Opinion

On Artificial Intelligence & Free Will

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ABSTRACT

It is desirable to us humans that a computer or an AI would not require any programmer to do meaningful work. How can we achieve this? This paper aims to provide a tentative answer. Lady Lovelace was the first person and programmer to point out that a computer needs to originate something to be creative and autonomous. Philosophers think this as free will objection. Though free will inspired some attention in AI literature, the mystery of free will is so far unsolved. This paper suggests that a desire for a divergent state is a plausible evidence for existence of free will. Though a desire is still mysterious to us in some way, the content of a divergent state is somewhat specific.

Key Words: artificial intelligence, free will, divergent state, human, computer, Lovelace.

1. Introduction

Lady Lovelace's objection was perhaps the most powerful objection against artificial intelligence. She stated that computers originate nothing and they merely do what we order them, via programs. Hauser[2015] classified it as free will objection. Bringsjord et al. [2001] took her objection as a way to avoid the problem of trickery stirred by the Turing Test. They states that strong AI will be demonstrated when a machine's creativity is beyond the explanation of its creator. However, Oppy et al. [2011] points out that "it remains an open question whether a digital computing device is capable of 'origination' in this sense".

Similarly, I understand it as an indication for our aim at AI: If a computer or an AI doesn't need any programmer to do meaningful work for us, it is a desirable scene for us. To achieve this, we need to add free will to AI. For example, if a man feels to be a puppet, he loses partly free will at least, cannot originate anything anymore, is not the author of what he does and (is forced to) waits for instructions.

McCarthy [2000] had given an attempt to realize a free will that is compatible with determinism. However, it still needs us to write programs. Thus compatible theory of free will is not adequate for the purpose of this paper.

In addition, the desirable free will faces serious problems because it requires that we have ultimate control over our actions: that is to say, it needs not nature (without us) but us the conscious beings as its ultimate source. Determinism holds that nature forms a great causal chain (perhaps) without ultimate source. Free will demands that our actions are not produced by a deterministic process

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that traced back to factors beyond our control [Pereboom, 2007b]. This definition presents a dilemma: if determinism is true, our desires/actions can be traced back to the remote past which is not under our control. Therefore, if this is true, then we are not free. However, if indeterminism is true, our desires/actions are nothing but a matter of luck. So once again, we are not free. Versions of this argument have been posited by Voltaire, Diderot, Spinoza, Schopenhauer, Nietzsche, Clarence Darrow, Paul Edwards, Bruce Waller, Saul Smilansky, Richard Double, and Pereboom [Pereboom, 2001, 2007a, 2007b]. As stated by Clark[2008], a determined event occurs necessarily from the remote past in conjunction with natural law. We have no control over it since we have no control over the remote past. An undetermined or chance event occurs spontaneously and receives no control from anything; hence it is not controlled by the agent. For example, if a quantum jump in one's brain resulted in a choice it would seem that it occurred by accident rather than from a choice by the agent.

That is to say, free will faces serious threatens from physical laws. Thus some philosophers begin to consider if physical laws is complete. Recently, [1]Horst[2011] provided a compatible theory of free will which holds that deterministic laws don't predict motions with exactness. However, this liberation is not enough for our desire to live. For example, if deterministic laws together with fixed past predicates the swing will hit me heavily without exactness, the swing-no- hit-me state is more desirable for me.

This paper states that a desire for a divergent state is the key for forming free will. Though a desire is still mysterious to us in some way, the content of a divergent state is somewhat specific.

1.1 Problem faced by free will realists

Free will paradigm holds free will as a necessary condition for moral responsibility, *i.e.*, free will is needed to makes us truly deserving of blame or praise for our actions. It presents a dilemma as we have stated.

Free will paradigm is faced by two questions:

(1) Is free will compatible with determinism?

(2) Is determinism true in our world?

