Research Essay

Brain & Mind in Everett Many-worlds

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Abstract

We redefine free will as the concept of identity in a deterministic universe. Causality is related to a meaningful explanation. For impossible explanations, causality does not exist, and the identity of the self-breaks. Only in meaningful causal worlds may personal identities exist. We are one person described by the meaningful path in the multiverse that is correlated with our free choices.

Keywords: Identity, all stasis, homeostasis, Everett many-worlds, free will.

1. Introduction

Incompatibilism states that a deterministic universe is logically incompatible with the notion that people have free will. Then again, it is supposed that non- deterministic quantum mechanics plays an essential role in the understanding of the human mind and free will. It is assumed that the mind is non-algorithmic and thus incapable of being modelled by a computer. In this paper, we follow the idea of Descartes that the mind and the brain are two different things. We assume, first, that the universe is deterministic and, second, that the mind interacts with the brain only in one direction: The mind senses the brain but does not make decision known to the brain. Despite these two major constraints, we indicate how free will can be present.

2. Computer Metaphor

Among many brain researchers and computer scientists, there is the strong belief that artificial intelligence can provide an answer to the problem of the mind and consciousness. The main task of artificial intelligence is the development of artificial intelligence systems that are as intelligent as humans or maybe even more so. It is speculated that the mind is an emergent property of complex systems simulated by a computer. The brain is viewed as being such a complex system that can be simulated on a computer. Some scientists even speculate that it is possible to achieve cybernetic immortality by downloading the information describing our brain onto a computer. Since a computer is a deterministic and executes algorithms, free will does not exist, and only one course of events is possible. Free will is an illusion, and the mind is generated as part of the

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process of computation. These are metaphysical speculations; however, their metaphysical nature is often denied by corresponding scientists. Related to this denouement is the intermixture of the terms cognition and mind. The word cognition comes from the Latin cognoscere, which means "to know", "to conceptualise" or "to recognise". Cognition is closely related to human intelligence and can be simulated by machines such as computers. On the other hand, mind has a vague definition; it has some consciousness, a combination of cognition and emotion, including an unconscious cognitive process. It manifests itself as a stream of consciousness, as described in the literary masterpiece Ulysses by James Joyce. It seems that cognition and the mind are closely related, but is this actually the case?

2.1 Explanation as a Function of the Brain

One of the cognitive brain functions is to provide a causally consistent explanation of events to maintain self-identity over time, leading to the psychological concept of "now". Identity is a concept that defines the properties of a rational person over time. It is a unifying concept based on the biological principles of homeostasis [Bernard, 1957], [Gross, 1998]. Organisms must maintain stability, e.g., the regulation of body temperature, to guarantee the maintenance of life. This principle is extended by allostasis [Sterling, 2004] for the regulation of bodily functions over time. To perform this task, efficient mechanisms for the prediction of future states are necessary to anticipate future environmental constellations [von Holst and Mittelstaedt, 1950], [Bao et al., 2014].

This is done, because the homeostatic state may be violated by unexpected changes in the future. It means as well that every organism implies a kind of self-identity over time [Zhou et al., 2014]. This identity requires a time interval of finite duration within which sensory information is integrated. Different sensor information arrives at different time stamps. The fusion process has to be done over some time window. Similar problems are present during a sensor fusion task in a mobile robot. For example in visual and auditory perception in humans the transduction of the acoustic information is much shorter than the visual [Pöppel et al., 1990]. In it is suggested that in humans a temporal window with the duration of 3 s is created [Pöppel, 2009]. This window represents the psychological concept of "now" [Zhou et al., 2014]. The consciousness concept of "now" represented by the temporal window is shifted backward in time of the consciousness itself, since a sub consciousness mechanism is required to perform the integration task. Split brain research and stimulation or brain regions during awake operation suggest that the brain generates an explanation of effects that were not initiated by consciousness [Libet, 2004], [Coon and Mitterers, 2012].

Before an event occurs, an explanation must be incited by the subconscious parts of the brain so that it is possible to integrate it into the temporal window of the self when the event occurs. Additionally, other organic functions must be put on alert due to some predicted possible events. If an explanation is not possible due to a lack of causality, the identity of the self may break. The implication is that that only in meaningful causal worlds may personal identities exist. This concept is related to the general constructor theory of David Deutsch [Deutsch, 2013]. In this

context, the mind defines the psychological concept of "now", and identity is more related to human senses than to an algorithmic device. From this perspective, artificial intelligence models human cognition but not the mind or consciousness. It is a window of our consciousness into the quantum reality. In the next section, we attempt to establish a relationship with quantum physics.

3. Quantum Reality

The wave function in quantum mechanics, if unobservable, evolves in a smooth and continuous way according to the Schrödinger equation, which is related to the Hamiltonian equation of motion. This equation describes a linear superposition of different states at time t, which is represented by the vector. The so described evolution is deterministic and reversible. The vector itself describes the probability of the presence of certain states. A dimension represents each state, and the value of the vector is related to the probability of the state being present. However, measurements always find the physical system to be in a definite state, which does something to the wave-function represented by the vector. This something is not explained by quantum theory.

