WHAT ACTUALLY IS AUGMENTED REALITY

Abstract

The answer to the question proposed in the title is complicated because what is meant by reality depends on prior philosophical conceptions. So, to respond rigorously, I should clarify the notion of reality by resorting to the history of philosophy. I shall offer two responses following two distinct philosophical stands. The first is the empiricism of Locke and Newton which I will take into account since although it emerges in the 17th century it somehow extends up to this day and is at the basis of what we mean by reality even today. The other position is the pragmatism of Dewey and Rorty, which openly criticizes the philosophical assumptions of classical empiricism and offers an alternative discourse upon which a new notion of reality is construed. What is real about augmented reality? Nothing, according to empiricism; it is mere appearance. And according to pragmatism the reality we grant it will depend on the problems it allows us to solve. In this paper I will explain both positions.

Keywords: augmented reality, appearance, situation, empiricism, pragmatism, representationalism, holism.

Experience by J. Locke

In 1690 J. Locke publishes *An Essay on Human Understanding*. Book I is a critique of the notions of evidence and certainty on which Descartes had based the new philosophy which had been studied in France for a few decades. In Book II, which is the one we consider central to this work, Locke systematizes his contribution and begins arguing that the starting point of all our knowledge is experience.

Experience consists of the observation of external sensitive objects or of internal operations of the mind. The instance that observes is the mind itself. In the first case it observes objects external to it and in the second case it observes itself. Thus *external and internal experiences* are respectively defined.

> Let us then suppose, the Mind to be, as we say, white Paper, void of all Characters, without any *Ideas*; How comes it to be furnished? Whence comes it by that vast store,

> which the busy and boundless Fancy of Man has painted on it, with an almost endless variety? Whence has it all the materials of Reason and Knowledge? To this I answer, in one word, From *Experience*: In that, all our Knowledge is founded; and from that it ultimately derives itself. Our Observation employ´d either about *external, sensible Objects; or about the internal Operations of our Minds, perceived and reflected on by our selves, is that, which supplies our Understandings with all the materials of thinking*. These two are the Fountains of Knowledge, from whence all the *Ideas* we have, or can naturally have, do spring[1].

It follows then that the notion of experience that Locke envisages assumes the acceptance of 1) an *instance* that is the mind, which is treated as "white Paper, void of all Characters"; 2) another instance beyond the mind which could be called extra-mental reality and which is formed by material objects; and 3) a cognitive relationship between the mind and the extra-mental reality. Points 1) and 2) place Locke's philosophy upon an ontological dualism, and 3) a cognitive relationship is understood as an epistemological representationalism that depends on a complex physical process:

> First, *Our Senses*, conversant about particular sensible Objects, do *convey into the Mind*, several distinct *Perceptions* of things, according to those various ways, wherein those Objects do affect them: And thus we come by those *Ideas*, we have of *Yellow, White, Heat, Cold, Soft, Hard, Bitter, Sweet*, and all those which we call sensible qualities, which when I say the senses convey into the mind, I mean, they from external Objects convey into the mind what produces there those *Perceptions*[2].

The process begins by some senses being affected by external sensitive objects, which transmit to the mind not strictly "*Perceptions* of things , according to those various ways, wherein those Objects do affect them" but "they from external Objects convey into the mind what produces there those *Perceptions*". And what is "what produces there those Perceptions"? The cause is not the qualities of the bodies because "qualities … in Bodies are, First such as are utterly inseparable from the Body, in what estate soever it be"[3]; the cause is the affections that the qualities of the bodies produce on the senses. These are the affections which are transmitted to the mind and produce ideas in it. This explanation raises the following questions:

1) How do the qualities of bodies affect our senses?

2) How are the affections transmitted?

3) Understanding that affections are transmitted to the brain, how are they transmitted from the brain to the mind? Because we should bear in mind that the senses are material, the affections of the senses are material, the brain is material, but the mind is not material, but mental. Therefore, how are the affections transmitted from the material environment to the mental environment?

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[1] Locke 1991, 104.
[2] *Ibid.*, 105.
[3] *Ibid.*, 134.

4) Placed in the mental realm, how do affections – now mental – produce ideas?

All these questions remain unresolved in the *Essay*. In fact, in the introduction to Book I Locke had already warned that they would be left unanswered. Thus he says:

> I shall not at present meddle with the Physical Consideration of the Mind; or trouble my self to examine, wherein its Essence consists, or by what Motions of our Spirits, or Alterations of our Bodies, we come to have any Sensation by our Organs, or any *Ideas* in our Understandings; and whether those *Ideas* do in their Formation, any, or all of them, depend on Matter, or no. These are Speculations, which, however curious and entertaining, I shall decline, as lying out of my Way, in the Design I am now upon[4].

Although Locke has medical studies he does not want to enter into physical or physiological considerations. He just attempts to investigate "the Original, Certainty, and Extent of humane Knowledge; together, with the Grounds and Degrees of Belief, Opinion, and Assent"[5]. And to that end he will use what he calls "this Historical, plain Method", which consists of studying exclusively the ideas of things that we have in the mind[6]. This is so stated in the introduction to Book I, but at the beginning of Chapter I of Book II we can read:

> I suppose, what I have said in the fore-going Book, will be much more easily admitted, when I have shewn, whence the Understanding may get all the *Ideas* it has, and by what ways and degrees they may come into the Mind …[7]

Therefore, he does not want to enter into physical or physiological considerations but he finally does, although in such a lax manner that he leaves unanswered the all-important referred questions. On such physical and physiological considerations are raised ontological dualism, epistemological representationalism and, for what concerns us the most here, a certain notion of reality that has survived to this day.