Question (2) relates to the fact of what our world is. Question (1) would only have theoretical meaning if there is evidence to falsity of determinism. By the way, the first one received most attention.

Thus arguments about free will can be classified into two kinds of arguments: theoretical and factual. Many theoretical arguments don't start from settling if our world is deterministic or not. They just argue that free will is incompatible or not with determinism (or indeterminism). Some of them require that there are causations by a substance without answering whether there are any in

[1] Thanks for Pereboom and Oppy for helpful discussions on arguing from incompleteness of physical laws, especially Horst's position.

our world. [Clarke, 2003, 135, 146-7; O'Connor et al., 2006, 244] Uncaused theories require that a free action be either uncaused or caused as long as it is not deterministically caused [Ginet, 2007; McCann, 1998; Ginet, 2002] while they give no evidence for this kind of indeterminism. Event-causal theories face this kind of problem, too. Though quantum mechanics is true in micro world, it hardly affects the macro world.

Factual arguments state that our world is either deterministic or probabilistically indeterministic or else. It is very rare in literature recently. Pereboom argues in this way, which can be summarized below. [Pereboom, 2001; 2007b, 469]

Either Deterministic or probabilistically indeterministic form of scientific naturalism is true according to scientific evidence.
The truth of these scientific naturalisms entails that all actions we perform are the result of processes that traced back to factors beyond our control (The past before we born or chance). If the act is the result of processes that traced back to factors beyond the agent's control, then the agent doesn't deserve blame or praise for the act. Thus we can't deserve praise or blame for our actions.

There are also experiments that showed that free will is a illusion besides theoretical objections. Smith [2011] stated that Haynes and Libet successfully suggested that some simple decisions are not under our conscious control, which contradicts to the belief that we have free will. You may have thought you decided whether to have tea or coffee this morning, for example, but the decision may have been made long before you were aware of it. This is a new challenge to the concept of free will. However, says Mele, the majority of philosophers debate the interplay between freedom and determinism—the theory that everything is predestined, either by fate or by physical laws —but Roskies says that results from neuroscience can't yet settle that debate. They may speak to the predictability of actions, but not to the issue of determinism.[2]

In this paper, I wish to find the evidence of free will that is partly specific by investigating a serious of the following propositions.
Propositions:
Suppose our world is govern by quantum indeterministic laws.
1. If we desire for a state, we desire for that state to happen not with the probability of less than 1 but 1.
2. Thus the desired probability of occurrence of desired state is 1.
3. In reality, the probability of occurrence of it is less than 1since it didn't occur (suppose the desire is unsatisfied, which is very common according to our experiences. Also suppose our world is govern by quantum indeterministic laws.).
4. Thus only one of them is the probabilistically determined probability.
5. If the desired probability is not a divergent one (which means "different from the probabilistically determined one") but the probabilistically determined one, then there is a state that failed to occur with the probabilistically determined probability, which states that quantum indeterminism is not true. Thus some desires must be desires for a divergent state.
6. We have a desire for a divergent state and it is satisfied. Thus quantum indeterminism is not true in our world.

[2] To be more positively, Mele takes a project of "The Philosophy and Science of Self-Control" to address the relation between free will and science of self-control.

We want to add evidence to indicate whether (6) is possible given others. That is to say, there may be some events or probability distribution of them that can't be computed from the past (before we born) and physical law. Thus neither determinism nor probabilistic indeterminism is true in our world. This is just a negative answer to what our world is. We only give a plausible argument from some facts. Let "a divergent state" mean "different from a determined state". Then (6) is changed into a proposition against determinism. Similar analysis is given in this paper, too.

Before we start, let's take a look at the value or aim of free will. I believe this presents a better start for seeking the evidence of free will and a plausible condition for the incompatibilities of free will with both determinism and quantum indeterminism.

