

CRITIQUE OF BERKELEY’S THEORY OF SUBJECTIVE PERCEPTION BASED ON PERCEPTION IN AUTONOMOUS ROBOTICS

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Abstract

This paper critiques Berkeley’s theory of subjective perception and found it incongruent with the phenomenon of perception in Autonomous Robotics (AR). Berkeley argued that perception is subjective. He explains that two perceivers cannot perceive the same object in the same way much as one perceiver cannot perceive the same object in the same way when using different channels of perceptions such as: seeing, hearing, smelling and touching. In this paper, I consider autonomous robots as perceivers in because of their capacity to identify and makes sense of objects or persons in their functional environment. Hence, the predictability of their actions. A swarm of robots working jointly on a task does not perceive the objects they work subjectively otherwise there would be breakdown in communication among them. I argued that “ground-truth” – an objective standard for data classification and identification to which machine learning algorithm adapts is the reason why robots can perceive things objectively. The paper is in three parts. First part deals with exposition of Berkeley’s ontology and epistemology with a focus on his theory of perception. This is followed by a discourse on the phenomenon of perception in autonomous robots and ground-truthing. The last part of the paper is a critique of Berkeley’s theory of subjective perception based on ideas from perception in autonomous robotics.

Keywords: Perception, Autonomous robotics, Ground-truthing, Epistemology.

Introduction

George Berkeley (1685-1753) published, amongst other works, two outstanding works on which his philosophical reputation rests: “*A Treatise Concerning the Principles of Human Knowledge*” (1710), and “*Three Dialogues between Hylas and Philonous*” (1713). Through these works he exerted a profound influence on the later course of Anglo-American philosophy, an influence that is still alive especially with regards to his theory of perception (Wild, 1953). He studied at

Trinity College in Dublin where he remained for a long period as a teacher of theology. Berkeley died in 1753 at Oxford where he had gone to found a missionary institute. Suffice to remark that John Locke, George Berkeley and David Hume are in a special class of their own as long as British empiricists school is concerned. This is due to the fact that “there is certainly an intellectual line of development that began with Locke and ran through Berkeley to culminate in Hume (Fogelin, 2001).

Berkeley’s philosophy was reactionary to Locke’s and Newton’s because of what he considered as their uncritical acceptance of *matter* as an intelligible and self-directing mind-independent substance. He not only attacked the materialist epistemologies of the due but he also went further to repudiate the prevalent scepticism at his time which he was convinced arose from the afore-stated uncritical position of Locke and Newton over matter. Berkeley’s disenchantment with matter was based on theological reason in that he considered uncritical materialism to be in opposition to God as ultimate cause and director of the affairs of realities. In other words, if Locke’s and Newton’s idea of matter as a self-directing substance was anything to go by, that would detract from God’s omnipotence over nature to which matter was a part of.

Much as most medieval scholars, Berkeley deployed his philosophy as an apologetic tool to defend his Christian faith. According to Spiegel (1996), “it is well known that the chief end of Berkeley's philosophical labors was to defend the Christian religion”. Berkeley’s philosophical meditations has the primary essence of being a means to solving the religious problem of his time which was to restore the spiritual and Christian values in the then society, threatened by the so-called freethinkers at the time that relied on Locke's theory of knowledge and Newtonian physics to undermine the Christian faith.

The main claim of Berkeley’s philosophy is that only *ideas* and *minds* exist hence there is no such thing as matter. His “*esse est percipi aut percipere*” – “To be is to be perceived or to perceive”, captures the core of his philosophy. As he equated existence with perception, it follows that those ideas (which he described as sensations in of the mind) and mind which perceive those sensations or ideas exhaust scope of being. Consequently, ideas and minds are the only true objects of knowledge. Since the mind belongs to the realm of subjectivity in that each person’s mind is exclusive to him/her, perception by the mind, *ipso facto*, is a subjective perception as no one can perceive for me. Berkeley argued that regular things we perceive such as chairs, tables, trees, horse, clothes, etc, are nothing but collection of different ideas or sensations. For example, when distinct ideas of

colour, taste, roundness, are collectively perceived simultaneously, the idea of a *thing*, say, an apple, is formed.

In that case, an apple is a collection of ideas or sensations subjectively perceived by a mind. This, of course, raises the question whether reality (in the present case, an apple) has mind-independent existence? Berkeley's response would be in the negative – No! This is because, for him, it is perception that accentuates being. In other words, nothing exists outside being perceived. Berkeley's critics took him up on this when they lashed him for assuming that it is the mind that cause things to be rather than things existing whether or not they are perceived or not. We will say more on this criticism but in the meantime, let me introduce another critical aspect to this paper with which I hope to critique Berkeley's theory of subjective perception. That is perception in autonomous robotics.

