Mental representation and its philosophical background

Elif Başıbüyük[1]

Abstract

In this study, it is aimed to make an overall assessment of the concept, mental representation from a philosophical point of view. This concept is so merged with countless studies in many disciplines that it becomes indispensible and becomes one of the leading areas of study in cognitive science as well as cognitive linguistics. What is aimed is to present the opposing philosophical views regarding cognitive representations and mental models and to set a general framework. Representationalists and eliminativists offer contradictory arguments. The latter group take the physical aspects, i.e., brain itself, into account while the former focus on mind to study representation of the world and divided mainly into two groups; symbolic vs. distributed representationalists. Symbolic and distributed representationalists offer different mental models for representing world knowledge, thought and language. The result of the discussion indicates that representationalists offer more efficient answers, moreover symbolic (classical) representationalists put forward a more fruitful approach to mental representation especially in terms of computationalism.

Keywords: Mental Representation; Representationalists; Eliminativists; Connectionists

1. Introduction

There is no doubt that our minds represent the world. Procedural, propositional knowledge, world knowledge and experiences, schemas, patterns of behavior, thoughts and language are represented mentally. Accordingly, we can define mental representation as "hypothetical internal cognitive symbol that represent external reality"(Morgan, 2014).

In the second half of 20th century, with the rise of rationalism, which is a reaction to behaviorism, the idea "no cognition without representation" (Edelman, 2008) has become popular. Mental representation, the content of it and such mental models were studied by many disciplines such as philosophy, psychology, linguistics and cognitive science including artificial intelligence studies. However, the studies regarding representations and mental models are extremely diverse. Therefore, before conducting research about mental representation, it is vital to look at the topic from a philosophical aspect. Since philosophy is known as the soil of science, having a clear philosophical approach presents a clear framework, makes it easier for us to carry out research and offers more meaningful results. Accordingly, the aim of this paper is to present a clear discussion of some of these various studies; explicitly indicate their possible philosophical backgrounds of mental representations; and present our view. The following chapters consist of the explanation of basic contradictory philosophical views related to mental representation.

[1] Başkent University, School of Foreign Languages, English Preparatory Department, ANKARA/TURKEY, elif2708@gmail.com

2. Representationalism

The main argument of representationalists is that there are states of mind which function to encode states of world. These states are representational, namely, intentional or semantic (Fodor & Pylyshyn, 1988). Any study or discussion related to cognition and cognitive architecture involves representational states and processes. Additionally, scholars who have the representationalist standpoint may be divided into two: Classical (symbolic) representationalists and distributed (connectionist) representationalists.

2.1. Symbolic representationalists

Logical approach: Classical representation begins with traditional formal logic within the scope of epistemology. From this perspective, it is crucial to make all knowledge accessible to deduction in the forms of declarative sentences. Thus, it offers a sentential approach to philosophy of science. Items to be represented have propositional form and stand in logical relations.

Fodor's language of thought theory: According to Fodor (1975), minds are directed towards the world and this "directedness" is termed intentionality. The contents of intentional states come from representations. Thus, to have a belief means to have a representation in one's belief box, fear box, desire box, etc., which also stands for folk psychology (Cummins, 1989). The intentional features of human mind are explained by the processing of a set of language-like inner representations and they form the content of propositional attitudes. Fodor (1975) claims that propositional attitudes are computational relations to mental representations and these mental representations form a symbol system. In this symbol system, symbols (atoms) are used to denote the semantically interpretable entities (concepts) (Feldman & Ballard, 1982). The system has the features of productivity and systematicity, i.e. structure sensitivity. Furthermore, mental representations include a combinatorial syntax & semantics, complex mental representations or structures.

Schema: One important form in mental representation is the concept called schema which goes back to Kant as a description of mental concepts and mental categories. Schemata appears in many AI systems in the forms of frames, scripts or similar structures.

Frame: In 1974, Minsky developed the frame theory to represent knowledge on mind. He claimed that representing ordinary knowledge in the forms of frames rather than many small, independently true propositions is better.

Unlike earlier theories schema and frame theories offer larger representations. However, they may indicate problems in the application to linguistic, psychological studies, computation or AI. Accordingly, Fodor's theory still seems to support a computational theory of mind except changing the sense of symbol from physical to information bearing states and processors because of the existence of syntactic operations which seem well suited to be used as computational operations. It seems that with a finite number of elemental representations and with a finite number of syntactic rules, it is possible to form infinite number of possible representations (Trigg & Kalish, 2010).

