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Functional View of Cognition without Conscious Representation

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Cognition without content

Abstract

In the first chapter of Hutto and Myin's book *Radical Enactivism*, Hutto and Myin argue that representationalism is not definitive of all mentality. They assume computationalism presupposes representation. Computationalism does not presuppose representation. Computationalism can be defined as the manipulation of internal states according to an appropriate rule. These internal states are called internal semantics. If cognition is a computational process then metaphysically cognition doesn't presuppose representation. In this project I have decide to maintain an account of content in enactivism leaving me with a teleofuctional autopioetic account. In this project, (1) I will first offer a summary of radical enactivism. (2) I define functionalism, the mind is the functional organization of the brain (15). I compare functionalism, computationalism and cognition. (3) Using the functional view of computational individuation I compare the internal semantics of a system to the developmental explanatory thesis. (4) Finally, I use the example of procedural memory as an example of radical enactivism is human cognition.

Part 1

Introduction

In the first chapter of Hutto and Myin's book *Radical Enactivism*, Hutto and Myin argue that representationalism, or the received view, is not definitive of all mentality, Representationalism does not serve as the basis of all mentality. This view hinges in content, a one to one correspondence between an object and that object as represented in the mind. They include computationalism in this argument. Hutto & Myin (2013) assume that computationalism presupposes representation. In other words you don't have computationalism without reference to representation. If computation is representational, then any computational process is a process by which information is represented and processed. However, computationalism doesn't presuppose representation. Not only can computationalism be defined as the manipulation of data according to an appropriate rule, it can also be defined as the manipulation of internal states according to an appropriate rule. This may mean that there are processes that organisms do within their environments that do not involve the manipulation of data in the representationalist sense. Creatures would perform these acts by habit. In the case of humans best example is that of procedural memory. There are certain actions that humans perform that may be deemed cognitive, but do not require the manipulation of data as understood by the received view. These acts don't require conscious representation.

My argument is if computation doesn't presuppose representation and cognition is a computational system, then cognition doesn't presuppose representation. The second part of my argument is this, procedural memory is a cognitive function. In certain cases one uses procedural memory without the involvement of content. Thus in the case of procedural memory not only does cognition, as a computational system, not presuppose representation, but it can function without the conscious use of content.

What is Radical Enactivism?

Radical Enactivism is the view that the basic nature of mind does not involve the processing of content. "The embedded and embodied activity of living beings is the best model for understanding mind (Hutto and Myin (2013)." To understand mentality we must appreciate how living beings dynamically interact with their environments. REC's two theses are the Embodiment thesis and the Developmental Explanatory thesis.

According to the Embodiment thesis basic cognition is the concrete dynamic interaction of spatio-temporally extended patterns between organisms and their environments. The Developmental-Explanatory thesis holds that mentality consists in interactions that are molded by the history of an organism's previous interactions (Hutto and Myin (2013).

The two 'parent' theories of radical enactivism are sensory motor enactivism and autopioetic enactivism. Sensory motor enactivism claims that perceiving, navigating and acting in an environment are connected. Hutto and Myin reject mainly the part of this theory that claims that perceptual experience is grounded in the possession and use of implicit, practical knowledge (Hutto and Myin (2013).[I] For Hutto and Myin (2013) knowledge is activity, and we are directed by habits formed by past interactions in our environments.

Autopioetic enactivism claims that mentality, or cognition, comes from the self-creating activities of the creature. For them the structures of mentality come about through a developmental process or interplay between the organism and its environment. While REC denies any notion of contents and meanings in basic cognition, autopioetic enactivism maintain them.[II] Meaning mirrors the organism's history and environmental context (Hutto & Myin 2013). For Hutto and Myin (2013) the simplest forms of life possess the ability of intentionally directed responding. This form of cognition lacks content. This is shared with coarser grained cognitive systems. Basic interest-driven ways of response provide the best means of understanding how mentality can be intentionally directed and completely embodied and enactive (Hutto & Myin 2013).

