Is free will compatible with randomness?

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It is frequently claimed that randomness conflicts with free will because

> *[i]f our actions are caused by chance we lack control*

and

> *[r]andomness, the operation of mere chance, clearly excludes control.*

How "powerful" is this type of argument?

An agent is an entity that can make a choice (decision) in some context.

Choice is the act of picking an element from an abstract set of objects.

The context $\mathfrak{C}$ gives the environment and the relevant constraints for the choice to be made. A context may include the position in space and time where an agent must make a choice, as well as various constraints the objects should satisfy. The object that the agent picks is called the chosen object in the context $\mathfrak{C}$.

Agents, objects, contexts and choices: examples

Consider first a girl at a pet store looking to buy a pet. Here the agent can be taken to be the girl, the objects are the pets available for purchase in the shop, and the context is the shop at some time; the girl can choose any pet.

On the other hand, an individual animal in the shop can be an agent in the same context: the objects are the foods the animal can eat and a choice consists in selecting one of the available foods.

In the same context, the same animal can be an agent for the set of actions $\{\text{eat, not eat}\}$, where the choice consists in deciding on an action in that set.

The idea of context is crucially related to the idea of possibility. The choices the agent can make are assumed to be contextually possible, i.e. possible in the given context.

They may or may not be considered rational, morally justified or politically acceptable.

Contextual possibility should also be distinguished from other notions of possibility.

Example: an agent may have the ability to scuba dive, even though it is not possible in a given context because, say, the agent is not close to water.

Contextual possibility is also different from Alfred Mele's intentional contextual possibility in which the agent has sufficient control over her ability to deliberately select certain outcomes.

Intentional contextual possibility implies contextual possibility, but the converse does not hold. For example, an agent can intentionally flip a coin, but while it is possible in the context for her to get heads she cannot intentionally get heads. It follows that she cannot freely choose to get heads.

A definition of free will: scope

In the vast literature on free will a lot of misunderstanding comes from the fact that free will has been understood in numerous different ways.

In what follows we try to avoid confusion by working with a simple, two-stage, contextual (not absolute) definition of free will.

This is not the uniquely right definition: its goal is mainly to propose a more precise and detailed framework for studying the relation between free will, determinism, and randomness.

A definition of free will: intuition

The definition of free will models the idea that an agent has free will in some context if it has the ability to make a decision that is not completely determined by or the result of prior events.

An agent A acted freely in the context $\mathfrak{C}$ with respect to the set of objects $O_{\mathfrak{C}}(A)$ if A could have acted differently to the way it did and A had full control over the outcome of the choice. This means that in the context $\mathfrak{C}$:

- **Possibility Assumption (P)** The set of objects $O_{\mathfrak{C}}(A)$ available to A contains at least two elements and every choice for A is possible in the given context.
- **Choice Assumption (C)** The agent A has full control over which of the objects in $O_{\mathfrak{C}}(A)$ to choose.

The main point of **(P)** is that in context $\mathfrak{C}$ there are at least two objects in $O_{\mathfrak{C}}(A)$ available to A to choose from. **(P)** thereby guarantees that the act of choice is meaningful and can lead to different outcomes, something that is impossible if $O_{\mathfrak{C}}(A)$ has fewer than two elements.

- $O_{\mathfrak{C}}(A)$ depends on the context $\mathfrak{C}$ and can vary with $\mathfrak{C}$ – by changing the context $\mathfrak{C}$ some elements may disappear and new elements can be added to $O_{\mathfrak{C}}(A)$.
- The identity of $O_{\mathfrak{C}}(A)$ may not be completely known by A: that is, A may not exhaustively know what, in the context, is possible for her.

The assumption **(C)** supplements **(P)** by claiming that the agent has full control over which option to choose.

The 5th BCE philosopher Leucippus wrote that

> *"Nothing occurs by chance, but there is a reason and necessity in everything."*

Similarly, under the influence of mathematician A. de Moivre, Hume called chance a mere word:

> *" . . . there be no such thing as Chance in the world."*

- There are no random events in nature. Randomness is only a theoretical concept which is defined and produced in deterministic ways: it is not a direct cause of actions.
- There is a process conception of randomness based on the idea that random objects or events are the outcome of a chancy process. Quantum randomness is an example.
- There is a product conception of randomness based on the idea that random sequences of objects or events lack any discernible or explicable pattern.
- Product randomness is studied in algorithmic information theory which proves, in particular, that true randomness does not to exist. There are only degrees of randomness (based on resources).
- Process randomness can be validated only by product randomness.

Indeterminism does not imply randomness and randomness does not imply indeterminism:

- pseudo-randomness or coin-tossing (chaoticity),
- Omega number or Schrödinger equation.

Quantum randomness justification by the indeterminism of quantum measurements is a fallacy.

Random selection was the principal way of achieving fairness in 5th BCE Athenian democracy ("rule by the people") which was based on isonomia ("equality of political rights").

Athenian democracy was run by the people: administration was in the hands of committees randomly allotted from the people and regularly changed.

Greeks considered elections to be undemocratic because citizens chosen on merit or popularity contradicted the democratic equality of all citizenry.

Because of random allotting, no one could know who would be selected: this prevents corrupt practices, e.g. buying votes.

Arguments based on "pure/true randomness" are unsound as they rest on vacuous concepts.