Before going any further, let us go back to the main thesis of Book II of the *Essay*. The mind has knowledge of itself to the extent it becomes aware that it thinks and of what it thinks, that is, of the ideas. It becomes aware of its own operations, such as "*Thinking, Doubting, Believing, Reasoning, Knowing,* Willing"[8], and also of the objects of these operations, which are the ideas. Interestingly, Locke asserts that the mind knows the ideas as ideas, that is, as signs or representations of objects external to the mind itself. The ideas expressed, for example, by the words "*Whiteness*, *Hardness*, *Sweetness*, *Thinking*, *Motion*, *Man*, *Elephant*, *Army*, *Drunkenness*, and others" [9], appear as

[4] *Ibid.,* 43.
[5] *Ibid*.
[6] *Ibid.,* 43-44.
[7] *Ibid.,* 104.
[8] *Ibid.,* 105.
[9] *Ibid.,* 104.

representations and, to that extent, carry the news of the existence of something extra-mental which is mentally represented by them. This is so, says Locke at the beginning of Book II, and on this there is no possible doubt.

It is clear then that knowing is not like digesting food, that is, it does not consist of the introduction of external objects into the mind in the same way that food is introduced into the stomach, but in the emergence of ideas in the mind. To the question of how ideas arise, neither Locke nor anyone else has responded, in my opinion.

Simple and complex Ideas

Ideas can also be divided into simple and complex. Simple ideas are the materials of all our knowledge and are characterized by the fact that the mind can neither make them nor destroy them. In other words, the mind proves itself totally passive at receiving them.

> These simple *Ideas*, the Materials of all our Knowledge, are suggested and furnished to the Mind, only by those two ways above mentioned, *viz*. *Sensation and Reflection*. When the Understanding is once stored with these simple *Ideas*, it has the Power to repeat, compare, and unite them even to an almost infinite Variety, and so can make at Pleasure new complex *Ideas*. But it is not in the Power of the most exalted Wit, or enlarged Understanding, by any quickness or variety of Thought, to *invent or frame one new simple* Idea in the mind, not taken in by the ways before mentioned: nor can any force of the Understanding, *destroy* those that are there[10].

The examples of simple ideas that Locke himself provides are motion and color; softness and warmth in the same piece of wax; the coldness and hardness, which a man feels in a piece of ice; the smell and whiteness of a Lily; the taste of sugar and the smell of a Rose[11].

Complex ideas are formed by the mind through three of its own actions and using simple ideas as materials. These actions through which the mind exercises its power over simple ideas are combination, relationship and abstraction.

> 1. Combining several simple *Ideas* into one compound one, and thus all Complex *Ideas* are made. 2. The *2d.* is bringing two *Ideas*, whether simple or complex, together; and setting them by one another, so as to take a view of them at once, without uniting them into one; by which way it gets all its *Ideas* of Relations. 3. The *3d*. is separating them from all other *Ideas* that accompany them in their real existence; this is called *Abstraction*: And thus all its General *Ideas* are made[12].

Locke enters into physical considerations of the mind because he understands that to attain the objectives of the *Essay* required a prior response to the question of whether

[10] *Ibid.,* 119-120.
[11] *Ibid.,* 119.
[12] *Ibid*., 163.

ideas faithfully represent what exists in extra-mental reality. Since "*In this faculty of repeating and joining together its* Ideas*, the Mind has great power in varying and multiplying the Objects of its Thoughts, infinitely beyond what* Sensation *or* Reflection *funishedit whit*"[13], although complex ideas be justified both in the experience as well as in mental processes and not be mere arbitrary products, we cannot assure that what is represented by them should exist in the extra-mental reality. However, the absolute passivity the mind shows on reception of simple ideas could lead us to conclude that what is represented does exist in the extra-mental reality, in the same way that there is a seal which is represented by the impression on wax. Locke affirms that this way of thinking is common but cannot be maintained.

> …that so we *may not* think (as perhaps usually is done) that they [our Ideas] are exactly the Images and *Resemblances* of something inherent in the subject; most of those of Sensation being in the Mind no more the likeness of something existing without us …[14]

The argument he gives in order to understand that not all simple ideas are representations of something extra-mental, which he calls *Quality*[15], is the famous argument of the grain of wheat that we divide and whose resulting parts we divide again up to a point where the parts cannot be perceived[16].Wheat had at the beginning a certain color, maybe a certain flavor, a certain smell, a certain strength, a certain shape, etc. Mistakenly we can understand that color, taste, etc., are qualities of the body; strictly we should say that they are simple ideas in our mind. The continued division of the grain makes us stop having the simple ideas of color, taste, smell, etc., but although the division continued further we would all have and will always have the ideas of strength, size, shape, movement, rest and number. How can we speak of strength, size, shape, etc., in the wheat powder? It would be a question of putting the wheat powder in a plunger, for example, to test its strength, size, shape, etc. At this point the issue is: why the continued division of the wheat grain into powder makes us stop having the ideas of color, taste, smell, etc., but cannot stop us from having the ideas of strength, size, shape, etc.? Locke's answer is that this happens because color, taste, smell, etc., are merely ideas in our mind and do not represent any quality of the extra-mental reality; instead, what is always maintained for everybody is the strength, size, shape, etc., because they are ideas that represent qualities which are always kept and strictly define the extra-mental reality.