While REC denies the view that cognition is constituted in propositional attitudes it does not claim that propositional explanations are never appropriate. Some creatures have more than one way of getting by cognitively. Action is constituted in the embodied engagements of mentality and is best explained through the habits of mind and not through content. Perception can be accounted for only in terms of the simple stimulation and perturbation of the sensory modalities. This is while REC adopts non-representational teleofunctionalism. This view is a good analog to REC, because teleofunctionalism is the view that organismic activity and purposes, or teleo- functions. Teleo-functionalism is an analysis of how the ends an organism seeks serve the organism (Hutto and Myin (2013). Cognition boils down to specifiable ways of responding.

One Problem with Radical Enactivism

One big problem with Hutto and Myin’s view of content is that they assume that content only occurs in conscious experience. Thus, if content only occurs in conscious experience then unconscious acts of habit do not require content. This is a blatant misunderstanding of the basic definition of content. Content is a one to one relation between an object in the external world and the replica (representation) of that object in the mind. While example of the female crickets that follow sounds of male crickets is an instinctual act, the genes that are responsible for this action represent the sound of male crickets for the female crickets. This is a one to one correspondence between an object in the external world (sounds of male crickets) and the mental audio (representation of the sound of a male cricket). Even if this is habit, there is still evidence of content. The radical enactivists would do well to maintain content in there theory.

[I] Sensory motor enactivists and other cognitivist distinguish between the knowledge base and the activity of deploying knowledge when they speak of knowledge-based competence. 2. It also claims that perceptual experience is contentful. For sensory motor enactivists, like Noe, all creatures have a notion of concept, because all perceptual experience is inherently contentful. For REC this view is incorrect. REC agrees that our bodily movements influence our perceptual experience they don't believe that we create concepts (Hutto and Myin (2013).

[II] Autopioetic enactivists want to give up on the input output model and the idea of informational content (Hutto and Myin (2013). For them the structures of mentality come about through a developmental process or interplay between the organism and its environment.

While REC denies any notion of contents and meanings in basic cognition, autopioetic enactivism maintain them. For example "Thompson says that sensory stimuli induce construction by nonlinear dynamics of an activity pattern in the form of large-scale spatial pattern of coherent oscillatory activity. While this pattern is not a representation of the stimulus but an endogenously generated response triggered by the sensory perturbation, a response that creates and carries the meaning of the stimulus for the animal. Thus meaning reflects the individual organism's history, state of expectancy, and environmental context (Hutto & Myin 2013)."

What is Representationalism?

Representationalism is the view that world of conscious experience, observed all around us, is a replica (representation) of external reality in the form of an internal representation ("Representationalism," n.d.). Content is a one to one relation between a replica of an object in the mind and that same object in the world. The object in the mind represents the object in the world. When you see a woman, at Mc Donald's, that woman is exists in Mc Donald's, probably eating a Mc Chicken, but there is a corresponding visual replica of that fat woman in your mind. Being consciously direct toward the woman (which could be looking at her or hearing her loud chewing) is called intentionality. The representation is the corresponding mental image or sound or any sense modality, in your head, that is similar to that object, in the external world, on which the mental image is based. The internal manipulation of information, within minds, is called computation. This doesn't mean that you can't have computation without representation, because computation can be defined as manipulation according to a rule. This can be the manipulation of internal states or the manipulation of information, in the form of representations. To take this a step further, one can have content without consciousness. In the case of procedural memory, or unconscious action there exists a one to one relation between the object in the external world and that same object in the mind.

Consider the following example. When you wake up every morning there is a cup of water, on the desk next to your bed, which you drink every day. You do this so often that you don't even think about it. One day you have a paper that you need to work on, so this is on your mind constantly. You wake up one day, thinking about the paper, you drink the water and you go about your busy day. You are no longer consciously directed toward the cup of water, you merely act. There is still a one to one correspondence between the cup of water on the desk and the cup of water in your memory, but you are not conscious of it. Expecting to cup to be there so often has allowed you to be directed towards objects without being conscious of them all. While Hutto and Myin are correct in their claim that cognition boils down to habits and teleofunctional ways of responding. They fail to eliminate content completely.

