

UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

The Notion of ' Dynamic Unit' and its Development in Cognitive Science

Permalink

<https://escholarship.org/uc/item/74z5z8pk>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 18(0)

Authors

Mandelbit, Nili

Zachar, Oron

Publication Date

1996

Peer reviewed

The Notion of 'Dynamic Unit' and its Development in Cognitive Science

Nili Mandelblit

Department of Cognitive Science
University of California, San Diego
La Jolla, CA 92093-0515
mandelbl@cogsci.ucsd.edu

Oron Zachar

Department of Physics
University of California, Los Angeles
Los Angeles, CA 90024-1547
zachar@physics.ucla.edu

Introduction

We suggest a common ground for alternative proposals in different domains of Cognitive Science which have previously seemed to have little in common. The underlying common theme is associated with a redefinition of the basic unit of analysis in each domain of thought. Our paper suggests a dynamic definition of unity which is based not on inherent properties of the elements constituting the unit, but rather on changing patterns of correlation across the elements. We review and examine the evolution of the concept of unit within several Cognitive Science domains in light of our proposed characterization of "dynamic unity". We find that the notion of Dynamic Unit, in each domain of thought, replaces the traditional unit of analysis. The change has been independently dictated in each domain by an increasing body of empirical evidence which challenges the traditional approach.

The following fields of Cognitive Science are discussed: In the domain of Neuroscience, we review alternative solutions to the problem of integration of neural information (Eckhorn et al. 1990, Damasio 1989). Within theories of mental representation, we compare alternative theories of conceptual organization (Fauconnier and Turner 1994, Langacker 1987). In Linguistics, we analyze solutions the problem of 'wordhood' (Ackerman and LeSourd, ms., Mohanan, ms.). And we end with a discussion of collective cognition and the Distributed Cognition framework (Hutchins 1995) as an alternative to traditional approaches. A conceptual (i.e. not physical) connection is made with the conceptual development and identification of elementary units in modern Physics theories (Anderson 1983). The epistemological common-ground that we find across the disciplines of Cognitive Science and Physics suggests that current 'alternative' theories form a collective conceptual revision of basic theoretical principles.

Characteristics of Dynamic Units

We suggest several basic properties that characterize the Dynamic Unit and distinguish it from the 'traditional' unit:

(a) The traditional unit of analysis, in each domain of thought, has been a rigid, locally-integrated unit, whose definition is based on properties inherent to the unit per se. In contrast, the novel unit of analysis is more flexible and dynamic in its construction. Its definition is based on a stable *pattern of correlation* among its elements.

(b) The identification of the Dynamic Unit is inseparable from the context of observation. Under different set-ups, different patterns of correlation may occur, therefore delineating different units. It is in this sense that we regard the characterization of unity as dynamic.

(c) The Dynamic Unit has properties which are not present in the substrate from which the unit is formed. These novel properties emerge from the interaction between the constituents leading to their correlated behavior.

(d) When interacting with the environment, the unit manifests the system's properties as a whole rather than the properties of the individual constituents.

References

- Ackerman, F., LeSourd, P. (to appear). Towards a lexical representation of phrasal predicates. In J. Bresnan and P. Sells (Eds.) *Complex Predicates*. CSLI/ University of Chicago Press.
- Anderson, P.W. (1983). *Basic Notions of Condensed Matter Physics*. The Benjamin Publishing Company, Inc.
- Damasio, A. (1989). The brain binds entities and events by multiregional activation from convergence zones. *Neural Computation*, 1, (pp. 123-132).
- Eckhorn, R., Reitboeck, H., Arndt, M., Dicke, P. (1990). Feature linking via synchronization among distributed assemblies: simulation of results from cat visual cortex. *Neural Computation*, 2, (pp. 293-307).
- Fauconnier, G., Turner, M. (1994). Conceptual projections and middle spaces. Cognitive Science Technical Report 94401.
- Hutchins, E. (1995). *Cognition in the Wild*. Cambridge, MA: MIT Press.
- Mohanan, T. (to appear). Wordhood and lexicality: noun-incorporation in Hindi. *Natural Language and Linguistic Theory*.