Kane reports that most ordinary persons start out as natural incompatibilists. The idea that freedom and responsibility might be compatible with determinism looks to them at first like a "quagmire of evasion" (William James) or "a wretched subterfuge"(Immanuel Kant) [Kane, 1999]. In my experience, when they learned that determinism is a true aspect of our lives, they often seemed to have a bleak feeling about themselves. Perhaps this was because it seemed that their future is determined by the unchangeable past, since because of this, how could they diverge from their determined future? If they are determined to have a miserable life, how could they struggle to escape this inevitable future? Thus, it is valuable that there is a divergence from deterministic laws, though this is not possible if determinism is true. In addition, quantum indeterminism threatens us too. If a disaster whose antecedent probability of occurrence is 0.82 according to quantum indeterminism is about to occur, we might become unhappy about this point and seek some way to ensure our chances of surviving. However, this result is not possible according to quantum indeterminism.

If determinism is true, we are destined by the remote past and natural law. Free will can help us escape from that destiny and affect the physical world. Thus even if some people are determined to encounter catastrophes, free will can guides them to find ways to escape disasters. If some outcomes of a quantum event are disasters, then it would be desirable if free will helped us to reduce the probability of these occurrences. Kane also raises this concern:

"Is freedom compatible with determinism?" —the question is too simple and ill-formed. The reason is that there are many meanings of "freedom" and many of them are compatible with determinism. Even in a determined world, we would want to distinguish persons who are free from such things as physical restraint, addiction or neurosis, coercion, compulsion, covert control or political oppression from persons who are not free from these things; and we could allow that these freedoms would be preferable to their opposites even in a determined world. [Kane, 1996]

Here Kane stated that a freedom that is incompatible with determinism is preferable. In other words, they are more favorable than their opposite values. Another reason similar to Kane's, is that it is valuable for us to have a freedom that is incompatible with quantum indeterminism. Clark also makes this point: "If it (the indeterminism provided)won't hurt, it won't help." [Clarke, 2008]

As we and others[Pereboom, 2001; Strawson, 2010] have stated, for us to have moral responsibility, there are events that can't be traced back to factors beyond our control. This we term it as a divergence. Obviously evidence is needed for this claim.

2. The desire for a divergent state is a key for free will

Let us take determinism to be the view that given the complete state of the world at one point in time with conjunction to natural law, the state of the world at every future point in time follows logically. Or interpret it as: the state of the world at every future point in time is uniquely determined by the previous states of the world as a matter of natural law. Here the state of the world is a state at a time t.

Paul Thiry D'Holbach, one of the leading figures of the French encyclopedistes, presented the cosmos precisely as a network of interlocking causes and effects. The universe, he wrote, "reveals to us an immeasurable and uninterrupted chain of causes and effects" [d'Holbach, 1770]. Thus, if determinism is true, the future state of the world is determined (by the past as a matter of natural law). That state is not only determined but also holds since it is the future state of the world. Thus we can analyze determinism into two conjunctions:

A determined state about each future time point is computed from the past and natural law. (1) That determined state obtains. (2) Thus, if a future state can't be traced back to the remote past and natural law, it is enough to show that (2) is false.

Let us understand quantum indeterminism as the indeterminism introduced by the standard interpretation of quantum mechanics. On this interpretation, the world is governed by statistical laws which are also strict laws following Davidson. Thus all the outcomes of antecedent events happen because of non-trivial probabilities, which are given by these statistical laws and the antecedent event. Here "non-trivial" denotes that the value of them should not all be 0 or 1 for capturing the idea that it is essential to probability that, at least in principle, it can take intermediate values. [Hájek, 2012] If some outcome is probabilistically determined by an antecedent event, then given the antecedent event, the probability of its occurrence is static given the statistical laws. In other words, if this probability is 0.3, then for a large number of instances it is correct to expect that the outcome happens close to 30 percent of the time. The words "probabilistically determined" used in this way is the same as how Kane understands indeterminism: "Indeterminism is consistent with nondeterministic or probabilistic causation, where the outcome is not inevitable." [Kane, 1999]

Similarly to determinism, Indeterminism can be analyzed into two conjunctions:

A probability distribution of states about the future is computed from the past and natural law. (3) This probability distribution obtains. (4)

Similarly, for an event not probabilistically determined, only (4) is needed to be false.