Autonomous robots act or behave with a high degree of autonomy that requires no human supervision. They have the capacity to 'perceive' objects around them, analyse and make sense of what they perceive based on the algorithmic indications that support their functionality. This process ends in their predictable actions. I say predictable because otherwise would defeat the essence of their being deployed to task. Because of the afore-described human-like agency of autonomous robots as known as autobots (I would be using both terms interchangeably in this work), I logically would qualify them as belonging to the category of Berkeleyan 'minds or perceivers. Perception in autobots is based on 'ground-truthing' through machine learning technologies. Ground-truth refers to a golden standard to which a learning algorithm that supports the functionality of an artificial intelligent needs to adapt.

It is like a tutor that tells a student. The student in this case is the machine-learning algorithm while the tutor is a human expert. According to Jason Brownlee (2020) "an algorithm in machine learning is a procedure that is run on data to create a machine learning model. Machine learning algorithms perform pattern recognition. Algorithms "learn" from data, or are "fit" on a dataset". So, in ground-truthing, the human expert labels data examples or dataset to be categorized by the adaptive classifier which is the algorithm. This makes it Ground-truthing makes it possible for an autobot to perceive and identify based on objective dataset rather than based on subjective perception, *contra* Berkeley.

In what follows, I discuss John Locke's theory of knowledge. This is followed by an exposition of Berkeley's ontology and epistemology and a phenomenological critique of the later. The last part of the work delved into the phenomenon of

perception in autonomous robotics using it as a basis to fault Berkeley's theory of subjective perception.

John Locke's Theory of Knowledge as a Prelude to Berkeley's theory of Perception

John Locke's (1632-1704) theory of knowledge is based on the central claim that knowledge comes through the senses. That there is nothing in the intellect that was not first in the senses. His epistemology was a reaction to Descartes' theory of *innatism* – the idea that we have *a priori* knowledge – that is, knowledge that we were born with. Against Descartes, Locke maintained that sense perception is the starting point of human knowledge as human mind is a *tabula rasa* (blank slate) at birth. As the objects of the external world induce certain reactions in us causing perception, the process of knowledge begins. Locke in his work, "*An Essay Concerning Human Understanding*" (1690) throws a challenge to his reader thus: "Let anyone examine his own thoughts, and thoroughly search into his understanding, and then let him tell me, whether all the original ideas he has there, are any other than of the objects of his senses, or of operations of his mind...And how great a mass of knowledge so ever he imagines to be lodged there, he will, upon taking a strict view, see that he has not any idea in his mind but what one of these two have imprinted".

He wrote extensively on *ideas*. Locke cited in Lawhead (2007) explains that an idea is anything that is the immediate object of perception, thought or understanding. This said notion of ideas is different from the common notion of ideas which connotes *concepts* or *abstract* notions such as love, goodness, justice, etc. Instead, ideas, for Locke, refers to qualities of sensation, such as colour, tastes, sound, texture, etc. He made a distinction between simple ideas and complex ideas. Simple ideas are atomic or particular sensations or imprints which experience leaves in the mind. For example, when an odour hits the nose or a sound wave hits the ear drum, they leave behind in the mind simple ideas. Simple ideas, as Lawhead (2007) explains, can come in two varieties.

On the other hand, are complex ideas, that are the outcome of a combination of simple ideas. Complex ideas such as the idea of books, trees, cars, etc, are analysable to simple ideas beyond which no further analysis of the ideas can hold. According to Lawhead (2007) Locke classified complex ideas based on the three activities of the mind: *compounding*, *relating*, and *abstracting*. First, through the mind's activity of compounding, it unites simple ideas to form a complex idea. For

example, simple ideas such as: sweet, round, red, are combined or unified to produce the complex idea of, say, ‘an apple’. Second, when the mind *relates* two ideas that are complementary, say, tall and short; fat and thin; big and small, it produces complex ideas by relation. Third, through abstraction, the mind brackets all the differentiating attributes of a complex idea in order to focus on that which is common to all objects that participate in that complex idea.