The argument used by Locke is that the presence, under any changes or physical transformation, always and for all observers, of the ideas of strength, size, etc., makes us conclude that such ideas are not generated by the mind but that the mind behaves with absolute passivity before the extra-mental and permanent presence of the qualities of strength, size, shape, motion, rest and number, which he calls *primary qualities*. So that "the *Ideas of primary Qualities* of Bodies, are *Resemblances* of them, and their Patterns

[13] *Ibid*., 164.
[14] *Ibid*., 134.
[15] *Ibid*.
[16] *Ibid*., 134-135.

do really exist in the Bodies themselves"[17]. However, the fact that the changes and physical transformations make the ideas of color, flavor, etc., modify or even disappear, being the mind, as it is, passive in receiving such simple ideas, leads us to conclude that what is referred to by those ideas, called *secondary Qualities* by Locke, "are nothing in the Objects themselves"[18]. In short, the ideas of color, flavor, etc. are generated by the mind of the observers from the sensations produced by the primary qualities, but in the extra-mental reality there are no colors, flavors, sounds, etc.

Locke's argument is also used by Newton in the *Optics*. However, it can only be held on two assumptions that neither Newton nor Locke questioned. The first is that under any change or physical transformation it is always possible to experience the strength, size, shape, etc. of bodies. Experimentation can make us have to resort to a much more sophisticated instrument than a plunger, but it is assumed that with the appropriate tool the experience of the primary qualities of matter will always be possible. The second assumption is that the repeated permanence and for all observers of the simple ideas of primary qualities is only possible by the constant action of the primary qualities belonging to the extra-mental reality. But we could also assume, as Bishop Berkeley does, that such repeated presence is also possible by the action on our mind of a more powerful mind than ours.

The conception of reality in modernity

The most important thing is to understand that in this way a certain notion of reality is defined in the 17th century. The material reality that exists beyond our minds and our ideas consists of solid atoms, i.e. impenetrable, which have - precisely because they are impenetrable - a certain size and a certain shape and move and rest in space and time. The aforementioned idea of number refers to the existence of atomic units in all aspects but distinguishable by their spatial and/or temporal determination.

Newton refers very clearly to this conception of material reality in the following fragment of the *Optics*[19]:

> All these things being consider'd, it seems probable to me, that God in the Beginning form'd Matter in solid, massy, hard, impenetrable, moveable Particles, of such Sizes and Figures, and with such other Properties, and in such Proportion to Space, as most conduced to the End for which he form'd them; and that these primitive Particles being Solids, are incomparably harder than any porous Bodies compounded of them; even so very hard, as never to wear or break in pieces; no ordinary Power being able to divide what God himself made one in the first Creation. While the Particles continue entire, they may compose Bodies of one and the same Nature and Texture in all Ages: But should

[17] *Ibid.*, 137.
[18] *Ibid.*, 135.
[19] Newton 1779, 260.

> they wear away, or break in pieces, the Nature of Things depending on them, would be changed. Water and Earth, composed of old worn Particles and Fragments of Particles, would not be of the same Nature and Texture now, with Water and Earth composed of entire Particles in the Beginning. And therefore, that Nature may be lasting, the Changes of corporeal Things are to be placed only in the various Separations and new Associations and Motions of these permanent Particles; compound Bodies being apt to break, not in the midst of solid Particles, but where those Particles are laid together, and only touch in a few Points.

In view of this, what can we say about augmented reality? The answer is that augmented reality is only an appearance generated in the mind from certain physical activities of material reality that affect the senses not directly, but by means of a technical device (e.g., a smartphone, a Google Glass, an Oculus Rift, a Google Cardboard, etc.). The most amazing thing about the conception of reality that emerges nowadays is that it requires that the reality lived in the spontaneity of our daily life also be regarded as mere appearance. It is mere appearance generated in my mind the table on which I write, the computer I have in front of me, my hands resting on the keyboard or the trees I see through the window. Locke and Newton have convinced us that the material reality that creates all those complex ideas is just a set of atoms more or less stabilized in space and time by the action of given inertial and gravitational forces.

Then the question arises as to what is the difference between augmented reality and the reality of our daily lives? It may be that our everyday life was just a case of augmented reality. The movie *The Matrix*, directed by the Wachowski Brothers and released in 1999, describes daily life as a merely mental product generated by certain machines and certain software. We find a similar plot in movies like *Level 13*, by Josef Rusnak, released in 1999, and *Dark City*, by Alex Proyas, released in 1998. On the other hand, it could also happen that augmented reality was so incorporated into our daily lives that we completely lost awareness of its specificity. That is what happens when we wear glasses or introduce contact lenses into our eyes. It also happens when we use a microscope or a telescope. But in any case it is possible to recognize, if not directly, at least reflexively, the specificity of augmented reality. And this is because a mediation of a technical device is required between the material reality and our senses. We understand, however, that we are assuming the previous distinction between the natural and the artificial, and that such distinction appears increasingly diluted. If technological development made it impossible, augmented reality would simply become everyday reality. In any case, from our present day view, one and the other would convey an appearance generated within the limits of our mind from the action of extra-mental material reality.