With these interpretations of determinism and quantum indeterminism in place, we return to the evidence of divergence. Let's take a look at events involving free will. It is common to see an event

involving free will as a process: deliberating on some reasons, forming a desire, performing some overt bodily actions, and testing if we will be able to succeed and fulfill our aims.

At first, a desire is a desire for a (desired) state of affairs.

"According to most theories, desires are always desires for conceivable states of affairs. A desire for tea is a desire for a certain state of affairs one has in mind: that one drinks some tea. A desire for a new pair of skates is likewise a desire for another state of affairs: that one owns a new pair of skates. And so on. This idea is also expressed with phrases such as 'desires are attitudes toward propositions' or 'desires have propositional content." [Schroeder, 2012]

For example, if Rose desires candy bars, then there is only one answer of the following five states of affairs that will provide the solution in which her desire is satisfied:

1. Rose possesses, but does not eat some candy bars in the near future.
2. Rose eats some candy bars in the near future.
3. Rose doesn't eat some candy bars in the near future while the probability for her to do this is 0.8.
4. Rose eats some candy bars someday.
5. Rose possesses, but does not eat some candy bars in the near future.

It seems that only 2 would satisfy Rose's desire. This gives us grounds to say that Rose's desire is for a state of affairs: that she eats some candy bars in the near future. An additional observation is that this state of affairs is possibly not realistic. For example, if only 4 represents Rose's reality, then the desired state is certainly not a feasible outcome. One of the other three observations that need to be addressed is that the desired state corresponds to sometime points which occur in the near future at the time that she began to desire candy bars.

The second observation is that: A desire is satisfied if counterpart of 2 is true. (SCOD satisfied condition of desire)[Schroeder, 2012]

The last observation is that: If we desire for a state, we desire that state happens not with the probability of less than 1 but 1.

Let's take a look at the concept of "state of affairs" since we used this definition above. A state of affairs: a way the world is (situations, being able to exist without obtaining) [Plantinga, 1974, 44; Pollock, 1984, 52]. It can be understood as a possible scenario.

For simplicity, I use "desire for divergent state" to denote "desire for a state that it and the determined state can't both be the obtaining state," in the case of determinism. Note that both of these two states occurring at about the same time and the same place can obtain, if they are the same. Thus if there is a desire for a divergent state, then it is a desire for a state that is not the same as the relevant determined state.

Similarly for the case of quantum indeterminism, the desired state may not be the same as the probabilistically determined state as long as they are different states in a normal sense or their probability of occurrence are different if they are the same. For simplicity, in the case of quantum

indeterminism, I use "desire for divergent state" to denote "desire for a state that it and the probabilistically determined state can't both occur with the same probability."

We provide evidence for a weak divergence and a strong divergence, though the latter is not ideally proven.

A weak divergence consists of a desire for a divergent state that is not actually satisfied. Though this is not an evidence for the direct falsity of determinism & quantum indeterminism, it is a divergence in the sense that the actions we perform to realize the desire is a failed try to change the state of the world from determined or probabilistically determined states. In fact, we can be responsible even if we failed. Thus this is also a divergence while it is a failed divergence. A strong divergence results from a desire for a divergent state that is actually satisfied. With such an example, we can say that we can change the world from determinism and quantum indeterminism to a desired state.

In this paper, I will focus the evidence for the case for determinism since analysis of the case for indeterminism is quite similar. Because of this, I will only provide some necessary words to the latter.

