Deterministic Mechanical Universe

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Abstract—A conscious mind in every epsilon moment wants to believe that one has an infinite number of options to choose between for every decision. In this study, we argue that the person is ultimately subjected to choose one of those options based on the flow of information between one's body and the surrounding. Using reverse inference reasoning, we show that there is only one available accessible state for a particle to choose at each step over time to maintain the change in entropic information of $2\pi i$ at each step. Therefore, we think that the manifestation of a collection of particles as a coherent and cohesive entity such as human free will leads to the emergence of decisions and, in general, deterministic evolution of the being.

Keywords—Determinism, Free Will, Entropy, Information

I. Introduction

A HUMAN owing to its conscious mind may feel confused about its life and feel lost as to where it stands over time. Not only do they lack the ability to look at themselves from the perspective of a creator with all the information, a human even struggles to look at themselves from another person's eye or third perspective to be able to have a better judgment of themselves. On the other hand, a person as a part of the universe can see the big picture and think about the universe as a whole which in turn contains the person yet as a negligible constituent, hidden in the big picture. As a consequence, it is feasible for human beings to comprehend whether decisions are made deterministically or indeterministically through time in the universe.

Believing in a deterministic mechanical universe conflicts with the theological belief of will.[1], [2] Many renowned philosophers discuss an unbroken chain of cause and effect in the universe as an indication of determinism.[3], [4] Nonetheless, there are still controversial debates as to whether free will exists and if so up to what extent each individual determines its future.[5], [6], [7] This controversy is extended among physicists, especially after the invention of Quantum Mechanics which is founded based on the probabilistic concept of the wave function.[8]

If we have all the information about a system, we can predict the evolution of the system and therefore its constituents precisely.[9] For instance, in molecular dynamics simulations, if we know all the information about the given parameters of a system such as force field and temperature, we can predict the system's evolution according to Newton's law of motion. Similarly, if we imagine a pool (billiards) in a universe that only is governed on the basis of Newtonian laws of motion, the positions and momentum of balls are precisely predictable. Even though it is believed our universe is governed by physical laws beyond Newton's second law of motion ($F = ma$), if we have all the information of all degrees of freedom we could be able to explain everything with an entropic force between particles, which itself is based on the second Newton's law of motion.

The comprehension of the evolution of the universe through forward inference reasoning is clear when we think with the simplest perspective about it. To back up this simplified interpretation of the reality of the universe we design a scenario in which we calculate the number of accessible states for a single particle given the entropic information for single displacement through phase-space. Here, we show that a particle always has a single option to obtain its new position at each step through time. We explain this conjecture using reverse inference reasoning by which we intuitively show that a system's evolution through time is deterministic.

II. Results and Discussion

We believe a Brownian particle with seemingly random motions is receiving its entropic information from a hidden medium similar to its analogous molecule diffusing with the Brownian motion in a fluid medium. The entropy of a particle under an applied field increases, and then this entropy dissipates to heat and work. Now imagine all the entropic information of a fundamental particle contained in a microscopic reversible process that converts to work with the passage of time. This particle evolves in time through phase space with a specific momentum and position. We believe that when t goes to infinity ($t \to \infty$) the particle eventually stops moving. Under this circumstance, the free energy of the particle (the driving force) would be zero:

$$A = E - TS = 0. \tag{1}$$

This is similar to a condition where the resultant force on the particle is zero. Therefore, in a motionless particle with no potential and kinetic energies at absolute zero kelvin, the internal energy is zero. Since the free energy of a system cannot be negative, the entropy of the particle should be zero. Consequently, the particle remains in absolute rest in the absence of an external field with only one available accessible state ($w \to 1$). Under this scenario, the entropy ultimately goes to zero:

$$S_n = k \ln w = 0. \tag{2}$$

Therefore, the number of paths that a particle can take goes to zero as the particle reaches an absolute equilibrium state. Furthermore, the Brownian motion of these microscopic particles is a reversible process. Therefore, all the entropic energy that is applied to the particle from the surrounding converts to work:

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$$T\Delta S = F\Delta x. \tag{3}$$

If the change in entropic information that is expended for every single displacement of a particle is [10]:

$$\Delta S = 2\pi ik. \tag{4}$$

In this regard, we find that the entropy of the previous step is:

$$S_{n-1} = 2\pi ik. \tag{5}$$

This tells us that $w = 1$ in the $n-1$ step. Similarly, when we go one step back of $n-2$ the entropy should be $4\pi ki$ to maintain the amount of entropic information change of $2\pi ik$ for single displacement. Therefore at $n-2$ step $w = 1$. In general, if we take j steps backward, the entropy and of $n-j$ step would be:

$$S_{n-j} = 2j\pi ik \tag{6}$$

where the highest backward step of j is $n-1$ at the first step during the evolution of the particle in phase space. Therefore:

$$S_1 = 2(n-1)\pi ik. \tag{7}$$

The backward stepwise analysis of entropy inspired by reverse inference reasoning fortifies our belief in determinism. Because it indicates that in every step the particle always has only one available accessible state to choose from.

This scenario can also be manifested for a particle in the immediate vicinity (minimum possible distance) from a body with an infinite attraction force. Under this scenario, the particle cannot escape the body and is inevitable to take the shortest path toward it with a minimum amount of change in entropy as one bit of information for a single displacement. The particle after being absorbed no longer can take another path. This is similar to our previous scenario where the particle reaches an absolute equilibrium state with no motions. Therefore, the change in entropic information during the displacement of the particle toward the body is $2\pi i$. This is the imaginary version of the lower bound entropy change of 2π for a particle that is one Compton away from the horizon of a black hole.[11], [12]

Singular choice in each step disagrees with the concept of the free will of a person as a person and its brain emerges from a collection of single particles. It is the flow of entropic information between the person's body and its surrounding that defines the behavior of the person at each time.[13] Complete knowledge of this information leads to a precise prediction of one's evolution through time. In theology, the creator knows all the information contained within the universe. Therefore, the creator if exist must have defined from the beginning the person's creation and the detailed evolution of it in time. Therefore, the belief in free will also should be considered as an opposition to the presence of a creator in the universe. On the other hand, not believing in free will does not mean that the creator exists, and this paradox seems like a theocratic confusion (theological fatalism). Nevertheless, the belief in determinism should not decrease one's moral responsibilities in a society.

III. Conclusions

Using the reverse inference reasoning of calculating entropic information through backward steps, we showed that a particle always has a single state to obtain. Therefore, we argue that a collective behavior of these particles can emerge as a human who only has one option at each time which is against the belief of free will.

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