Critique of modernity

In the Introduction to *Philosophy and the Mirror of Nature* Rorty points out that the conception of the world and reality of Locke and Newton has been maintained in one way or another until the 20th century , specifically up to the entry into the philosophical scene of Dewey, Wittgenstein and Heidegger.

> Wittgenstein, Heidegger, and Dewey are in agreement that the notion of knowledge as accurate representation, made possible by special mental processes, and intelligible through a general theory of representation, needs to be abandoned. For all three, the notions of "foundations of knowledge" and of philosophy as revolving around the Cartesian attempt to answer the epistemological skeptic are set aside. Further, they set aside the notion of "the mind" common to Descartes, Locke and Kant –as a special subject of study, located in inner space, containing elements or processes which make knowledge possible[20].

Rorty resorts to these authors to abandon the ontological dualism and epistemological representationalism of modernity and defend a behaviorist and materialistically oriented philosophy[21]:

> Discussion in the philosophy of mind usually start off by assuming that everybody has always known how to divide the world into the mental and the physical –that this distinction is common-sensical and intuitive, even if that between two sorts of "stuff", material and immaterial, is philosophical and baffling. So when Ryle suggests that to talk of mental entities is to talk of dispositions to behave, or when Smart suggests that it is to talk of neural states, they have two strikes against them. For why, if anything like behaviorism or materialism is true, should there be anything like this intuitive distinction?[22]

This post-modern and pragmatic philosophy brings in a new conception of reality. I want to account for it following Rorty's orientation and the references he makes to Dewey. From the pragmatic conception of reality that Dewey and Rorty propose I will try to understand augmented reality.

Notion of experience in Dewey's philosophy

In the article entitled *"The Reflex Arc Concept in Psychology"* Dewey criticizes the distinction proposed by Locke between mind and material reality for the consequences it has had for psychology[23]. Such dualism has allowed us to distinguish between two units, stimulus and response, and explain their connection from the repetition of the concurrence of both. Dewey analyzes the behavior of a child in front of a candle to conclude that such

[20] Rorty 1979, 6.
[21] *Ibid.*, 379.
[22] *Ibid.*, 17.
[23] Dewey 1972, 96-109.

units cannot be maintained and that the starting point to be taken by psychology is the coordination between organism and environment[24].

Experience is to be understood as the interaction between an organism and an environment. But not in the sense that we usually say that an organism lives in an environment, assuming that both of them are already existent prior to the vital relationship established between them. Rather, it should be considered that the organism lives in virtue of the environment and that this stops being something indifferent and it becomes the environment of the organism inasmuch as being part of its vital functions. Thus, the environment of a locomotive animal differs from that of a sedentary plant because the land becomes part of their respective activities in a different way; the environment of a jellyfish differs from that of a fish because the water enters their bodily functions differently, etc. The organism and the environment are mutually defined through the vital relationship established between them[25]. We may think that there is an independent nature of the organism, but this is environment only when it takes part of the organism's vital functions. And we can also think that organisms are part of nature; but they exist as organisms only when they are actively connected with the environment around them[26].

The complex system of interactions between organism and environment can be balanced. When this is the case Dewey insists that there is, in objective terms, *a unified environment*[27]. Changes in the organism maintain their uniform integration in the environment, every activity paves the way for the next and all of them manage to occur not only in succession but also forming a well basted series.

However the balance can be broken, which happens when an excess or a defect appear in a given factor. In this case the need arises in the organism to recover the lost state and it starts making the necessary efforts to this end. Dewey calls *need* the state of disturbed equilibrium. The activity aimed to restore the balance is called *search and exploration*. The recovery of the balance is called *fulfillment or satisfaction.*

> The state of disturbed equilibration constitutes *need*. The movement towards its restoration is search and exploration. The recovery is fulfilment or satisfaction[28].

Hunger, for example, is a state of imbalance. Various organic functions such as the digestive, circulatory, motor, etc. are no longer coordinated. At that time a real state arises (which is not mere sensation, insists Dewey) of unease, anxiety, necessity[29]. From this moment the organism develops behaviors, such as lengthening limbs, opening the mouth, etc., designed to meet the need. Attaining this achievement allows the restoration of the

[24] Shook 2000, 111-113.
[25] Dewey 1988a, 32.
[26] *Ibid.,* 40.
[27] *Ibid.,* 32-33.
[28] *Ibid.,* 34.
[29] *Ibid.*

state of balance, that is, the restoration of coordination between functions. When this is the case we say that the organism has given an adapted total response.

The efforts made by the organism to regain balance generate changes in the environment and at the same time, new environmental conditions involve a modified state of the organism. It is particularly true in the case of humans that activities carried out in order to meet their needs transform the environment, which creates new needs, which can only be met through changes in human activities, which in turn transform the environment, and so on and so forth.