2.1 Our world doesn't constrain the desired states to be only the determined states of the world

Let's see an attempt that is well known: perpetual motion machine. A perpetual motion machine is a hypothetical machine that can do work indefinitely without an energy source. This kind of machine is impossible, as it would violate the first and second laws of thermodynamics. [Derry, 2002, 176; Roy, 2002, 58] Thus, the existence of such machine is against natural law. Though no such machine has ever been built, many have the desire to create one.

We get two states of the world: one is the real state of the world where there is no perpetual motion machine being built, the other is the desired state that there is a perpetual motion machine being built. Only one of them obtains that there are no perpetual machines being built.

The question is which one is the same as the determined state of the world according to natural law? Or is the desire a desire for a divergent state?

Clearly there are no perpetual motion machines being built is the determined state, and obtaining one since is not even possible according to natural law. Similarly, it is also bound to be the case in the quantum world since a perpetual motion machine is also impossible according to quantum mechanics. So since there are no perpetual motion machines being built it is also not an obtaining state according to quantum mechanics. The obtaining and determined state is that there are no perpetual motion machines being built.
Thus we have evidence that there are desires for a divergent state: desire for perpetual motion machine. Similar cases include desires for a Golden Mountain, round squares, meeting aliens, etc.

This forms firm evidence for the claim that determinism doesn't constrain desired states to exist only within determined states of the world. (This is similar to the case of quantum indeterminism since a perpetual motion machine is also impossible if quantum indeterminism is true.) In addition, I have another example for the evidence of desire for a divergent state. Let's consider unsatisfied desires. The first thing to mention is the truism of them. We have desires almost every day: desire to have a birthday party, desire to have progress in somebody's career, etc. Many of them are unsatisfied. In fact, large numbers of desires are satisfied desires.

Example 1 of an unsatisfied desire:

Tom wanted to drink some water. Then Tom found no water, but an apple after some action or changed his mind without any action. Tom ate the apple.

These states are listed according to the time sequence of them.

Observations from the above example:

The desired state is not realized in reality. If not so, it is a satisfied desire according to SCOD.
The real state of the world in the near future of the desire is not the same as the desired state.
Only one of them is the same as the determined state by definition of determinism and (2).

If the desired state is not a divergent state but a determined state, then there is a determined state that failed to hold, which is a contradiction to definition of determinism.

For if this is so, then even a virtual state can be a determined state and thus determinism fails to have any bearing on reality.
Thus each unsatisfied desire is a desire for a divergent state if we want to believe that determinism is true.

Let's turn to the case of quantum indeterminism.

Example 2 of an unsatisfied desire:

Tom wanted to drink some water. Then Tom found no water, but an apple after some action or changed his mind without any action. Tom ate the apple.

We have the following observations:

1. If we desire for a state, we desire for that state to happen not with the probability of less than 1 but 1. (A previous observation at the beginning of Section 2)
2. Thus the desired probability of occurrence of desired state is 1. The desired state is "Tom's drinking some water".
3. In reality, the probability of occurrence of it is less than 1since it didn't occur.
4. Thus only one of them is the probabilistically determined probability.

5. If the desired probability is not a divergent one but the probabilistically determined one, then there is a probabilistically determined state that failed to occur with the probabilistically determined probability, which states that quantum indeterminism is not true.

Thus each unsatisfied desire is a desire for a divergent state if we want to believe that quantum indeterminism is true. Combined with the former observation, we have to accept that each unsatisfied desire is a desire for a divergent state whether determinism or quantum indeterminism is true. This is the second evidence for the claim that we can have a desire for a divergent state.

2.2 Weak divergence

As I have defined, weak divergence is the satisfaction of these two claims:

1. Somebody has a desire for a divergent state.
2. The desire is not satisfied.

We saw that the desire for a perpetual motion machine is such a desire, which satisfies these two claims. And if determinism is true, each example of unsatisfied desire is such a desire, too.