In abstraction, the mind reaches for the essence of things while living out its accidental features. Through the mind’s power of abstraction, it forms a general or universal idea which cannot be reduced to an idea about this or that particular thing. This general idea, Locke believed, exist in the mind. Berkeley kicked against Locke’s notion of general idea. He argued that there is nothing like a general idea in the mind because, since existence equates perception, and since abstract or general ideas cannot be perceived as this or that particular idea, they do not exist. Berkeley was of the view that if ever there is general idea as Locke suggests, it has only nominal existence and as such refers to nothing in particular. Suffice to note that on the issue of ideas, Berkeley agreed with Locke only to the extent that the objects of knowledge are designated as ideas or sensations. But on what constitutes the ontological nature of those ideas or sensation is, Berkeley radically differs from Locke.

Berkeley’s Immaterialism

The core principle of Berkeley’s ontology is expressed in his *esse est percipi aut percipere* – “To be is to be perceived or to perceive”. By this, he defends the view that only that which is perceivable or is capable of perceiving is real. Consequently, he denied the existence of matter because for him matter can neither be perceived nor perceive. His epistemology, which stems from his ontology, holds that *ideas* and *minds* are the proper objects of knowledge. Arguably, Berkeley took on an arduous project of reformation of empiricism in order to defend the common-sense view of reality. Thus, he battled scepticism, atheism and unbelief that held sway in his time. He considered those epistemological vices as attempts by empiricists of Newtonian physics to deny God of his role as the sole creator and director of the affairs of the world. The title of his major work, published in 1710: “*A Treatise concerning the Principles of Human Knowledge wherein the chief causes of error and difficulty in the Sciences, with grounds of Scepticism, Atheism, and Irreligion, are inquired into*” is an apt description of his Philosophical grand mission.

Consequent, upon his denial of the existence of matter, Berkeley limited the scope of reality to *minds* and *ideas* (Hunter, 2013). According to Dicker (2011) some of Berkeley's disciples are of the view that in reading Berkeley, one should be wary of falling into the common error of assuming that Berkeley's denial of *matter* equally means a denial of the existence of the 'ordinary things' of our world such as trees, cups, horses, chairs, tables, etc. Dicker explains that much as Berkeley's immaterialism is the view that only minds and ideas exist; there is no such thing as matter but by holding the view, Berkeley does not mean that rocks, trees, tables, chairs, and so on do not exist. Rather, he means that they are only collections of ideas or what he calls *sensations*. These ideas or sensations include visual, tactile, auditory, gustatory, and olfactory, sensations.

So, Berkeleyans would like us to believe that Berkeley had no intentions of denying the existence of any part of our world. He was merely analysing what the term "existence" means. For Berkeley, existence equates perception such that when we say that something exists, we mean that can be perceived by me or by somebody else or that the thing itself can perceive.

Max Bailey (2017) explains Berkeley's position on existence and perception that in terms of what exists in general, there are two things. Ideas, whose inherent role is to be perceived, and an active perceiver which is called the mind. Since our minds are independent ones because everybody has different passions, imaginations and their own points of view on a range of topics, Berkeley concludes from this that if we are the active party in the action of perceiving, then it is only right that there would be a passive party – the ideas, which we perceive with our senses, fill this role. The role of an idea is to be perceived – for them to exist outside of their meaning would be illogical. Therefore, things that aren't being perceived don't exist outside of that role.

Berkeley knew that his critics would demand from him an explanation as to what happens to objects when they are not being perceived by anybody at a particular point in time. Do those objects vanish out of existence only to return immediately there is a mind to perceive them? This borders on the 'persistence problem' in Berkeley's philosophy. Berkeley introduced the notion of "the Eternal Spirit" in response to his critics. The Eternal Spirit (God) is the one who perceives objects when nobody else does, and primarily, the function of the Eternal Spirit is to give the world some regularity which it, arguably, has (Max Bailey, 2017).

So, objects do not vanish out of being when not being perceived by a finite (human) mind because the Eternal Spirit (God) is perpetually perceiving them.

Berkeley (1957) cited in Lawhead (2007) explains with an example when he writes: “the table I write on, I say exists, that is, I see and feel it, and if I were out of my study, I should say it existed – meaning thereby that I was in my study I might perceive it, or that some spirit actually does perceive it”. Based on the foregoing response by Berkeley to critics, one sees again the theological in Berkeley’s philosophical project. He sought, through his philosophical project, a logical way to retain the validity of science while at the same time preserving the necessary role of God in world events.