The most important change that occurs in the organism is the conditioning of the subsequent behavior, i.e., the emergence of *habits*[30]. Habit is the ability to repeat a certain behavior and it arises, according to Dewey, as the result of overcoming the state of necessity and the attainment of fulfilment or satisfaction. It is the satisfaction of the need which creates in the organisms an organic rearrangement that leads them to act similarly in similar conditions. The habit is not, in the case of higher organisms, completely rigid but the response operates with some flexibility regarding both the organism's actions as well as the environmental conditions. The habit does not arise therefore by a mere repetition but repetition is the result of a habit.

The situation

Dewey insists that our experience is not of isolated objects or events, but always of objects given in a context that is physical, biological and cultural. An object or event is a part in connection with the surrounding environment, which Dewey calls the *situation.* Sometimes, looking for certain purposes, it is possible to put the object in the foreground of attention and take it away from the complex environment that surrounds it, which is then blurred and relegated to the background. But this can be done because the experience is beforehand that of an object given in a contextual whole.

When the system of interactions between the organism and the environment is no longer in balance, that is, when the environment is no longer unified and each activity no longer paves the way to the next, then the doubt arises. In order to defend a radical empiricism Dewey affirms that it is the situation in which we are trapped and involved which is presented as being inherently dubious. In *Inquiry into Meaning and Truth*, the title of the publication of the William James Lectures that Russell taught at Harvard in 1940, he insists that you cannot believe that Dewey has ever meant there may be a doubtful situation without a personal doubter[31]. To get Russell out of his astonishment,

[30] *Ibid.*, 39.
[31] Russell 1940, 407.

or perhaps to amaze him even more, in the article *"Propositions, Warranted Assertibility and Truth"* published in 1941, three years after the *Logic*, Dewey writes:[32]

> When the term "doubtful situation" is taken in the meaning it possesses in the context of my general theory of experience, I do mean to say that it can exist without a personal doubter; and, moreover, that "personal states of doubt that are not evoked by, and are not relative to, some existential situation are pathological; when they are extreme they constitute the mania of doubting… The habit of disposing of the doubtful as if it belonged only to us rather than to the existential situation in which we are caught and implicated is an inheritance from subjectivistic psychology".

It is the situation itself which appears as being inherently doubtful, and that is why we are doubtful. Dewey also speaks of a situation which is indeterminate, unstable, troubled, complicated, ambiguous, confusing, full of conflicting tendencies, dark, painful, etc.[33]

The inquiry

Both in the case of ordinary knowledge as in the case of scientific knowledge Dewey defines inquiry as follows[34]:

> Inquiry is the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole.

The starting point of the inquiry is an indeterminate, disturbed, unstable, uncertain situation. It is, in the first place, a situation that is objectively doubtful, that is, which itself is presented as having these traits. Given the correlation between organism and environment in the situation we can say that just because the situation is presented as being inherently doubtful we find ourselves doubtful. On the other hand, the same objectivity of the doubtful situation warrants its inter-subjectivity, i.e., the fact that the doubt is ours and of any organism living through it for finding itself in that given situation.

To account for the doubt as if it belonged to subjectivity and not to the situation itself is a legacy from the ontological dualism proposed by the subjectivist psychology of Lockean origin. This dualism explains the doubt from the existence of a material reality completely determined in its properties and relationships and of a mental reality that has an indeterminate knowledge of the material reality. Thus, from this point of view it is attributed to doubt a fully subjective character. Dewey resorts even to the interpretation of Copenhagen of Quantum Mechanics to explain that dualism cannot be maintained and that the indeterminacy belongs not to the knowledge of material reality, but to material

[32] Dewey 1988b, 184-185.
[33] Dewey 1988a, 109.
[34] *Ibid.*, 108.

reality itself[35]. Therefore, it would be a mistake, a flight from reality, to try to get out of the doubt by simple manipulation of our mental states. Doubt is resolved by facing the situation and carrying out the necessary operations to change the existing conditions and restore the lost functional balance between organism and environment.[36]

Secondly, doubt is not a general uncertainty, it does not affect the whole of life, but it belongs to a particular situation, which acquires special relevance on a vital horizon which is not questioned at this point.

Thirdly, it is the single and concrete doubt that exercises control over the necessary operations to get out of it. Not any solution is valid nor are there available beforehand some definitive criteria to determine a solution, but it is the concrete doubtful situation which provides the criteria and guide the operations leading to the restoration of the integrated situation.

Any action of the organism in the doubtful situation cannot be classified as inquiry. This requires both in ordinary knowledge as in scientific knowledge, a review of the environmental conditions, an anticipation of the consequences and a selection and ordering of the actions with respect to the specific features of the situation.

The doubtful situation is given; we come across it regardless of our will. At first what appears to us is an indeterminate situation characterized by the fact that, to our regret, there is an interruption in the events of life, in the fluid flow of the organisms' activities in their environment. There is nothing cognitive or intellectual at this time; we could say that the situation is precognitive[37].