Part 2

Functional view of computational individuation

If Computation doesn't presuppose representation then how else can we describe computational systems? Piccinini (2008) attempts to resolve the question of whether computation presupposes representation with what he calls the functional view of computational individuation. The problem of whether we can discuss computation, or rather describe computation without any reference to representation. If we apply the functional view to the problem at hand then we would say that computational states can be distinguished (individuated) by their functional properties, and their functional properties are specified by a mechanistic explanation without reference to any semantic properties (p. 2).

According Piccinini (2010) functionalism, "the view that the mind is the functional organization of the brain" (p. 15), claims that mental states are functional states'. A functional organization is a set of functional states with functional relations. A functional state is defined by, and can be distinguished from its causal relations to inputs, outputs, and other functional states (p. 2).[III] A function is simply what something does. A heart pumps blood, a piston pumps gasoline and spark plugs ignite gasoline. Computation is the manipulation of data and (possibly) internal states according to an appropriate rule. (p. 31)[IV] Computation is also the view that the functional organization of the brain is computational.

[III] Piccinini (2010) equates his notion of functionalism to Putnam's description of functional organization, the machine table of a Turing machine. According to Putnam "a functional organization is a set of functional states with their functional relations, where a functional state is defined by its causal relations to inputs, outputs, and other functional states (p.2)."

[IV] Piccinini clarifies this point even further, claiming that "among systems that manipulate strings of digits, producing output strings of digits from input strings of digits in accordance with a general rule, which applies to all relevant strings and depends on the inputs and possibly the internal states for its application. The general rule specifies the function computed by the system. However, "some systems manipulate strings without performing computations over them. For instance, a genuine random number generator yields strings of digits as outputs, but not on the basis of a general rule

In order to differentiate functionalism from computationalism we must invoke a mechanistic reductionist view of functionalism. In the mechanistic version of functionalism, a system is individuated by the functions and the relevant causal and spatiotemporal relations of its component arts. The functional states of the system are individuated, or specified by their role within the mechanistic explanation of the system. The states of the system are not only distinguished by their causal relations to other states, inputs and outputs, but also by the part, or component to which they belong and the function performed by that part when it is in that state. This goes for all mechanisms, including computing mechanisms.

The example Piccinini (2008) gives is that of the human body where the human body is a mechanism its components include the heart and the hearts function is pumping blood. The heart is connected with other arteries and these have the capacity of blood circulation. Thus we can isolate components or even discuss the entire system without any reference to representation, or rather without giving any interpretation to the input and output features of the system.

In a mechanistic functionalist view of neurons, every neuron has an input and output feature, stuff goes in and stuff goes out, similar to any other organ in the body. The neurons taken together, form a system. The components of the system are neurons. The system, itself, is cognition. In trying to classify cognition as a computational system one must say that before something can be deemed a computational system, it must manipulate data according to a rule.

According to Piccinini (2008) the uniqueness of particular Turing Machines is determined by their instructions and not by the interpretations of their inputs and outputs (8). If we apply the human body example to this analysis we can isolate the heart and describe its structure without describing, or rather give any interpretation of, the things going into it and out of it.[V] We can simply look at the structure of the heart.

Internal semantics

According to Piccinini (2008) the internal semantics of a computer may be described as the operations performed by a computers processor. These operations occur in response to a machine language corresponding to what the instruction meant in assembly language. The operations that occur are based on how the computer was put together. In this instance we are looking at the internal, syntactic, structure of the computer without giving any interpretation to the inputs. We are merely describing the structure, or rather the function of the computational system.