Berkeley’s Epistemology as a reaction to Locke’s theory of Ideas

In his “*Principles of Human Knowledge*” (1710) Berkeley declares: “anyone who surveys the objects of human knowledge will easily see that they are all *ideas* that are either actually imprinted on the senses or perceived by attending to one’s own emotions and mental activities or formed out of ideas of the first two types, with the help of memory and imagination, by compounding or dividing or simply reproducing ideas of those other two kinds”.

We have the idea of many things through our senses. By sight we have the ideas of light and colours with their different degrees and variations. By touch we perceive hard and soft, heat and cold, motion and resistance, and so on; and each of these also admits of differences of quantity or degree. Smelling supplies us with odours; the palate with tastes; and hearing conveys sounds to the mind in all their variety of tone and composition. Berkeley (1710) explains that when different ideas are observed to occur together, consistently, we identify such combined ideas as an *object*. For example, a certain colour, taste, smell, shape and consistency having been observed to go together, they are taken to be one distinct thing, called an ‘apple’.

Lawhead (2017:232) explains that Berkeley’s argument for mind-dependency of ideas can be sketched thus: (a) sensible objects are things present to us in sense experience. What is presented to us in sense experience consists solely of our ideas and ideas exist solely in our minds. Therefore, sensible objects exist solely in our minds. What this means is that such a thing as ‘an apple’ is a composition of various ideas in the mind which, if (each of the distinct idea or sensation) is separated by the mind, nothing remains to be called an apple. Much reason why Berkeley dismissed the notion of *abstract* or *general* ideas when he argued that there are no such thing as abstract or general ideas; only particular distinct ideas exist, because only particular ideas are perceivable.

What Berkeley means is that the argument for abstract ideas, which is that the mind can abstract, individually, the constituent ideas or sensations that forms a compound idea of a thing, does not mean that we can thus form an abstract idea of each of the constituent ideas, say extension or colour, because none of those constituent ideas can exist independent of the other. Also, whatever abstract idea of colour or extension the mind forms will inevitably be in *particular* sense rather than in a universal or general sense because the mind cannot conceive of colour that is neither red, nor green, yellow, violet, etc. According Fogelin (2001:12) “one of Berkeley’s central claims is that to be is to be a particular – that is, there are no such things as abstract entities, including abstract ideas. He further held that the doctrine of abstract ideas has been the source of endless confusion. Berkeley was not only an immaterialist, he was also a nominalist, or, as we might better put it, a *particularist*”.

Berkeley’s notion of the Mind as Perceiver

Besides *ideas*, Berkeley also spoke of *mind* or *spirit*, describing it as that which perceives the ideas. The mind is distinct from the ideas and is the only substance that exists. In his “*Principle of Human Knowledge*”, Berkeley stated that, the perceiving, active being is what he referred to as ‘mind, spirit, soul, or myself’. The mind, he explains, is radically distinct from ideas that it perceives. He further explains that the existence of the mind as the precondition for ideas to be perceived is intuitively known by anyone who considers the meaning of the term “exist”, when applied to sensible things. In other words, the various sensations or ideas imprinted on the sense, in whatever form they are (blended or combined together) cannot exist otherwise than in a mind perceiving them.

Berkeley’s repudiation of scepticism is contained in his two important works viz, “*A Treatise Concerning the Principles of Human Knowledge*”, (1710) and the “*Three Dialogues Between Hylas and Philonus*” (1713). Berkeley’s main aim in those two works, Oyeshile (2002) recounts was to demonstrate the reality and perfection of human knowledge. This, Berkeley did by attacking Locke’s representative theory in which Locke held that the existence of matter is neither mind-dependent nor perception-dependent. Recall, that Locke believed in the existence of matter as a substance upon which primary qualities such as shape, solidity, extension rest. In fact, all Materialists hold that primary qualities are inherent in matter while secondary qualities (taste, colour) are ideas in the mind. Berkeley disagreed with that.

As Bailey (2017) explains, buttressing Berkeley's view on matter, "matter is a micro-substance which has ideas of its own, like extension, for it to make up other objects – but it does not perceive. However, *ideas* such as extension only exist in the mind, so it cannot be possible for matter to possess this idea if it is not a perceiver itself. This means that the existence of matter, for Berkeley, is contradictory – an idea cannot be like anything but another idea". Berkeley found a loophole in Locke's theory of knowledge which is (as Locke held) that primary and secondary qualities are united, and in an object, one can't exist without the other – this, surely, means that primary qualities must also exist only in the mind, as secondary qualities do.