The transformation of the indeterminate situation into a problematic one requires the implementation of the inquiry to achieve a minimum of determination in the situation. Such determination becomes all important because "without a problem there is only groping in the dark"[38]. On the problematic situation will depend what is considered relevant and what is discarded as irrelevant and so will the selected data, the hypotheses or the suggested conceptual structures. Therefore to accept as a starting point for the inquiry an issue that does not belong to the given problematic situation renders the data, the hypotheses and the structure of the inquiry completely arbitrary.

The definition of the problem is not possible in an absolute indeterminacy, but it requires finding in the undetermined situation those constituent parts or contained ingredients *(constituents)* which are determined. These are taken as the constant factors of the particular situation. Its knowledge is obtained by observation. Dewey calls them

[35] *Ibid.,* 110.
[36] *Ibid*.
[37] *Ibid.,* 111.
[38] *Ibid*.

the facts of the case[39]. They are the terms in which it is possible to formulate the problem and the conditions that must be taken into account when proposing any solution. That is why we say that the problem incorporates its solution.

One possible solution is then suggested by the facts of the case warranted by observation. The solution is presented as an *idea*, and is presented in the same way as the facts of the case are presented to observation. In Dewey's words[40]:

> A *possible* relevant solution is then suggested by the determination of factual conditions which are secured by observation. The possible solution presents itself, therefore, as an *idea*, just as the terms of the problem (which are facts) are instituted by observation.

The idea is not a representation in the Lockean sense, it is an anticipation of what can happen; it indicates a possibility referred to the resolution of the problematic situation. For this reason it is said that science is *predictive*[41]. Since the idea indicates a possibility, its value is checked experimentally, that is, it must be put into practice, it must be put to work. This means bringing to light facts previously unobserved, called by Dewey *trial facts*[42], comparing them with the facts of the case and checking whether the idea allows for the interpretation and organization of all the facts into a coherent whole.

Since ideas point to something that is not present and existing here and now, they can be regarded as symbols that mean the non-present facts. A hypothesis is a symbol consisting of a general statement. Its meaning can be immediately relevant to the resolution of the problem. But it can also happen that such immediacy is not given and that it should be necessary to relate it to other intermediate meanings until the relevant meaning sought is reached. This is what is done when, through *reasoning*, ideas are put in relation with one another[43].

If finally the solution sought is not achieved we are forced either to change the ideas although keeping the facts of the case, or to change the facts of the case by changing the ideas accordingly, or, ultimately, to change the ways of reasoning. The validity of the facts, the ideas and the reasoning lies exclusively in the operational force to resolve the problematic situation.

On considering ideas as suggestions they seem to be reduced to mere mental constructs separate in principle from the scope of observation. In this case it should be explained, perhaps psychologically, how certain facts suggest certain ideas, and it should be explained, perhaps logically, why certain ideas, and not others, are solutions. The possibilities offered by reasoning should also be explained, that is, the fact that certain

[39] *Ibid.,* 113.
[40] *Ibid*.
[41] *Ibid*.
[42] *Ibid.,* 117.
[43] *Ibid.,* 115.

relationships between ideas allow for ideas that finally solve the problem. It is known that Kant's solution, presented by himself as the overcoming of rationalism and empiricism, resorts to the action of synthetic understanding to explain the relationship between the scope of sensitivity and the scope of understanding.

Dewey's solution diverges from the previous ones when considering that ideas as well as the facts of the case are operational[44]. Ideas are operational because their content is a set of proposals and plans to act on the given situation in order to bring new facts to light. The facts of the case are operational because, unlike empiricism's assertions they are not determined units themselves, accessible through observation without any modification; they become relevant, they are selected and described in terms of the operational force they show to solve the given problematic situation. They are shown and backed, ultimately, when together with the suggested ideas they enable the exit from the problem situation and restore the fluid interaction with the environment. The operational nature leads Dewey to assert that the distinction between ideas and facts merely responds to a functional division of the inquiry work[45].

The described inquiry pattern is similar in both ordinary knowledge and scientific knowledge. The difference between them lies in the different subjects discussed and the various special techniques applied. The problematic situations with which common sense is faced have to do with activities of individual or collective use and enjoyment. The use and the enjoyment are the ways in which humans are directly related to the world around them. For the use and enjoyment, practical activities are carried out, such as living expenses, housing, defense, protection, etc., and objects such as planets or stars are of interest to the extent that they are connected with such practical activities. On the other hand, in the inquiry into common sense, those symbols contained in common language are used, which group members often employ to communicate with each other; and these symbols keep a direct reference to use and enjoyment activities.

Science is characterized for keeping an uninterested intellectual concern for matters of use and enjoyment. The problematic situation science faces has to do with objects that are not directly defined by activities of use and enjoyment, but by relationships. Therein lies its abstract and general nature[46]. Scientific objects are strictly relational. The development of science has made us aware of this, as there has been a gradual interpretation of tertiary, secondary and primary qualities in terms of relationships.[47] Accordingly, the language of science cannot be that of common sense, but it consists of a sign system that allows for the explanation of these relations from the connections that the signs establish with each other.

[44] *Ibid.,* 116.
[45] *Ibid*.
[46] *Ibid.,* 120.
[47] *Ibid.,* 119-120.