According to Chalmers (2011) "computations are specified syntactically, not semantically (p. 8)." This view mirrors Piccinini's (2008) functional view of computational individuation[VI]. Chalmers goes further stating that in the "original account of Turing machines by Alan Turing certainly had no semantic constraints built in." A Turing machine is described and specified only by the transformations of the syntactic patterns, or rather mechanisms involved (p. 8).

defined over strings. Systems that manipulate strings of digits in accordance with the relevant kind of rule deserve to be called computing mechanisms (p. 25)."

[V] The mathematical theory of computation can be created and discussed without assigning any interpretation to the strings of symbols being computed.

[VI] Weakness of a common notion of causation

Piccinini (2008) splits with Chalmers in Chalmers view of causation. While Chalmers and Piccinini both argue that a description of computation should not be dependent of content, or rather representation. Chalmers argues that both should be dependent on a common notion of causation. Piccinini calls this view weak. According to Piccinini (2008) "causal individuation, without constraints on which causal powers are relevant and irrelevant to computation, is too weak. It does not support a robust notion of computational explanation the kind of explanation that is needed to explain the capacities of computers, brains, and other putative computing mechanisms in terms of their putative computations (p. 6)." This notion is Piccinini's functional view of computational individuation.

Part 3

Physical system implement computations

According to Chalmers (2011) Cognition is a formal mapping, or rather, the mind is a formal mapping, a one to one mapping of formal states to physical states[VII]. The mind or the functional series of mental states that occurs in the brain. This cognitive process corresponds to a physical state. This is how you would distinguished cognition from any other bodily processes. There is a certain class of computational states. There is a certain class of computations that exist in such a way that any system performing these computations can be deemed cognitive[VIII]. This system is the brain. As a combinatorial state of automata the internal or mental states of the mind are classed as vectors that correspond to individual physical systems[IX]. The mind is a mapping of a physical state to a corresponding vector in the brain. According to an enactivist functional theory, the mind is just another component of cognition. It can be isolated functionally, but it is still a part of a system.

Enactivism and including external objects as parts of the computational system

What if we include aspects of the environment as components in the mechanism? We still take a functional view of computation individual including aspects of the environment? A male mosquito in the process of pollinating a flower, the system is the male mosquito and the flower. A component of the system is the sack that holds the nectar its function is holding nectar[X].

[VII] A physical system implements a given computation when the causal structure of the physical system mirrors the formal structure of the computation (p. 3)." In other words a physical system implements a computation when there is a one to one mapping of formal states to physical states, which are grouped into state types. The physical system happens according to its formal structure.

[VIII] Chalmers goes further with a description of cognition. Stating that "it is in virtue of implementing some computation that a system is cognitive (p. 7)." According to Chalmers" there is a certain class of computations such that any system implementing that computation is cognitive. We might go further and argue that all cognitive systems perform some computation in such a way that any performance of the computation would also be cognitive, and would share numerous specific mental properties with the original system (p. 7)." While Chalmers says that this claim is controversial it must hole in order for us to distinguish cognition from digestion.

[IX] While computations are generally specified relative to some formalism, for Chalmers the implementation of any computational system is can be subsumed under the class of combinatorial-state automata (CSAs). The difference between finite state automata and combinatorial-state automata is that the "internal states of the system need to be specified as vectors, where each element of the vector corresponds to an independent element of the physical system (p. 4)." Thus, vectorization is a requirement. "The system implements a given CSA if there exists such a vectorization of states of the system, and a mapping from elements of those vectors onto corresponding elements of the vectors of the CSA, such that the state-transition relations are isomorphic in the obvious way (p. 4)."

The problem with classifying both the mind and other parts of the body as computations is how to distinguish something like digestion from cognition. But this objection rest on a misunderstanding according to Chalmers. "It is true that any given instance of digestion will implement some computation, as any physical system does, but the system's implementing this computation is in general irrelevant to its being an instance of digestion (p. 7)." Because "the same computation could have been implemented by various other physical systems without it's being an instance of digestion. Therefore the fact that the system implements the computation is not responsible for the existence of digestion in the system (p. 7)."