Though we have no evidence for direct falsity of determinism & quantum indeterminism from this, it is a divergence in the sense that the actions we perform to realize the desire is a failed try to change the state of the world. Exemplified by the desire for a perpetual motion machine, the determined state of the world is that there is no such machine, while there is also the desired state by those people trying to build one as if such a machine were possible to build. Thus the desired state is different from the determined state.3

If they had succeeded, the state of the world would not be determined by the past and physical laws. (Counterfactual analysis of weak divergence)

In fact, we can be responsible for the actions required to satisfy a desire even if we fail in our attempts to reach it, because this is also an attempt to diverge from determined state even though it is a failed divergence.

For example, those who tried to build perpetual motion machines can be said to make bold and failed efforts to change the determined world, and it makes good sense to say so.

In addition, many divergent states are as easy to realize as determined ones. Suppose a door is determined to be open at some future time. Then the door's closing at that time is a divergent state. That is also easy to realize. If someone chooses this as his or her desire, then divergence is expected.

[3] Whether the desire for a divergent state is determined or not doesn't matter, it is weak divergence as long as that desire is a desire for a divergent state. This shows that Libet and other neurobiologists might be too quick to form the idea that free will is an illusion.

Counterfactual analysis of weak divergence is prime facie very similar to what compatibilists give by their conditional analysis:

"Since determinism is a thesis about what must happen in the future given the actual past, determinism is consistent with the future being different given a different past." [McKenna, 2009]

However, there is a tracing-stop at the time of desiring when I use the denotation of desire for a divergent state:

From an unsatisfied desire for a divergent state, we may derive these counterfactuals: if that desire (for a divergent state) were satisfied, a divergent state would obtain.

We can trace this back further: if the agent had taken more care, her desire for passing an exam would be satisfied.

However, we cannot trace back further to unmake that desire:

If the desire for a divergent state were not made, then this desire would be satisfied.

Certainly this is false, because it is ridiculous to say that a desire that doesn't exist is satisfied.
This is not to say that you cannot trace back further in other respects, but that the desire for a divergent state should hold necessarily for divergence in the same way as satisfying a desire for a divergent state. It is far beyond the scope of this paper.

There is no such tracing stop for compatibilists:

Determinism is consistent with the future being different given a different past. Compatibilists state that if someone has different desires than they had originally, and then accomplishes these new desires, that the world would be different, because this new desire is an alternative to the previous one.

Thus the satisfaction of desire for a divergent state doesn't need to be traced back further to the time of making that desire. It needs only to change something afterwards.

If we have desires for a divergent state, we have to fail in our attempts to satisfy those desires in order for determinism to be true. That is to say, that as we satisfy a desire for a divergent state, that there is also a divergent state that occurs with obtaining.

Thus we have to admit:
Any satisfied desire is a desire for a determined state.
This is intuitively not plausible since we desire many things and we normally don't know and don't consider whether our desire is the determined state.
In fact, with careful analysis, I can show that this actually involves highly implausible coincidences for this to occur. This is provided in detail in the next section as a proof for strong divergence.

2.3 Strong divergence

In case the world is a deterministic world:

1. From section 2.1, I show that each example of desire for an impossible state is an example of desire for a divergent state.
2. Each time we have an unsatisfied desire, we have a desire for a divergent state. (That is to say, we have a desire for determined state and failed to satisfy it, and then there is a determined state that occurs even without obtaining.)
3. Each time we have a satisfied desire, we have a desire for a determined state. (If that is not so, then there is an obtaining non-determined state that derives in the same way as the case of unsatisfied desires.)
4. If the mechanics of forming desire is the same in the case of desire for an impossible state (unsatisfied desires and satisfied desires) it seems to involve a wild coincidence for 2, 3 to hold. This is especially true for 3, based on the fact that the examples of unsatisfied/satisfied desires are very large. I will explain the reasons below.
5. Failure of 2 or 3 entails that determinism is not true or has no decisive bearing on reality.

Note 1 is not needed to derive 2 and 3.