But with regard to the issue of objectivity the most important thing is that the solutions provided by the inquiry carried out both in ordinary knowledge and in scientific knowledge be solutions that organisms give themselves when, wanting to avoid pain and suffering, they select new data and new conceptual structures. Much of modern philosophy has attributed to pain a purely subjective nature and to the resulting inquiry, a remote utilitarian nature far from the standards required by objective knowledge. Dewey brings to light the ontological dualism that underlies this position and replaces it with an anti-dualism [48] which claims as its starting point the correlation of organism and environment in the situation. Pain, doubt or problem thus acquire an objective character and become the criterion that guides the inquiry. And also the selected data and the conceptual structures that configure the solution acquire an objective character to the extent that their operational force should be able to transform the situation which, having been doubtful or problematic so far, now becomes fluid. The donation or imposition of the problematic situation warrants, in turn, the intersubjective character of the solution, that is, the fact that the solution, even when depending on the organism, not be so, exclusively, for this organism but for any other in the same situation.

Centers of descriptive gravity

All this discussion underlies Rorty's considerations around reality, which will serve us to understand what augmented reality is. To account for Rorty's proposal I will begin by Chapter IV of *Truth and Progress. Philosophical Papers, vol. 3* entitled "Charles Taylor on Truth" and will continue in Chapter V, entitled "Daniel Dennett on Intrinsicality".

To defend with Dewey that the validity of the facts, ideas and reasoning that are defined in a specific description of the world lies exclusively in the operational force to resolve a problematic situation leads to abandon what Rorty calls "the third dogma of empiricism, the distinction between scheme and content"[49]. This distinction refers to the existence of a world of things quite apart from how we describe it, that is, it refers to the "purportedly noncontroversial idea that things have intrinsic, non-description-relative features"[50]. Only abandoning this idea completely can we come to understand that the traits and relationships in the world, even causal relationships, arise precisely from within the descriptions we make. Therefore, we cannot say that the solar system was still, there, awaiting the arrival of Kepler, but rather that Kepler provides a re-description of the Copernican description and that Copernicus provides a re-description of the Ptolemaic description[51].

[48] Shook 2000, 180-184.
[49] Rorty 1998, 87.
[50] *Ibid.*
[51] *Ibid.*, 89-90.

You can defend the thesis that there are inherent traits in things if previously we defend the thesis that some descriptions made with some vocabularies manage to faithfully represent reality. If we defend, for example, that the vocabulary used by Newton allows a description that accurately represents reality while the vocabulary used by Aristotle fails to do so. We then say that the Newtonian description represents reality more accurately than the Aristotelian description thus assuming deep down a sort of linguistic representationalism. The question is whether such a statement makes sense, and Rorty thinks not[52]. He thinks not because he understands that the limits of language are the limits of the world and because he understands that what cannot be said cannot be thought. This philosophical position is identified with holism[53].

Holists cannot speak of a reality formed by intrinsic features metaphysically understood as "property whose presence is necessary for the object being the object it is"[54]. The reality of objects, as Locke says, does not consist in a set of necessary properties "for the object's self-identity, a self-identity it possesses apart from any particular description of it by us"[55], simply because outside description there are no objects. In short, Rorty says, "we must insist that *identity* is always identity under a description"[56].

Consequently the objects must be considered as *centers of descriptive gravity*[57]. With this expression it is meant that they are woven and rewoven by the descriptions we make and the languages we use, so that a change in the description entails a change in the objects because the descriptive gravity shifts, and new centers are generated. Rorty puts it as follows:

> Like heroines whose stories are told by novelists, and selves whose self-consciousness about their own past character results in the acquisition of a quite different future, objects change as our descriptions of them change. That is to say, their center of descriptive gravity shifts as inquiry proceeds[58].

There is, in short, no intrinsic character to grasp in the objects, no primary quality that defines their true reality beyond appearance. Objects are what they are in terms of the relationships they establish with other objects, and all this is evident and takes place in language. This leads us to abandon the distinction that Locke and modernity made between appearance and reality. There is no reality beyond the relations that appear in language. The reality of objects consists precisely in their appearing.

What is relevant

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[52] *Ibid.,* 86.
[53] *Ibid.,* 100-101.
[54] *Ibid.,* 103.
[55] *Ibid.*
[56] *Ibid.*
[57] *Ibid.,* 105.
[58] *Ibid.*

At this point it is inevitable to wonder whether they are real, to the same extent, the table on which I write, Sherlock Holmes, Middle-Earth, number 17, the rules of chess, the clause on interstellar trade in the United States' Constitution and the lost socks of Daniel Dennett. We can ask the question in an even more provocative way: do witches and atoms have the same reality? I am tempted to say yes, but Rorty's answer is much more nuanced:

> If we drop such representationalist notions as "appearance" and "making true", then we can let numbers and tables, quarks and stars, lost socks and moral values share the same "objective" status. The interesting differences among them will be those made by our (often fluctuating) notions of what is relevant and irrelevant to the truth of beliefs about each different sort of object. These notions will not be responsible to something called "the intrinsic character of the object in question", but only to the ordinary process of reweaving our webs of belief and desire, often in unpredictable ways (as when we begin to think of Riemann's axioms as relevant to interstellar distances or of the origin of the human species as irrelevant to moral values)[59].

