Interface Model for Mental Monism

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Abstract

According to the theory of mental monism, reality consists ultimately of nothing but conscious minds. What we conventionally take to be the physical world is a construct. Within the construct, each personal mind has an avatar, which we conventionally take to be the human body. As the construct as a whole obeys physical laws, the avatar is likewise orthonomically constrained. At the same time, in order for the avatar to serve as such, it must allow the mind to read its state and affect its state: in other words, the avatar functions as an interface between the mind and the physical construct. In this paper, I propose a model for how the avatar can perform this function while constrained by physical laws. The specific component of the avatar that is readable and controllable by the mind is referred to as the portal. A fundamental point (argued by Lloyd 2019) is that the portal must be spatially non-separable, that is a physical simple. A second fundamental point is that it must be non-deterministic. I shall argue quantum measurement is a natural locus for the mind-body portal.

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1. Introduction

According to mental monism, the physical universe does not exist as a mind-independent reality, but is only a construct, a notional system that captures the observable laws of the manifest world as consciously experienced. Causation exists only within the mental domain. What we naively take to be causation in the physical domain is a shadow of actual causation in the mental domain.

Modern virtual-reality systems provide an excellent analogy. Imagine playing billiards in a virtual world. Your virtual arm holds a virtual cue, which strikes a virtual ball, which rolls along and hits other virtual balls. Virtual kinetic energy is transferred from ball to ball in accordance to Newton's laws of motion. It appears as if the initial impact of the cue causes a chain reaction of knock-on effects. Indeed, if one is immersed in this game, one might forget that it is a simulation. Really, the rendered images of billiard balls do not, and obviously cannot, perform any role in causation. Their motion is an epiphenomenon of causal processes in the electronics of the computer in which the simulation is being executed. A very similar picture is presented by the mental monist: the world around us is a rendering of underlying conscious processes in a system that Lloyd (1999) called the 'metamind', which has historically borne such religious titles as 'God' (Berkeley) and 'Saguna Brahman' (Shankara). What we take to be physical causation is a rendering of actual mental causation.

From the user's perspective, the virtual-reality mechanism is transparent. If you wish to move a virtual billiard ball from one position to another, you do not think about the underlying subroutines and data structures. Rather, your actions are framed to the virtual operations of your avatar.

In virtual-reality, you are not literally inside your avatar. Your avatar is a virtual object to which your real actions and perceptions are linked by mechanism extraneous to the simulation of the virtual-reality world. If, in the underlying computer, we were to create the appropriate data structures, we can create a new avatar and invite new players into the virtual-reality world.

Likewise, in the mental monist doctrine, you are not literally inside your body. Your body is a like a physical avatar for your conscious mind.

2. General properties of conscious machines

By ‘body’ I mean any macroscopic entity in the physical construct. A human body, an animal, a robot, a desk, these are all bodies. Of course the bodies that are of interest to us here are those that possess the cognitive ad motor circuitry to detect the environmnet and carry out complex actions, which basically limits us to living organisms and artificial computers.

A body is said to ‘embody’ a conscious mind if there is a mind can systematically maintain an awareness of some part of the body, and also control some part of the body.

A ‘classical body’ is one that obeys classical physics, that is one that can be explained without reference to quantum physics. Such a system operates from moment to moment in a completely deterministic manner on the basis of prior states and known inputs. In reality, there are no strictly classical bodies as we live in a quantum-mechanical world. Nonetheless, at the macroscopic level most bodies approximate to classical bodies as the effects of quantum physics can be neglected in normal circumstances. For the purposes of his essay, we will look at an interface model in a classical body first, for expositional clarity. We can establish one of the principles of the interface model without referring to quantum physics, as doing so simplifies the account. Quantum physics will be reserved to the next section.

A ‘controlled’ classical system is whose initial state is wholly known, and (because it is classical) whose state transitions are deterministically driven from one moment to the next. A well-formed computer program is a perfect example of a classical machine. It begins in a certain state with all its memory areas initialised to known values; at each step, the logic of the program defines exactly what actions to take, which lines of code to execute next, what memory variables to change, and what output to generate. Whatever known input is given to the program, its response is wholly determined by its logic and current state. A non-classical machine is one that does not fit this description. I shall argue below that a classical machine cannot embody consciousness, and then discuss two general types of non-classical machine (‘chaotic’ and ‘quantum’) and how they might embody consciousness. Finally, with reference to the principle of non-separability (Lloyd 2019, §4), I shall argue that a conscious mind can be embodied only in a quantum computer, be it natural or artificial.