Berkeley (1710), had the following scathing words for Locke and his likes, "they who assert that figure, motion, and the rest of the primary or original qualities do exist without the mind in unthinking substances, do at the same time acknowledge that colours, sounds, heat cold, and suchlike secondary qualities, do not – which they tell us are sensations existing in the mind alone, that depend on and are occasioned by the different size, texture, and motion of the minute particles of matter. This they take for an undoubted truth, which they can demonstrate beyond all exception. Now, if it be certain that those original qualities are inseparably united with the other".

In his "*Three Dialogues Between Hylas and Philonous*", Berkeley articulated his idealist view. In the first dialogue, Hylas accused Philonous of being a sceptic due to the latter's denial of the existence of material substance. Philonous accepted Hylas view on his (Philonous) being in denial of the existence of anything of such called material substance. But he maintained that his view does not lead to scepticism and is based on common sense. He further argued that philosophers who subscribe to the doctrine of material substance are the ones who should be accused of scepticism (Oyeshile, 2002).

Philonous replied Hylas thus, "that there is no such thing as what Philosophers call material substance, I am seriously persuaded: But if I were made to see anything absurd or sceptical in this, I should then have the same reason to renounce this, that I imagine I have now to reject the contrary opinion" (Wilkin, 2002). In furtherance of his point, Philonous declared that only colours, shapes, sounds, tastes, and those qualities which we perceive immaterially by our senses exist. But Hylas would not admit of this because he strongly believed in some sort of material substances and thus insists that the real existence of sensible things is independent of their being perceived. Philonous used the experience of heat as an example to demonstrate to Hylas that there is no mind-independent objects.

Philonous argued that when we experience extreme heat, what we actually feel is great pain and that it is absurd for anyone to believe that material substance contains pain (Wilkin, 2002).

Hylas retorted, arguing that we can distinguish between heat and pain. But Philonous pressed on, suggesting that Hylas put his hands near fire and see if he feels two distinct sensations: heat and pain or only pain, which according to him (Philonous) exists only in the mind. Philonous further explains that similar reasoning applies to various degrees of heat, which are felt as either pleasant sensations of warmth or as pain. For instance, if one's hand is warm, and the other cold, and the two are dipped into a bowl of water at room temperature, the water will feel cold to the one hand and hot to the other. Philonous asks Hylas, if he thinks that the water has two distinct temperatures at the same time? (Oyeshile, 2002). Hylas, having felt cornered by Philonous conceded to the latter that heat and cold are only sensations in the minds rather than qualities in things (Wilkin, 2002). Similarly, Philonous took on Hylas on the issues of taste, colour, odour and sound. On each of them, he applied the same line of argument as he did with heat to get Hylas to see that the qualities: taste, odour, sound, color are all mind-dependent. Philonous argued that whatever taste one perceives depends on one's palate much as colour depends on one's perception. In addition, colours of objects vary depending on the reflection of light on the objects (Oyeshile, 2002). Hylas accepts all the submissions of Philonous; that colours, sound, taste, and indeed all that we call secondary qualities exists only in the mind (David, 1977).

Hylas tried to avoid Philonous' anticipated position which is to argue, in the manner he had done earlier, that objects that we perceive are only ideas in the mind. So, he invokes Locke's distinction between 'primary' and 'secondary' qualities. Primary qualities are those qualities such as solidity, figure, extension, motion, etc. Philonous would not accept that. He responded with a dismissal of Locke as an inconsistent empiricist who dared to hold that secondary qualities exist in the mind but would not accept that primary qualities also exist in the mind. Philonous stated that there is no justified ground for Locke to even make the distinction between primary and secondary qualities in the first instance. According to Philonous in Oyeshile (2002) "it is evident that extension, figure and motion are only ideas existing in the mind, and that an idea can be like nothing, but another idea, and that consequently neither they nor their archetypes can exist in an unperceived substance. Hence, it is plain that the very notion of what is called

matter or corporeal substance, involves a contradiction”.³⁰ In what follows, I am going to attempt a phenomenological critique of Berkeley’s theory of perception.

Berkeley’s Theory of Subjective Perception: A Phenomenological Critique

If we could find answers to the questions of the ‘wherefrom’ and ‘how’ of our perception we would have established the bases for legitimacy, validity, nature and limits of our perception and consequently, our knowledge. Locke and Berkeley dedicated their theories of knowledge to addressing the questions. Berkeley formulated his theory of subjective perception with the following assumptions, as Wild (1953) recounts: First, sensations or " ideas " are simple atomic units with no relational structure. To sense an object is simply such a unit lying "within " the mind. Second, these " ideas " are " passive and inert. Third, they are the impressed effects of external causes. The mind, on the other hand, is purely active. Third, these passive effects are called *appearances of things*. Fourth, each datum is different from every other hence it is neither possible for two observers to observe datum nor for the same observer to apprehend the through two different cognitive avenues. Fifth, these effects are perfectly determinate, and infallibly apprehended. Indeed, to apprehend such an object to *have* it within the mind. Hence if it is there, no mistake is possible. Sixth, images differ from real objects only in being involuntarily received, weaker, less vivid, and less regular than the latter. There is no other difference.

