more equal. This system could also help determine social biases

through the comparison of participation depending on gender or ethnic group. It could also be used in the context of couple therapy to bring light on unbalance patterns between spouses. Those applications all spam across the spectrum between dispositional trait and situation specific aspects of empathy, and without pretending aiming to modify behaviour a certain predetermined way has some potential to be pro-socially transformative for the users as it invites to reconsider the position of the self and of the others during interactions.

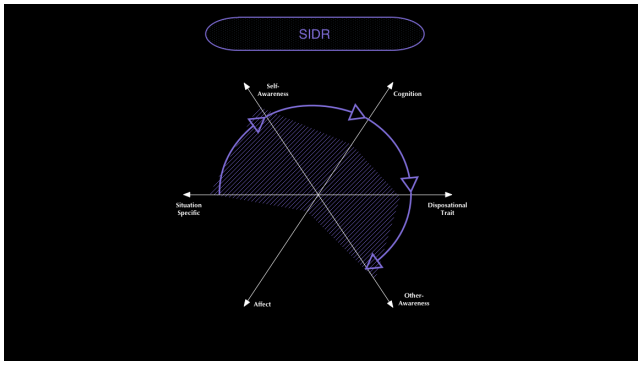

Figure 12: Empathetic footprint of the SIDR exprerience

3.3 Passerelles

Passerelles stands for "little footbridge" in French and is the title of a architectural concept. The scale model of the project in the figure below illustrates the vision of an architectural building entirely composed of stairs. The staircases would be narrow and offer an open view on the entirety of the space.

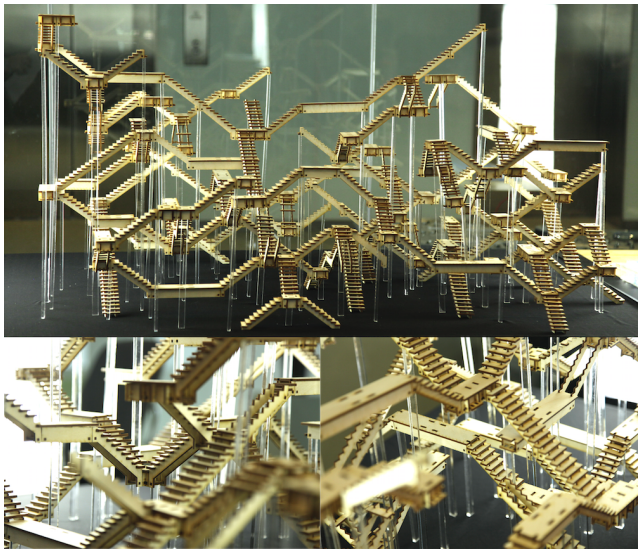

Figure 13: Scale model of the Passerelles project (Photo by Jonathan Williams)

The inspiration of the project draws from three domains: sociology, cognition and poetry. In terms of sociology, this work was inspired from the reading of Goffman's books "Presentation of the Self in Everyday Life" [14] and "Behavior in Public Places" [13] as well as Hirschauer's "On Doing Being a Stranger : The Practical Constitution of Civil Inattention" [21]. Those three pieces of work present an enlightening analysis of the little unconscious choreographies of everyday life: phenomena such as crossing a stranger on a narrow sidewalk or riding with others in an elevator. Those analyses are key to understand the whys and wherefores of "civil inattention" and the "practice of strangeness". As Hirschauer states it: "What has to be done for nothing to happen? How do elevator riders accomplish "doing nothing"? How do they accomplish "doing nothing" to each other? And how do they manage to have "nothing to do" with each other?" For example, Goffman describes very specifically the different steps –always identical – happening when two strangers cross on a sidewalk. First, at a certain distance, each protagonist has a "quick but open glance" at the other, then look down (to his phone or the emptiness in front of him). Then, quickly, the glances are raised a second time, right before crossing each other, generally not exchanging eye contact but in a pattern that means "I am not a threat, I wish you are not one either but I do not want to interact". Finally the glances are lowered right at the instant of crossing. The details of the choreography, such as distance and timing of glances, may depend slightly on cultures but are quite immuable and typical of sidewalk interactions. Inside building, in elevators or in stairs the choreography is different but still always involve two dimensions: the dimension of the bodies and the dimension of the gazes. They alleviate each other, as Hirschauer would say: "One needs space for glances because they are the crucial means left to display social distance in extreme physical proximity" [21]. But sometimes body and gaze have to work together and it is the case when people cross each others on stairs. Walking up or down stairs is a challenging locomotor task. When crossing a stranger on a staircase, people need to gaze at each others for a longer time than on sidewalk, and thus increasing the chance of eye contact. Even when the gazes are lowered they are still projected 4 steps ahead of their location instead of right in front of the protagonist [32] which also calls for more proximity in the gaze dimension. We believe that those little details do play a role in terms of positive biased toward strangers and they guided the design of the Passerelle space as a space entirely composed of stairs and designed to generate self-reflection and other-reflection through contemplation.