Let me explain this in more detail. Before we form a desire, it is highly possible we think about many possible scenarios of the near future and choose one from that. Since determinism doesn't constrain desired states as only determined states, where only one of them is the determined state, we have a good chance to choose the non-determined state. For example, imagine Tom is playing chess with somebody. Before he decides to choose what to do next, he considers every possible scenario. At most, one of them is the same as the determined state. Since there are many possible steps if not an infinite number, it is probably true that none of them is the same as the determined state. Thus we should have much more desires for a divergent state than we should have desires for a determined state. Thus 3 is more implausible than 2. The failure of 3 decisively sentences the death of determinism: there is a non-determined state of being realistic in the world, and this is the desired state.

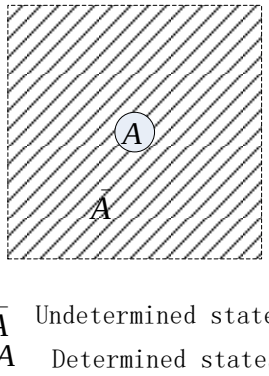

Figure 1. Venn diagram of the set of determined states and the set of undetermined states

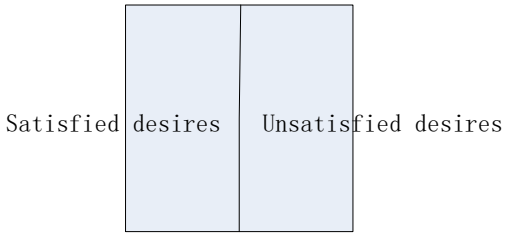

Figure 2. Venn diagram of the set of satisfied desires and the set of unsatisfied desires

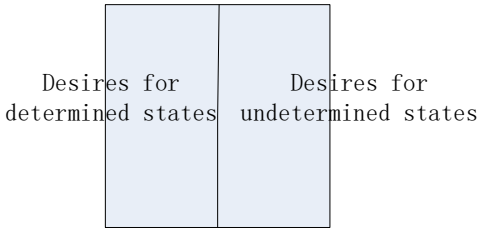

Figure 3. Venn diagram of the set of desires for determined states and the set of desires for undetermined states

Someone may worry that having unsatisfied desires signals that the desired state is a divergent state, and having satisfied desires is the sign that the desired state is a determined state. Of course this is highly implausible since it would result in a contradiction: if so the probability of choosing the determined state as the content of our desire is close to 50% (1) because many desires are satisfied (I can estimate that nearly 50% of our desires are satisfied). However, we have many options to choose from, so the probability for us to choose the determined state as the content of our desires is most likely far less than 50%.

Figure 1-3 expresses this analysis. Since the number of determined states is extremely smaller than that of undetermined states and the number of satisfied desires occupies almost half of all desires, we should accept that determined states are much easier to be chosen as desired states and this seems highly implausible.

Let's dig a little further to show there is strong divergence in some other ways.

The first thing I should address is that we can be certain we will satisfy our ordinary desires. For example, it is very easy for a healthy adult to do the job of opening or closing the door. Some may worry that there are possible threats of a catastrophe occurring. Let's restrict this job as doing something on a normal day by a healthy adult who we will call, John.

Suppose that John opens and closes the door a thousand times. Each time he formed a desire and tried to satisfy his desire. He succeeded every time. In this case, it is plausible that if his desire changed, the outcome will change according to his desire. In another word:

His desire is always a correct sign of the door's state (if the door is open or closed) in this situation. (ASD always satisfied desires)

Since each time at most one of these two outcomes represents the determined state, at least one of them is a divergent state. This divergent state is as easy as the determined one to realize.

Now imagine:

John is a Laplace's demon: he can predict which outcome will occur in the near future.
John chooses his desire in this way: if he predicts that the closed door is the determined outcome by vast computing, then he chooses opening the door as his desire.