2.1 Classical bodies, controlled

A ‘classical body is closed under laws of physical causation. The state at each moment is wholly determined by its antecedent state and its input. There is no causal gap into which non-physical consciousness can intervene and exert an effect. But consciousness states are not physical (see Lloyd 2018, §1, Lloyd 2006, and Lloyd 1999 for detailed arguments for this claim). Therefore a conscious mind cannot affect a classical machine. Even if the machine ‘had’ consciousness in some sense, it could never tell us about it, as all of its outputs are fully determined by antecedent physical causes. If a conscious mind were to make the machine do something different, then it would violate the laws of physics; conversely if the mind just makes the mind do what its own state already determines it to then that is not what we could call causation.

Therefore, a classical lacks the wherewithal to embody conscious states or operations.

2.2 Classical bodies, chaotic

We may consider two components of any deterministic system: the initial conditions, and the moment-by-moment progress of the system. In what I have above called a ‘controlled classical system’, the initial conditions are fully and precisely known. In such a system, every subsequent state and output of a system is determined and predictable for given inputs. As we have seen, this classical system cannot embody consciousness. I shall now consider a variant, which in principle could embody consciousness.

There is a particular category of deterministic system that are called ‘deterministially chaotic’, or simply ‘chaotic’. (The word is used in a mathematical sense, distinct from its everyday sense as a synonym of haphazard.) In a chaotic system, arbitrarily small differences in the initial state can be amplified into arbitrarily large effects. This is a radically different kind of dynamic from linear systems, in which an effect is proportionate to its cause. For example, on the billiard table, if I strike a ball with a certain force, then it accelerates at a rate directly proportionate to the force. A trivial example of a body that is profoundly unstable in one position is a perfect cone: whereas, when it placed on its base, it is very stable, and it would require an appreciable force to knock it over; but, when balanced precisely on its point, any force, no matter how small, will cause it to topple over.

The upside-down cone is thus profoundly unstable in the specific sense that an arbitrarily small perturbation can cause an arbitrarily large cone to fall. Of course, this cone unreal, as there are no perfect cones in the real world; it is also a trivial example and does not count as a non-linear system. A popular non-trivial case of a chaotic system is the atmosphere, and a familiar albeit fanciful illustration is that a butterfly flapping its wings in Malaysia could cause a hurricane in the Gulf of Mexico, because a temperature inversion in the air is unstable just like an inverted cone. Needless to say, the chaotic system that interests us is the human brain.

Profound sensitivity to initial conditions is not the only defining feature of a chaotic system. First of all, it is a non-linear dynamical system, that is to say a system whose behaviour is governed by non-linear differential equations. The usual way of thinking of such systems is by referring to its 'phase space', a concept devised in the 19th Century by Ludwig Boltzmann, Henri Poincare, and William Gibbs. Each state that the system can be in is represented by a point in an abstract space; and each degree of freedom of the system is represented by an axis in the abstract space. The state of our one is constitute by its position and The position of the cone, for example, could be represented by two axes: the declination, or angle that its central axis makes with the vertical (starting at 0°, or very close, and increasing toward 90° as it falls down); and the azimuth (express as, say, the degrees from North). For example, the state <0.001°,180°> would represent an inverted cone tilted very slightly due south. Given a phase space, the behaviour of a system is described by a topology, which defines the trajectories that a system a take through the space. In the case of the inverted cone, there is a central point at declination = 0°, and possible paths radiate outward from that point, as even the slightest deviation from the vertical will cause the perfect cone to topple over. These radiating lines will travel out in all azimuthal directions from North to South, and will terminate, not quite at 90°, but (90° - w) where w is the angular width of the cone itself. If any lateral force is applied to the cone, it will swivel around its point. There are thus lateral trajectories that intersect with the radial ones. Finally, if we add a third dimension to the graph to represent its potential energy, then we have a smooth surface, descending from a peak when the cone is on its tip, down to zero then it is resting on the floor.