Looking at the forgoing formulation, it stands to reason that Berkeley’s theory of subjective perception is inherently problematic in that it contradicts phenomenological facts when we take into consideration the structure of relation in human perception. Hence, drawing largely on John Wild’s *“Berkeley’s Theories of Perception: A Phenomenological Critique”*, I set forth to show the inherent fault lines in Berkeley’s theory of perception.

On the claim by Berkeley that sensation or ideas are simple atomic units without relational structure, Berkeley was mistaken because he fails to take into cognisance the phenomenological evidence which is that “all awareness is relational or of intentional in character” (Wild, 1953). This means that to think or to perceive is to do so *of* something which is distinct from the conscious state of the subject. Wild (1953: 1344) explains that “every thought is the thought *of* something. Thus, sensation is not a globular entity included within a *mental* container. This would

³⁰ G., Berkeley, “Principles of Human Knowledge” in R.J. Hirst (Ed) *Perception and the External World*: New York: Macmillan Company. p.247 Cf. O.A. Oyeshile, (2002) “George Berkeley’s Idealist Critique of Materialism”, *West African Journal of Philosophical Studies*, Vol. 5, ISSN 1595 255X pp.79-97

be a gross oversimplification of its relational structure – an act which intends or reaches out towards an object distinct from itself. I do not see or hear my own sensation; I see a colour pattern; I hear a sound". *Contra Berkeley*, the object of awareness is not the same with the sensation that it evokes.

According to Wild (1953) that which is perceived is interpreted as this *thing* lying within another containing thing distinct from the mind's conscious experiences. The consequence of Berkeley's failure to make a distinction between mental state and the object of perception is that it raises the question as to whether qualities such as extension, colour, taste, sound, which we attribute to the objects are qualities of the mind since those ideas or sensations are mind-dependent as Berkeley argued. Wild (1953) asks "if the mind is nothing but its ideas – then we shall certainly have to say that it is extended, round, square, hot, cold, green, etc., in which case it cannot consistently be held to be an incorporeal substance, a principle of importance for Berkeley." Berkeley could not address this question because he could hold that the mind is immaterial and at the same time concede that it has the qualities of extension, colour and taste.

Furthermore, Berkeley's claim that 'ideas are passive and inert, while the mind is active' throws up a problem of dualism, reminiscent of Descartes' mind-body problem. Dualism between passive dependent ideas and active substantial spirits that is incompatible with physicalist view of sensation as the reception of external influences (Wild, 1953). Berkeley contradicted himself when he admitted that ideas are impressed on the mind by external causes (including God). The question for Berkeley is, Wild (1953) posed is: "how is an active, purely spiritual substance to be passively impressed by external influences? If it is strictly incorporeal and unextended, how is it to contain these effects within itself?" Of course, Berkeley had no convincing answer to the question.

More so, Berkeley claimed that ideas or sensations impressed on the mind through external causes are *appearances* of their causes. In the *Principles*, Wild (1953) recounts, Berkeley states: "We see only the appearances, and not the real qualities of things." These appearances are the effects of external causes, and the argument from an appearance to that which appears is supposed to be analogous to the argument from an effect to its efficient cause. The problem here is that Berkeley again failed to make a phenomenological distinction between ideas and the cause(s) of the ideas. Appearing is not a *thing*, but a relation which cannot be described except in intentional terms. To think of an appearance, Wild (1953) submits, as though it were a separate thing or entity in itself is to perform an illicit hypostatization.

It can be inferred from the above that Berkeley misfired in his argument by conceiving appearance as a *thing*, whereas, in reality appearance is not ontologically one and the same thing with *that* which appears much as intentional act is not the same as the object. This explains someone can be mistaken in his/her perception. One can perceive wrongly. For example, when one sees the shadow of a tree cast on a wall by the reflection of the moon at night and immediately perceive that (wrongly) to be someone leaning on the wall.