We were also motivated by research on the influence of spatial environment on cognition. The mnemonic *Method of loci* [**?**] consisting of mentally placing thoughts in real precise known location in a familiar building is known since antiquity and is still used by a lot of memory contest champions. On the other hand it has been shown that walking through doorways might be linked with our brain forgetting things we had remembered [**?**] which let us suppose a cognitive reset, the doors serving as 'event boundaries' in the mind [**?**]. Doors and others architectural objects appears to be an important cognitive object in subconscious parts of our brain affecting us in specific situations but that may be harnessed in the future to create more curated subliminal experiences.

Finally the poetic aspect was important as to create an impact. We envisioned a place that has to be mainly experiences in owe of its grandiosity. By letting the rest of the space empty we keep a total visibility of the space form any standing point, enabling each user to encompass the completeness of this little world and all its inhabitants. The feeling of connection as belonging to the same space is first experienced vieually through the experience of sharing a space. Letting anyone wonder about the unique trajectory

of all the other participants calling for a little cognitive shift, a miniature overview effect [46]. We decided to present the project as an an homage to sky and clouds, a sort of antidote to the Babel tower in which building and climbing high generates discord between humans. In our case, it is not the height of the climbing that matters but the wander and the creation of one's own trajectory of saunter. We envisioned a space where users are invited to reflect on being present, exploring different perspectives, going somewhere as a metaphor and bridging different kinds of banks with other users. Finally, this project also enters in an effort to create experiences to "look up". Most technologies today, from the phone to the computer to the iwatch, require the users to "look down" toward a screen. Instead we are aspiring to create technologies and experiences that invite users to adopt a more straight and uplifting posture inside and outside their bodies.

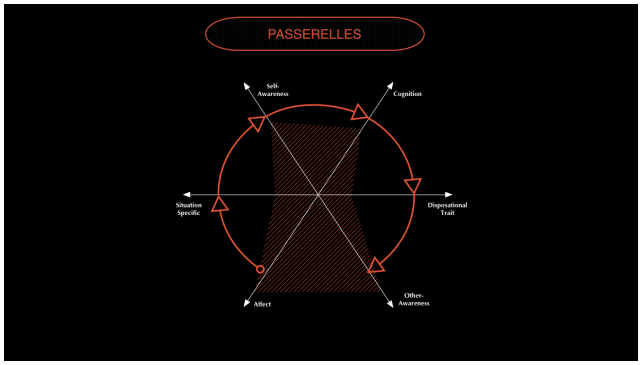

Figure 14: Empathetic footprint of the Passerelles exprerience

4. CONCLUSION

There is the idea of empathy and there is the reality of it. In this work we presented a design language that unpacks the different facets of the word empathy with the goal of making it's reality more effective. To guide artists in the theoretical and practical thinking around empathy, we created a map where they can envision and represent the empathetic footprint of the experiences they create in a comprehensive manner. This map dissociates six different aspects of empathy: visceral aspect; situation specific framing; self-awareness; cognition; expression of a dispositional trait; and other awareness. Such dissociation is important to avoid mistaking a humanistic élan for a a biased visceral burst. Our goal is to create and help anyone create experiences that truly increase the quality and depth of human interaction, and thus betters the individual and societal well being.

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