No measurement can be infinitely accurate. Even in classical physics, where a measurement can be *arbitrarily* accurate, it cannot be *infinitely* accurate. For any

given delta, we could, in principle, devise a measuring instrument that can measure a target to within that delta. But we can, in principle, never devise an instrument that could carry out the measurement with zero error. Take the example, of the inverted cone. For any given delta (say, a millionth of a millimetre), we could measure the position of the cone and say that it is upright to within that delta of the upright position. But if the upside-down cone is even slightly off the vertical, it will topple. We cannot measure the position of the cone with zero error, hence we can never know the precise initial position, hence we cannot predict with certainty how it will behave—whether it will topple and in which direction it will fall.

The cone is a trivial example, but the same principle applies to more serious chaotic systems such as the brain: even if the system operates according to deterministic laws, the fact that the state of the system at any starting point cannot be measured with absolute accuracy means that it is not predictable.

If we were using an ontology of physical realism, then the brain's being a mathermatically chaotic system would not throw any light on the mind-body interface. But we are inquiring into an interface model within mental monism, which is irrealist about the physical world, and this creates an interesting opportunity.

In physical realism with classical physics, the complete state of the physical world at any time t before the present is determined and cannot be changed. In mental monism, however, the physical world is replace by the physical construct, which is a model on the basis of which the metamind renders our perceptions of the world. The metamind is required to populate the physical construct to the extent that it is observed. Not all of the physical world is observed, however: distant interstellar systems, such as planets of other stars, might never have been observed; and most of the fine details of the environment around our avatars has not been observed. It is an open question how much of these unobserved details the metamind bothers to determine. Nature in general is economical, and seems a profligate waste of resources for the metamind to populate its mental database with facts that nobody has ever observed and most of which will probably never be observed.

Therefore it is a reasonable hypothesis to suppose that the metamind populates the physical construct only with the facts needed to render the actual perceptions of conscious observers.

Consider, for example, the fine-grained molecular structure of the laptop that I am writing on. Nobody has cut open my laptop and put thin slices into an electron microscope, and I am pretty sure that nobody will ever do so. Therefore, it would be otiose for the metamind to populate these details. If, however, someone were to decide to do precisely this, then the metamind would have to populate those details just in time to render them. I shall call this the hypothesis of just-in-time world generation.

Since the fine-grained details of the physical construct are, by this hypothesis, indeterminate until they are rendered, we can consider a further hypothesis that a personal mind can send an instruction into the metamind to mould those details to its will. Although, according to the narrative within the physical construct, these details were fixed when the plastic and metal of the laptop were formed, in fact, they were not: they were left open and indeterminate until rendering, and a person's conscious mind might therefore have an opportunity to set or re-set those details.

This proposal nominally seems to involve going back in time and retroactively changing the past, but in fact operates wholly in the present. It just *seems* to change the past. Undoubtedly this requires a significant imaginative shift, as the notion that the physical past is really in the past is ingrained in our way of thinking. An illustration from virtual reality might help.

Imagine that you are playing a virtual-reality game that involves exploring an old castle. Within this game, you have obtained a key to a room that has been locked for four hundred years. You unlock it and put open the huge creaking door. Inside, you have to push past cobwebs hanging from the walls and ceiling. On a table in the middle of the room stands a huge, leatherbound book. Both the book and the table are covered in thick dust, accumulated over four centuries. You brush the dust off and open the book. Inside, you find, written in faded ink written with a quill, a message addressed to you personally, congratulating you on finding your way into the secret room in record time. At first, you are shocked: how could the author have known that you would come here four centuries later. Suddenly, you realise: although in the narrative of the virtual reality the book was written generations ago, in reality it is a virtual book, which is rendered in real time, and the underlying computer can choose to incorporate fresh contents in the present. As long as we maintain a clear distinction between the in-world time and the meta-world time, it is evident that

actions are really proceeding forwards in time, and only virtually acting backwards in time.

Let us now return to the brain. Suppose that at time t_0 a particular part of the brain could be in one of two unobserved states, S_A or S_B. At this point, we need not consider the nature of these states: they might be a state of ion distribution at the surface of a dendrite, or they might be a state of microtubule. The supposition is that no conscious mind has yet made an observation that would constrain the brain to be S_A or S_B. Let us further suppose that if the brain is in state S_A at time t_0, then the natural chain of neural cause-and-effect will lead to an action X_A at t_2; conversely if it is in S_B at time t_0, then cause and effect will lead to an action X_A at t_2.