Another problematic claim in Berkeley's theory of knowledge is the fourth claim in the afore-stated formulations which is that "it is neither possible for two observers to observe the same *datum* nor for the same observer to apprehend the same object through two different cognitive channels". Suffice to state that this particular claim is of much concern to the present work because of its variance with the phenomenological experience of perception in autonomous robotics that we will discuss in the next part of this work.

Common-sense suggests to us that although we may perceive one object from different perceptual angles or positions, it is nonetheless, the same object that is perceived and much it can be objectively perceived and described. In so far as we bear the *intentionality* of awareness in mind, Wild (1953) explains, we would have no difficulty in understanding how by one and the same act one may apprehend one object from different perspective. For example, I can smell my brewed coffee, I can taste it, I can see it, I can even dip my finger into it. These are all different cognitive channels of perceiving "the same" reality. The point here is that it is possible to apprehend one and the same object in different ways. But for Berkeley, every sense experience is distinct from every other to the extent that each sense experience constitutes a *being* on its own. One can arguably say that Berkeley, by that idea, is guilty of ontological fallacy.

Following from the foregoing, Berkeley's originality of philosophical ideas may not be in doubt but he also created more problems for philosophy than he sought to address. One can infer from his theory of perception problems such as: *solipsism*, *occasionalism*, *relativism* and *dualism*. Solipsism, a claim that reality only exists in the self and there can never be an existence external to the self. According to Waribugo & Eketu (2016) existence in solipsism means 'my existence and that of my mental states'. Hence, the individual mind is the primary source of knowledge and nothing exists in the world unless one is aware of it.

Berkeley's attempts to defend this position was a failure because phenomenological facts as well as common-sense proved otherwise. If reality is

limited to the subjective contents of the mind, “how did those contents get into the mind in the first place? Berkeley would expectedly point to God as the one in whose mind all things exist objectively and who causes the ideas in our minds. But rather than address the first problem such allusion God would raise another problem which is occasionalism.

Still on the problem of subjective perception, the belief, as Berkeley’s position suggests, that that there is no provable objective truth is tantamount to saying that there we do not have epistemological capacity for determining objectivity. Of course, this is bad for the idea of scientific objectivity much as it is to ethics because there will be no mechanism for distinguishing right from wrong, good from evil, nor light from dark. Empirically speaking, experience and perception constitute the starting point of knowledge. Going by that, Berkeley’s theory of subjective perception puts the possibility of objective knowledge in jeopardy. If we all perceive differently and by so doing, know subjectively, of what importance is data verification and validation of scientific claims through confirmatory tests by scientists other than the first person to arrive at the claim? Obviously, Berkeley’s theory of subjective perception has inherent fault line which we will further discover in the next part when we discuss the phenomenon of perception in autonomous robotics.

Autonomous Robotics and Perception in Autonomous Robots

Robotics is an emerging field at the intersection of mechanical and electrical engineering with computer science. According to Correll (2016), with computers becoming more powerful, making robots smart is getting more and more into the focus of attention and robotics research most challenging frontier hence autonomous robotics. Correll further opines that autonomous robotics brings together the fields of artificial intelligence, robotics and information engineering. Autonomous robots also known as ‘autobots’ are systems that sense, actuate, compute, and communicate.

Autobots have the ability to gain information about their environments, and work for an extended period of time without human intervention. Examples of autobots range from autonomous helicopters to robot vacuum cleaners. In terms of their autonomy and self-reliance, autobots can move themselves throughout an entire operation or work process without human assistance, and are able to avoid situations that are harmful to themselves or people and property. They are also likely to adapt to changing surroundings.

Going by the current stage of technology, perception in autonomous robots is mainly focused on visual perception. Future evolution in Artificial Intelligence (AI) and Big Data may likely improve perception in autonomous robots. According to Sünderhauf *et al* (2016) cited in According to Premebida, Ambrus and Marton (2018), “robotic perception (also designated robotic vision) differs from traditional computer vision perception in the sense that, in robotics, the outputs of a perception system will result in decisions and actions in the real world”. This underscores the importance of perception in embodied, active, and goal-driven robotic system – autonomous robotics. Perception provides the necessary information to make an autonomous robot aware of its own status and its surrounding environment. Premebida *et al* (2018) further explains that “robotic perception is related to many applications in robotics where sensory data and artificial intelligence/machine learning (AI/ML) techniques are involved. Examples of such applications are object detection, environment representation, scene understanding, human/pedestrian detection, activity recognition, semantic place classification, object modelling, among others”.