2.2. Connectionists

Connectionist systems contain processing units representing conceptual objects such as features, letters, words or abstract elements. Connectionism involves distributed representation which has small, feature like entities called micro features in contrast to one-unit, one-concept or localist representational system in which single units represent entire concepts or other large

meaningful entities (Rumelhart, 1989). Therefore, Connectionists argue against the sentential or propositional attitude to mental representation.

Connectionist models of mind involve the activation of "large arrays of interconnected units that are based on simplified model of neural architecture" (Clapin, 2002). It includes three forms of representation. The first form is composed of schematic representations where each node has one semantic meaning. Networks are capable of local representation in schemes where each unit has a single semantic interpretation. The second includes the activation of the network's units which is presented as a vector. Finally, the third form is related to the connectivity of units which means units are connected to which and with what weights (Clapin, 2002).

When Connectionism is discussed, this subject matter seems a fruitful approach that has led to many researches in several disciplines. However, certain distinctions and drawbacks can be observed when it is compared to symbolic representationalism. (a) Classical view argues that mental representations are symbolic data structures whereas connectionist view denies that mental states are symbolic and language like, but relations between nodes or units. (b) Classical approach involves serial processing while the latter holds the view that operations occur at the same time, i.e. parallel processing. (c) Fodor's symbol system includes syntactic, semantic and functional information. However, connectionist systems do not present a syntactic structure in mental representations, which poses a problem for especially linguistic, computational studies or AI. (d) Finally, classical systems are quite applicable to linguistic or computational theories whereas connectionist theory seems impractical to apply to computational & linguistic representational scheme due to its multilayer distributed form (Clapin, 2002).

3. Eliminativism

According to eliminativism, opposing to representationalism, mental states are identical with brain states and characterized in terms of neurological, behavior or syntactic properties not by semantic notions. Brain not mind is the research subject for eliminativists. Thus, it holds a physicalistic view of nature. According to Churchland (1989) and Stich (1992), who offer a neuro-computational perspective against representationalism, (a) intentional states or propositional attitudes such as beliefs, desires, fears, which are elements of folk psychology, do not play a role in a theory of human mind. They must be eliminated. (b) These mental states do not exist since science has proved their inexistence. (c) Language of thought focuses on explicit representation. Little attention is given to tacit (implicit) knowledge (Churchland, 1981).

When the two views, namely representationalism and eliminativism are analyzed, it seems that eliminativism has several drawbacks. First of all, mind must be taken into account separately from brain; relatedly, psychology cannot be reduced only to neuroscience for mind studies are essential. We cannot underestimate the power of intentional stance which is one crucial subject of study in computational, psychological view of mind and AI. Moreover, since semantic concepts, properties of language are ignored within eliminativist point of view, it may not be favorable for linguistic studies. Lastly, effective computation relies on symbolic representations. Computers operate autonomously on the basis of inner representation.

Though seems outdated and is criticized by eliminativists and connectionists, the theory of symbolic representation on mind (not physical representation) still offers a powerful background for studies in many fields, especially cognitive science. Newell, Rosenbloom and Laird (1998) state that functions of mind such as memory, operations, interpretations or interactions can be

explained in terms of symbolic system and structures. Relatedly, in several studies, representations on sentential level in terms of propositions, which stands for the abstract idea units constructing sentences, based on Wittgenstein's view "Understanding a sentence means understanding a language" (Kintsch 1974) has been studied.

4. Conclusion

In this paper, the subject matter 'mental representation' which is a rather interdisciplinary phenomenon has been analyzed and discussed in philosophical terms. Two contradictory philosophical debates, *representationalism* and *eliminativism,* were disputed. Representationalists focus on mind while eliminativists reject the idea of mental representation at all and put emphasis on brain and neurological studies. Moreover, unlike representationalism (classical view) that includes both syntactic and semantic properties in its system, eliminativism tends to ignore the semantic concepts. The former group forms another conflicting parties, *classical representationalists vs. distributed representationalists.* Classical view, especially Fodor's language of thought theory still offers a clearer explanation to the concept, better solutions to the problem and an easier application. As a result of discussions, it was concluded that despite its shortcomings classical approach to mental representations offers a better understanding to both philosophy of cognitive science and science in general.

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