Now, let us conjecture that when the world is at time t_1 a person can send a signal to the metamind, instructing it to populate the construct with state S_A at t_0 and backfills the chain of causation from S_A to X_A. It is possible to do this because the physical world is only a construct and its time dimension is virtual.

To an observer within the physical world, it looks like a gross breach of physical rules. Either (a) it would seem at first that at t_1 the mind had directly forced X_A to occur, over-riding the brain might have been disposed to do; or (b) on closer inspection, it would be found that X_A could occur only if S_A had occurred earlier, at t_0, and so it would appear that the mind had retrocausally forced S_A to occur. It is only when we step into the meta-perspective that stands outside the physical construct that we understand that the personal mind has not really acted retrocausally, but had caused the metamind to select a set of possible histories.

More formally, let U(t) be the set of possible states of the universe at physical time t. Let $U_O(t)$ be the subset of possible states that are consistent with all observations made so far by conscious minds. Let $U_{OA}(t) \subset U_O(t)$ be the subset that includes in its history S_A at t_0 and therefore will lead to X_A at t_2; likewise let $U_{OB}(t)$ be the subset that includes S_B at t_0 and entails X_B at t_2. Left to its own devices, when we come to observe the brain's behvaiour at t_2, the metamind will choose arbitrarily between $U_{OA}(t_2)$ and $U_{OB}(t_2)$. The postulate is that at some intermediate time t1 ($t_0 < t_1 < t_2$), a personal mind initiates a signal to the metamind, triggering it to select $U_{OA}(t_2)$. As noted in the previous paragraph, to an observer within the physical world, it would appear that the personal mind at t_1 exercised its free will and retrocausally flipped S to S_A and hence causes X_A to happen.

Thus, we have shown that, within mental monism, even in a classical physical world that operates according to a wholly deterministic rules, a consciousness can exercise its volition and cause events to happen in real time. That is, we can formulate a non-violating interface model.

Two points must be noted: First, in this classical interface model, consciousness can act only on chaotic systems. Thus consciousness could not be embodied in, say, a non-chaotic robot whose behaviour is completely predictable from it software code. Second, this interface in philosophies that are irrealist about the physical world, which basically means mental monism. As a minor corollary of this point, alternative philosophies such as panpsychism, which are realist about the physical world, cannot allow this interface model, and hence have no means for a conscious mind to act in the world. Thus, in a classical world, we would have the paradox that if panpsychism were true, it could never be stated, for one's bodily actions (including speech and writing) would be driven by physical cause and effect, and the casual closure would exclude the possibility of any utterance referring to conscious experience.

What we have is a framework that shows in principle how a conscious mind could operate in the world without breaking physical laws, that is, an outline of a non-violating interface model. What we lack, at this point, is any specific mechanism for how the personal mind's intention can be communicated to the metamind with the required effect; correspondingly, we have said nothing of how the personal mind knows what is going on in the physical construct. Thus, we do not yet have a specific theory. In the next section we will begin to fill in this gap.

[The paper is unfinished at this point. Only rough notes from here on.]

2.3 Consciousness portals

A portal, or psychophysical input / output unit, is a mechanism whereby a conscious mind can input information from, and output information from, its avatar in a physical construct.

A unified mind (such as a human mind) must use a portal that is physical simple. It cannot be separable in space. The only candidate for this is the quantum portal. Therefore we must infer that the brain uses quantum portals, and any design for an artificial mind would do likewise.

A basic portal must involve at least two components: an element than can be set

by the conscious mind and read by the avatar (motor port), and an element that can be set by the avatar and read by the conscious mind (sensory port). There could be any number of such ports in a portal. An act of volition by the mind involves the conscious mind writing an instruction into the motor port, which the avatar then executes—for example, by contracting or relaxing a muscle group. Conversely, an act of perception by the mind involves the avatar writing a datum—for example, from some transducer—into the sensory port, which the conscious mind then reads.

The portal thus exists as a structure in the physical avatar, and as a parallel structure in the mind.

2.4 The addressing problem

The 'addressing problem' is this: how do object-minds locate and address each other in order to communicate within the mental domain?

This problem arises as a ramification of mental monism. It does not exist in physicalism or dualism. In the standard physicalist model, the way I see my laptop is that light rays flood in from daylight outside my window; a lot of it bounces of the walls, floor, and ceiling; a certain amount of light strikes

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