Machine learning algorithm, deep data and learned-model approach are foundational to perception in autonomous robots. Through their instrumentality, an autonomous robot is capacitated to perceive, make sense of and consequently act. The key components of perception system in autonomous robots are “sensory data processing, data representation (environmental modelling) and machine learning (ML)-based algorithm”. Machine Learning techniques employed in autobots’ perception, range from classical (supervised) to deep-learning (unsupervised) approaches or a combination of both. But regardless of the approach considered, data from the autobot’s sensor(s) are the key ingredients in robot’s perception (Premebida *et al*, 2018).

‘Ground-truthing’ in Autonomous Robotics

Robots can do amazing things, such as work in assembly plants collaboratively with humans, deliver packages quickly within warehouse, and engage in space exploration. We also have robots that work in homes as domestic assistants. They can clean, answer the door, and, “we’re only beginning to see robots that can make a decent cup of coffee” (Amin, 2019). All of these are possible, thanks to different technologies which enable robots to ‘perceive’ and make sense of the objects around them.

In machine learning we use the term “ground truthing” to refer to the process of gathering the proper objective (provable) data for testing and proving research hypotheses.

Kobielus (2014)) explains ground-truth as “a golden standard to which the learning algorithm needs to adapt. It involves a tutor that tells the student – that is, the machine-learning algorithm – what to learn. The tutor is a human expert who labels the data examples to be categorized by the adaptive classifier, which is that same algorithm. He further adds that “machine learning has a critical dependency on learned humans. Without a baseline set of training data labelled by one or more human experts, many machine-learning algorithms can’t get off square one. They (autonomous robots, operating with machine learning techniques), search for data patterns that are consistent with those previously tagged and flagged by a human in the know.

Thinking about Berkeley’s theory of relative or subjective perception vis-à-vis perception in autonomous robots one would be forced conclude (rather unrealistically) that is it useless to deploy autonomous robots to work as is presently the practice in assembly plants, hospitals, restaurants, homes, etc. Let’s imagine hundreds of robots in a car manufacturing and assembly plant that perceive the same objects the assemble differently. Obviously, such plant would experience crisis to the magnitude of the Biblical “Tower of Babel” crisis. And that could be dangerous even for the lives of humans working alongside the robots.

According to Kozyrkov (2021) practically every AI student has to see through the task of building a system that classifies images. The reason this is a classic AI task is that recognizing objects is a task that is relatively easy for humans to perform, but it’s really hard for us to say how we do it (so it’s difficult to code explicit rules that describe “*catness*” for the machine). But one thing that is clear is that the system needs objective criteria to do its classification work. This is where ground-truthing in AI is handy. Ground-truthing in AI Building an AI system can properly classify hundreds of thousands of images in addition to other amazing cognitive actions. This further confirms the position of this paper which is that perception in autonomous robots is not relative or subjective. Something must serve as a foundation from which and upon which consciousness might bootstrap. It’s one thing to say that the machine will learn based on data inputs. It’s quite another to discern what is real without a ground truth outside myself.

Arguably, infirmity of one's senses or mental state of an observer can impact negatively on his or her perceptive ability much as defective sensors or algorithm in a robot can affect exteroception and perception in an AI system. But this does not suffice to conclude that such deficient condition represents the normal state of affairs with regard to perception in humans and autobots. Science cannot be science without an understanding and acceptance of empirical evidence. That is the essence of "ground truth."

Conclusion

Perception represents a unique source of how we experience reality. When we perceive an object, we acquire specific bits of information about it, which includes its location, shape, texture, size, colour, taste etc. Berkeley's argument that the perceive in things are not in those things, contrary to what common-sense suggests, but rather they are ideas in our mind, is not consistent with his physicalist empiricist position by which we it is admitted that knowledge begins with experience. The originality of Berkeley's philosophical ideas notwithstanding, he created more problems for philosophy than he wanted to solve.

Berkeley's claim that two observers or perceivers cannot perceive the same object is a phenomenological fallacy as long as perception in autonomous robots is concerned. Going by Berkeleyan ontological delineation, autonomous robots qualify as 'minds' because they can perceive like humans. As perceivers, if autonomous robots do perceive objects subjectively, it would be disastrous to deploy them to work in that their actions following from what they perceive would be unpredictable (which is not the case). The fact of ground-truthing further punctures Berkeley's theory of subjective perception. It is cringing to imagine a future in which a group of autobots carrying out a very sensitive task such as performing a surgery on humans would have their actions at such a material time based on their relative perception' of the same surgical objects before them.

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