[X] Mechanisms have many intrinsic properties.

It is difficult to say which intrinsic properties of mechanisms are functionally relevant. This is where an appeal to context comes into play. In order to understand which properties are functionally relevant we must look at the interactions between mechanisms and their contexts. Piccinini (2008) uses plants as an example. "Plants absorb and emit many types of electromagnetic radiations, most of which have little or no functional significance. But when radiation within certain frequencies hits certain specialized molecules, it helps produce photosynthesis an event of great functional significance (p. 16)." The problem is that we don't typically know which external events cause which internal events or the effects of the external events on certain internal events. We can't "distinguish the functionally relevant properties of a mechanism from the irrelevant ones" leaving us with one option, a wide interpretation of the functional properties of mechanism (p. 16).

When it is combined with other relevant mechanism, the mosquito, the system is complete. For Hutto and Myin (2013) this would be the Embodiment Thesis which equates basic cognition with concrete spatio-temporally extended patterns of dynamic interaction between organisms and their environments. Adherents of the strong Embodiment Thesis assume that mentality in all cases is concretely constituted by and consists in, the extensive ways in which organisms interact with their environments. The relevant ways of interacting involve, but are not restricted to, what goes on in brains. The brain would be another component in the system. However, the brain is where the rules are. If we use the Turing machine as an analogue then the brain is the guiding component.

The Developmental-Explanatory Thesis and internal semantics

The Developmental-Explanatory Thesis holds that mentality consists in interactions grounded in and molded by the history of an organism's previous interactions in its environment. This is similar to Piccinini's (2008) view of the internal semantics of a computer (using the example of the desktop computer we can invoke another analogous example[XI]). This may be described as the operations performed by a computer processor occurring in response to a machine language correspond to what the instruction means in assembly language. The design of the computer has implications on how it functions. Thus, if we want to know why the computer operates a certain way this requires nothing other than knowing the history of (for the enactivist-active engaging) how the structures came to be. This explains an organism's or a computational systems current tendencies. This is teleo-functionalism. Piccinini advocates a non-etiological functionalism, he is more interested in how. Hutto and Myin advocate an etiological functionalism. They believe the best way to know the how is through the why. The best way to understand how a creature behaves in its environment is to look at the history of the environment and the adaptions of the creature over time.

This analysis applies to computers, and other concrete computing mechanisms, as well. Piccinini (2008) states that "most ordinary computers would not work for very long without a fan, but the fan is not a computing component of the computer, and blowing air is not part of the computer’s computations (p. 16)." But the fan is an intrinsic property of the computer. Thus, we need to "distinguish the properties of a computing mechanism that are functionally relevant from the ones that are irrelevant (p. 16)." We need to know which properties are relevant to a computing systems input output functions. To do this we need know how the computational inputs and outputs of a mechanism interact with its context.

For some theories of content the wide view of the function of an internal states covariance with an external variable is the same as saying that an internal state represents a variable.

[XI] The wideness of putative computational properties of nervous systems

Piccinini (2008) addresses this claim first by stating that while functional properties are wide they are not that wide. The functional properties pertain to the normal interaction between a computing mechanism and its immediate mechanistic state of affairs through its input and output transducers. Piccinini (2008) uses a desktop computer as an analogy. The forces exerted of a keyboard (the input device) and the signal sent to the computing components and the relation between the computing components that serve as out put devices releasing signals are enough to determine if a computation is performed by a mechanism.

According to Piccinini "the wideness of putative computational properties of nervous systems does not even reach into the organisms’ environment; it only reaches sensory receptors and muscle fibers, that is enough to determine whether a nervous system performs computations and which computations it performs (p. 17)." The functional significance of the interactions between neural signals and muscle fibers was enough to justify the first computational theory of mind created by McCulloch and Pitts.