The ontological status we assign to socks, atoms or numbers has nothing to do with their intrinsic features but with the importance we give them in the discourses they appear. They are the networks of beliefs and desires that weave those centers of descriptive gravity defining in turn the determinations that constitute them and their sense of reality. And certainly the centers of descriptive gravity are rewoven as our networks of beliefs and available discourses change.

In any case, the question we asked above can be rephrased: what is it that makes our beliefs and our discourses change, and consequently the objects and their sense of reality? Convergentism explains these changes in terms of an ongoing process that is guided by the discovery of the intrinsic features of things. The process is progressive to the extent that every time we are closer to the full recognition of such features and, consequently, our discourses are increasingly closer to the truth. As Rivadulla noted, Peirce is a convergentist to the extent that he defines truth and reality in terms of "the end of the inquiry" and Popper is so too because he "maintains that what characterizes science as a rational endeavor is its growing convergence to truth"[60]. As can be expected, Rorty's criticism to epistemological and linguistic representationalism leads him to criticize convergentism[61].

Rorty finds the answer to the question in Dewey when he says that philosophers should abandon the notion of truth and confine ourselves to the *warranted assertibility*[62]. That is, we defend some beliefs and some discourses not because they are true but because they have shown the operational force to solve the problematic situations we face, as we explained above. However, as situations change, it may happen that the discourses that

[59] *Ibid*., 106-107.
[60] Rivadulla 2015, 30-31.
[61] Rorty 2000, 5, 12.
[62] *Ibid.*, 1-2.

once provided solutions no longer provide them, creating even more problems than solutions. In such case there will appear objections to our beliefs, giving rise to situations of doubt, uncertainty, irritation, pain, which we could only overcome by starting a new process that through new vocabularies and discourses, could give rise to new centers of descriptive gravity allowing us to recover the warranted assertibility.

Perhaps it may seem that in all of this there is a remnant of idealism. "For this may seem to entail not saying that objects change not by being battered or moved about or discolored by other objects, but only by our changing our descriptions of them. Further, the suggestion that they change in the latter may seem to go against our intuition that *objects exist independently of thought*, the intuition the idealists tried to put in question"[63]. However, it is not possible to maintain idealism if we take Dewey seriously when he says that warranted assertibility is not something that happens in subjectivity but in an objective situation.

Reality in a pragmatic sense

Let us go back to the question we attempt to answer in this work: What is real about augmented reality? From the standpoint of empiricism, nothing Augmented reality is a mere appearance generated in our minds by the action on our senses of a material reality consisting of solid and extensive atoms moving in space and time. But from the viewpoint of empiricism, the reality that appears in our daily experience is also mere mental appearance generated in the same way. The question then is: How to distinguish between everyday reality and augmented reality? And the answer we gave is that this will be possible while we be able to distinguish between the affections directly produced on our senses and those produced through the mediation of a technical device. If technology were incorporated into our senses in such a way that this distinction would be made impossible, which is already the case, then we would not be able to separate everyday reality from augmented reality.

Analyzing the critique of pragmatism to empiricism we realize that this position is maintained on an ontological dualism, an epistemological representationalism and a linguistic representationalism. Dewey avoids ontological dualism and epistemological representationalism understanding the experience as a complex system of interactions between organism and environment that results in a determined or undetermined situation, and assuming that organisms flee from indeterminate, problematic, confusing, painful, etc. situations. On the work of Dewey, Rorty avoids linguistic representationalism as he defends holism. The result is a notion of reality that is not characteristically based on the existence of intrinsic features in things like primary qualities (strength, size, shape, motion, rest and number), but in terms of the definition in a given vocabulary and in a given discourse on centers of descriptive gravity. The reality

[63] Rorty 1998, 109.

attributed to the centers of descriptive gravity depends on the relevance they acquire in the discourse that constitutes them, and the relevance is related to the operational force they show to solve the given problematic situations.

From a pragmatist view, what is real about augmented reality? The answer to the question is not about the direct or indirect action on our senses of an alleged material reality, nor about the fact that we can determine the mediation of a technological device between material reality and our senses. The question now has to do with the importance we attach in our discourse to the centers of gravity we define. And the relevance is given in terms of the concrete practical operations that result from our discourses.

Let us give an example. We have the discourse by which we consider as real the landforms we see on other planets through a telescope. That discourse has a high degree of sophistication and has to do with the discourse of physics, optics and astronomy. They allow us to determine what we see as a landform, and such a consideration allows us in turn to solve certain specific practical problems that have to do with the science of our time, but also with our daily lives. Because on them depends the setting of satellites into orbit, our tracking and communication systems, etc. However, the scholastics who managed to open the trial against Galileo understood that what he was watching through his telescope were not landforms, but mere optical appearances generated by the instrument lenses. This was the discourse required by the physics and the ontology of Aristotle, which obviously did not have to face the problem of putting a satellite into orbit, but others of a very different nature.

Will the time come when we say that the reality we see with the Oculus Rift is as real as the one we see with a telescope? It all depends on the problems we could solve through such a discourse. But I bet that, shortly, to say otherwise will pose us more problems than solutions.

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