An example is Hume's and Schlick's ontological thesis expressed in

Eddington's words: *There is no half-way house between random and correlated behavior. Either the behavior is wholly a matter of chance, in which case the precise behavior within the Heisenberg limits of uncertainty depends on chance and not volition. Or it is not wholly a matter of chance, in which case the Heisenberg limits . . . are irrelevant.*

Popper disagreed: *Hume's and Schlick's ontological thesis . . . seems to me not only highly dogmatic (not to say doctrinaire) but clearly absurd.*

Randomness is incompatible with freedom: using randomness violates **(C)**

A more interesting, but still unsound, argument is the following: randomness exists (in various degrees), so if an agent's actions are caused by randomness, the agent lacks control, so the assumption **(C)** is violated.

1. Assume **(P)**.
2. An agent A has free will with respect to $O(A)$ in the context $\mathfrak{C}$ if the assumption **(C)** is satisfied.
3. So A has ultimate control of which object in $O(A)$ to choose.
4. If the object was chosen randomly (to some degree), then no one had full control of which object in $O(A)$ was chosen.
5. Hence, A cannot not have full control on which object in $O(A)$ to choose.
6. Therefore, A has no free will with respect to $O(A)$ in the context $\mathfrak{C}$.

Randomness is incompatible with freedom: using randomness violates **(C)**

Unfortunately, this argument does not offer a clear explanation of how the object selected was chosen sufficiently randomly to prevent A having control over its decision.

Rather, it is often claimed that **(P)** is inherently able to provide this. However, randomness does not "float around", and is not something that is somehow "imposed on the agent". Randomness is just produced, and then used by the agent in coming to a decision. To make random decisions the agent needs to use a random generator, which is a device producing random bits of a certain quality (but never "truly random bits"); there is no alternative.

Randomness is incompatible with freedom: using randomness violates **(C)**

According to our definition of free will, the detailed process used by the agent A to choose an object in some context $\mathfrak{C}$ where more than one object is available for selection is irrelevant: with **(P)** in place, all that is needed for her to choose freely is satisfaction of condition **(C)**. For the purposes of making a decision, using a random generator is no different than using the advice of a friend or getting more information from Wikipedia!

For clarification we look at the process of choosing at random. We henceforth assume that **(P)** is satisfied and consider first how a random generator may interact with an agent's decision making process, and second how the quality of the randomness generated may affect the agent's freedom. With the former in mind, we discuss four possible cases of interactions between the agent and the random generator.

Four ways to use randomness

(0) A uses G which outputs x, but ignores the output and picks an element of $O(A)$.

(1) A uses G which outputs x, and, after first deciding whether to use x to pick an element of $O(A)$, A then picks an element of $O(A)$.

(2) A uses G which outputs x and continues as follows:
- A uses x to determine whether to use G or not,
- depending on x, A makes no use of G or uses G to produce another (independent) output y which becomes its decision (in the last case G actually takes the decision on A's behalf).

(3) A uses G which outputs x and its decision is x (G is used to take the decision on A's behalf).

In case (0) it is clear that A's freedom is not hindered by randomness. Still it is worth pointing out that there was a random element in her decision process (though it did not impact A's decision).

To show that case (1) does not undermine A's freedom, we restate that the information which A uses to make a decision is irrelevant to A's decision being free. A merely asks G for advice. In fact cases (0) and (1) are identical if A picks something other than G's output. In either of these cases however, A can consistently choose any element in $O(A)$ and, regardless of what G outputs, A has the final say on the decision. Hence, neither of these cases will disturb A's freedom.

Case (2) is a hybrid between the earlier cases and the substantially more severe case (3). In (2) A operates G to generate a random bit. Depending on what this generated bit was, G either stops (leaving A to make the decision) or uses G to generate another random element of $O(A)$ and chooses this element on A's behalf. Thus (2) will either reduce to (0) or (3) depending on the result of the first computation.

The point is that in cases (2) and (3), once A starts G, which object is chosen may potentially be decided by G rather than A. Is **(C)** fulfilled in these cases? Does the quality of random bits matter (e.g. if they form an incomputable sequence)?

The reason these cases seem to violate assumption **(C)** is because the agent gives up its final decision, not because the agent gives up its final decision to a random process. Asking another agent to make a decision on its behalf is no different than asking a random generator. Notice that whether A retains its freedom in asking another agent B to make its decision, is a delicate issue, one which is, in practice, judged on a case by case basis. This shows that from the point of view of free choice, the role of B is as detrimental to A's freedom as the role of G.

Giving up freedom to randomness is as harmful as giving up freedom to any other agent: A retains its freedom when it gives up its decision to B if and only if A retains its freedom when it gives up its decision to G.

Similarly, even if A does not voluntarily give up its decision, another agent B choosing an element of $O(A)$ is no different than some random generator G doing the same. Thus, the fact that indeterminism allows for randomness should not lead us to conclude that free will is impossible any more than the fact that there are other free agents which are capable of choosing on behalf of others.

We argued that randomness is compatible with free will so long as free will is itself metaphysically possible.

Our arguments are relative and do not answer the main philosophical question about free will, namely does free will exist and, indeed, can it exist?

The arguments presented are not definitive: more refined models of free will are likely to reveal aspects hidden by the simplicity of the proposed model.

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