Also the extent that "wide functional properties are the same as wide contents depends on which theory of content one adopts (p. 18)." Under the functional view of computational individuation, the relevant functional properties of the computational individuation of a mechanism are to be found by looking at the "mechanistic explanations under the empirical constraints that are in place within the natural sciences (p. 18)." In some cases semantic properties supervene on computational, or rather functional, properties. Meaning they happen together. This is not a weakness, this means that we can describe, or individuate, the computational properties without appealing to the semantic features and for the human body this works even better. We may not even need to appeal to the outside to functionally isolate the components of the human body.

Part 4

Procedural memory is a mental process

According to Ullman (2004) procedural memory is our implicit memory of skills and reflex responses. This type of memory is known as implicit or non-declarative memory. Declarative memory involves knowledge of facts and experience, or rather ones semantic and episodic memory. According to Mitchell et al (1990) the memory systems are arranged in a "monohierarchical fashion" with procedural memory as the foundation, supporting semantic memory, which supports episodic memory. According to a study done by Mitchell et al (1990) procedural memory can function without semantic or episodic memory, and semantic memory can operate without episodic memory. However, none can function without procedural memory, but procedural memory can function without either.

According to Kihlstrom (1989) a lot of mental activity is unconscious in the strict sense of that it is inaccessible to phenomenal awareness under any circumstance. According to Kihlstrom (1989), summarizing Fodor's view, the mind may "consist of a number of innate, domain-specific cognitive modules controlling such activities as language and visual perception, hardwired in the nervous system and operating outside of conscious awareness and voluntary control (3) Unconscious procedural knowledge may be described as automatic as opposed to controlled. These processes are automatic "because they are inevitably engaged by the presentation of specific stimulus inputs, regardless of any intention on the part of the subject (p. 3)." Plus these automatic processes use little to no attentional resources. Our ability to perform multiple tasks simultaneously is limited by the demands they make on any available attentional resources. If the attentional demands exceed the attentional resources, then tasks will interfere with each other. This is why "routinized processes consume little or no attentional capacity (p. 3)." Making it possible for typists to talk and type and drivers to drive and listen to the radio.

Functionally individuating cognition

Can we really use the functional view of computational individuation to isolate cognition? Yes, in describing cognitive activity in terms of computational states we can argue that computational states are individuated by their functional properties, and their functional properties are specified by a mechanistic explanation, a components approach, in a way that does not reference to any semantic properties. Using the enactivist view we can even insert environmental features, exterior to the mind, because they are relevant to cognition. This is different from the extended mind thesis in this way; “The difference between the Extended Mind Hypothesis (EMH) and radically enactive cognition is that for the extended mind hypothesis in exceptional cases, non-bodily add-ons are required in order to make the achievement of certain cognitive tasks possible. Thus, minds extend (Hutto & Myin 2013, p. 7). For Radically enactive cognition minds are already dynamically connected to the environment.

Enactivism and internal semantics

The greatest area of comparison is between Piccinini’s (2008) view of the internal semantics and the Developmental-Explanatory Thesis. The Developmental thesis holds that mentality is shaped by, and explained by nothing more, than the history of an organism's previous interactions. To use Chalmers term mentality, or cognition is programmable. This understanding is similar to Piccinini’s (2008) view of the internal semantics of a computer. The operations performed by a computers processor occur in response to a machine language corresponding to what the instruction meant the in assembly language. The design of the computer has implications on how it functions. This is teleo-functionalism. According to Hutto and Myin (2013) nothing other than the organism’s history of active engaging structures explains the organism's current tendencies.

Procedural memory and enactivsm

If we take the example of procedural memory in humans as a case of a cognitive process that is automatic because one is inevitably engaged by the presentation of specific stimulus inputs, regardless of any intention on the their part. Not only does this system operate without the use of content.

We can isolate the component parts of procedural memory, from an enactivist perspective. If we take the example of someone who wakes up in the morning and puts their keys in their pocket every day and then drives to work as they listen to the radio. We have two examples where one interacts with features of their environment without processing content.