Since using ASD, the door is open, then this is a contradiction of determinism.
As we have stated, strong divergence is true iff there is a satisfied desire for a divergent state. In summary, we give a very weak argument:

Many desires are desires for a divergent state.
Many desires are satisfied desires.

Thus it is possible that there is a satisfied desire for a divergent state. This is very weak but is helpful for us to summarize our intentions.

So far I have concentrated on the value and end of free will: divergence from both determinism and quantum indeterminism, even though I have strong evidence for weak divergence and have very plausible evidence for strong divergence, I have not explained what indeterminism looks like and where it starts. Let's leave this deeper analysis to another paper. Here is a primary analysis of normal reasons to form desires:

As shown above, I have shown that there is a tracing-stop for desire of a divergent state:

If the desire (for a divergent state) were satisfied, a divergent state would obtain.

However, we cannot trace back further to unmake that desire:

If the desire for a divergent state were not made, then the desire would be satisfied. This is ridiculous.

This shows the character of indeterminism that we have studied: it is necessarily for us to first have a desire no matter what the other factors are surrounding it.

3. Objections

One may objects in this way: For example, if the brain is considered as a physical machine, the states of brain and also the desires of people will also be determined. In this case, the free wills are just the products of the internal states of the machine.

At first, "the states of brain are determined" is never decisively proved though it is plausible. We don't provide direct objections. We prove that we will encounter a highly plausible contradiction if we accept this:
(If we accept this,) We have to accept that it is determined that the desired state is a (probabilistically) determined state in any case of satisfied desires. Besides the contradictional air it involves, based on the vast number of satisfied desires, it will involve highly implausible coincidences to accept that all satisfied desires are desires for determined states since the agent is not necessarily going to consider the determined states.This is not an affirmative answer to what our world is and not an answer to why the desire is not determined. It states only that determinism is probably false in our world.

Someone may still have confusions. Why is it possible that determinism is not true even if deterministic laws still holds? As stated above, this is beyond the scope of this paper. However, I have a vague answer to it. Strawson told us that the only way is that we are *causa sui* by quoting Nietzsche's comment about its impossibility. We are the cause of ourselves[Strawson, 2010]. Inspired by this, the way to save free will is through the fact we are media. Desires as mental states are media that can be directed to a desired state which is a state in another causal chain different from the one in our world. (States in any counterfactuals are such examples.) Why this is helpful? The desired state is a virtual state which can't result in anything without some media. It has no cause in our world. Thus it is a source. It should have no positive effect to our world because it doesn't exist in our world. With desires as a media, we brought them into our world. Thus the required *causa sui* is not we cause ourselves, it is a representation of another source causes its existence with the help of us as a media. It is only *quasi causa sui* and seems to avoid contradictions faced by *causa sui*.

Someone may get the idea that a desire for a divergent state is the source of the new causal chain. This is a misunderstanding because it only serves as an evidence for falsity of determinism and quantum indeterminism in this paper though it is crucial for having free will. Can it be a source of a new causal chain? It seems not. After all, we are masters of our desires.

4. Conclusions

What is gained? Weak divergence shows that there are efforts to make events happen that are (probabilistically) determined not to happen, and that there also are efforts to stop events from happening when they are (probabilistically) determined to happen. Whether the desire for a divergent state is determined or not doesn't matter, it is weak divergence as long as that desire is a desire for a divergent state. This shows that Libet and other neurobiologists might be too quick to form the idea that free will is an illusion. Strong divergence shows that determinism and quantum indeterminism does not govern the events that involve a desire for a divergent state. Based on the vast number of satisfied desires, I argue that it will involve highly implausible coincidences to accept that all satisfied desires are desires for determined states since the agent is not necessarily going to consider the determined states. Hence, it is hard to believe that all satisfied desires are desires for determined states and will not introduce divergences from natural laws, whether they are deterministic or statistical. If we are right, at least a divergent state as desire contents is specific and realizable in computer, while a desire is still mysterious to us in some way.

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