The best known example of this type kind of this 'something' is the Schrödinger's cat paradox [Schrödinger, 1935]. A cat is apparently evolving into a superposition of two states that can be characterised as an alive cat and a dead cat. A Geiger counter measures the decay of a radioactive substance. There is a fifty percent chance that, in a given time frame, decay is measured. The Geiger counter is connected to a device that kills the cat, if decay is measured. Because the cat and the Geiger counter are in a closed room, we do not know whether the cat is dead or alive. Each of these possibilities is associated with a specific fifty percent probability. The cat is in a mixed state, and the two states are "really" present at the same time. A measurement always finds either an alive cat or a dead cat with a probability of fifty percent.

As long as we make no measurements, there are no random effects. The behaviour of the system is strictly deterministic. The randomness is only present during the measurement. Randomness is an effect of measurement. The most popular interpretation, the Copenhagen interpretation, claims that quantum mechanics is a mathematical tool that is used in the calculation of probabilities and has no physical existence; all other questions are metaphysical.

If one assumes that quantum effects are only present at the microscopic scale, as suggested by the Copenhagen interpretation, then it would follow that the corresponding probabilities are rarely observed at the macroscopic scale. The corresponding statistics are near to certainty at the macroscopic scale, resulting in classical deterministic mechanics, as proposed by adequate determinism. However, it seems that our organism and our subconscious brain are aware of the quantum nature of the universe. Clues from psychology indicate that human cognition is based on quantum probability rather than the theory of traditional probability, as explained by Kolmogorov´s axioms [Busemeyer et al., 2006], [Busemeyer and Trueblood, 200 [Busemeyer et al., 2009], [Busemeyer and Bruza, 2012]. This approach would lead to the conclusion that a wave function can be present at the macro scale of our everyday life. The modern version of the wave-function collapse in quantum mechanics is based on decoherence and leads to the

multiverse interpretation of quantum mechanics [Bousso and Susskind, 2012].. Every time a quantum experiment with different possible outcomes is performed, all outcomes are obtained. If a quantum experiment is performed with two outcomes, i.e., with outcome A and outcome B, then both the world with outcome A and the world with outcome B will exist.

A person should not expect any difference between the experience in a world A and B. This corresponds to the Everett many-worlds theory, it views reality as a many-branched tree in which every possible quantum outcome is realised [Everett, 1959], [Wheeler, 1957], [Dewitt and Graham, 1973], [Deutsch, 1997], [Deutsch, 2002], [Wallace, 2002], [Wallace, 2003], [Wallace, 2003], [Byrne, 2007]. A person should not expect any difference between the experience in world A and world B, but a person in world A is a different person in world B. We are one person described by the path in the multiverse that is correlated with our free choices.

3.1 Multiverse Metaphor: Library of Babel Metaphor

Someone is reading a book about a certain hero and his adventures. During the process of reading, he identifies with the hero and lives through his ups and downs. Reading is a complex cognitive process, and it cannot be described by a simple function. It requires high cognitive functions for textual interpretation and decoding into a cognitive representation and comprehension. The brain preforms these functions; it decodes and interprets the story, but it does not create it. However, an illusion that the reader is the hero described in the book and that the reader is making the decisions may exist. Let us perform a thought experiment. A human being´s life, with all of his decisions, is recorded and transcribed into an enormous book called the book of life. A demon allows the human being to live again; however, he would erase all of his memories. The new life of the human consists of reading the previously recorded book of life. Does this mean that, during the reading, the human being is making his free choices or not? One can argue that the person makes free choices because the book describes free choices in a free world and these choices are those of the person. One can argue that, to write such a book, one must live in a free world. The book is a description of a real free life. By reading it, one cannot distinguish between the moment in which one is making choices and reading the book of life.

What if some demon knew about the person's free choices and wrote the book of life without the person actually having lived and having made the choices at all? Is it possible that a demon can predict free choices?

In Borges' story, the universe consists of an enormous library of an indefinite and perhaps infinite number of books. The books contain every possible ordering of just a few basic characters. Most of the books are completely useless to the reader and have no meaning. However, among all of these meaningless books, there are all the books that are or ever will be written. These meaningful books define causality; in other words, causality is represented by a meaningful book. These include all possible biographies of any person and translations of every book into every language. By chance, a person will find his book. By reading some noise, we

become nothing. We are defined by our book of life, as we are defined by our human body. Do we make free choices? Yes, we do because we cannot make any distinction between reading our book of life and living in a free world.

A person should not expect any difference between reading book A and book B, but the person reading book A is a different person from the person reading book B. We are one person described by the book that we are reading or, in the language of quantum physics, by the path in the multiverse that is correlated with our free choices.

4. Conclusion

There are billions similar persons, but they are not us. Our choices are a part of the multiverse, they are not created and they do not disappear, they are forever the part of static deterministic multiverse. Our choices are defined by our personality. The multiverse corresponds to some Platonic world of ideas that is explained to us by our mind, our consciousness is the unchangeable part of us. It is nonphysical and it senses the world. It does not interact with the brain in the other way beside it.

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