Procedural memory and intentionality

During the process of procedural memory one is intentionally directed towards features of their environment, however they are not always aware of these interactions. If we take the case of the car keys and driving we would then say that our while we see the car keys and the steering wheel and while we respond to environmental changes we are not acting based on content. Our perceptual experiences are mediated and made possible by the possession and skillful deployment of specialized practical knowledge of sensorimotor contingencies. The ways in which stimulation in a certain sense modality changes, contingent upon our movements and actions. Because knowledge of this special sort is meant to account for the expectations that perceivers have concerning how things will appear in the light of possible actions, then it follows that perceivers must have implicit mastery of relevant laws concerning sensorimotor contingencies. Thus, it appears that the knowledge that grounds sensorimotor understanding is really a kind of knowing 'how' as appose to a knowing 'that'. Knowing the how includes the history. Know that, is merely know the function, or what something does.

Cognition, thus, emerges from the self-organizing and self- creating activities of living organisms. Instead of being directed by inner representations the relevant structures become manifest only through a developmental process in which factors belonging to the organism and factors belonging to its environment play equally important roles. Intentional directedness is shared between lower and higher grained forms of life. Basic interest-driven ways of responding provide the right platform for understanding how mentality can be intentionally directed and also wholly embodied and enactive without being representational. Certain organisms are set up so that they are intentionally directed at situations that can bear on their interests. This is possible despite the fact that such responding lacks content and is wholly non-representational.

Conclusion

While content is still relevant must of the radical enactivist foundation is a basis for a different understanding of cognition. While I have said nothing new the addition of a functional view of computational individuation broadly supports this new understanding. Through the application of the functional view of computational individuation, combined with Chalmers description of cognition as a computational system we can argue for a nonrepresentational theory of cognition. The computational system that is cognition doesn't have to be representational. This is true we are giving a description of the function of cognition and its components whether they are active or not. If we take on the embodiment thesis from Hutto and Myins radical enactivist book we can arguably include the features of a creature's environment in our analysis. When we include the developmental thesis we can argue for a functionalist view that mirrors Piccinini's notion of the internal semantics of a system. The system operates in accordance with the original design of the system. For a computer this would be the assembly language, for a creature this would be a combination of the design of the creature's cognitive system and the original event that lead to the behavior that we are seeking to understand. This particular behavior may be a behavior that the creature is unaware of but is merely doing. Within humans the best example is that of procedural memory.

Bibliography

Chalmers, D,J. (2011). A computational foundation for the study of cognition. Journal of Cognitive Science, 12(4), 323.

Hutto, D. D., & Myin, E. (2013). Radicalizing enactivism: Basic minds without content. Cambridge, Mass: MIT Press.

Kihlstrom, J, K. (1987). The cognitive unconscious. Science, 237(4821), 1445-1452. doi:10.1126/science.3629249

Mitchell, D. B., Brown, A. S., & Murphy, D. R. (1990). Dissociations between procedural and episodic memory: Effects of time and aging. Psychology and Aging, 5(2), 264-276. doi:10.1037/0882-7974.5.2.264

Piccinini, G. (2010). The mind as neural software? understanding functionalism, computationalism, and computational functionalism. Philosophy and Phenomenological Research, 81(2), 269-311. doi:10.1111/j.1933-1592.2010.00356.x

Piccinini, G. (2008). Computation without representation. Philosophical Studies: An International Journal for Philosophy in the Analytic Tradition, 137(2), 205-241. doi:10.1007/s11098-005-5385-4

Ullman, M. T. (2004). Contributions of memory circuits to language: The declarative/procedural model. Cognition, 92(1), 231-270. doi:10.1016/j.cognition.2003.10.008

Representationalism. (n.d.). In *The Representationalism Web Site*. Retrieved from http://cns-alumni.bu.edu/~slehar/Representationalism.html