Grenander, Ulf
A calculus of ideas. A mathematical study of human thought. (English) Zbl 1273.68003

The book develops a model of human thinking and concept formation based on the fundamental idea of linked nodes in a graph (network). Propagation along the weighed links leads to an activation level of nodes, which may stabilize over several cycles. With respect to thoughts/propositions these updating cycles may be considered as propagation of conditional probabilities.

Methodologically the book is detached from current cognitive science. It claims to investigate thoughts or the mind without reference to the brain and bases its sweeping claims (like having built a mind) on theses on the mind established by personal introspection. The model is presented also by an implementation in MATLAB, where a mind is understood as being merely a set of thoughts (thought representations).

The book, additionally, is detached from current state of the art theories of the mind in several respects. The claims on language suffer from several unclear conceptions of syntax and grammar: the graphs, for instance, are incapable of producing context-free grammars (as needed for natural language). The graphs, and ultimately networks corresponding to them, may model some conceptual connections (like in associations and concept-activation), but they cannot model thematic roles (in sentence frames etc.). The problem of generativity of language is underestimated (like in other empiricist or connectionist theories). The book claims the priority of thought over language, but doesn’t take a stance on the issue whether thought is best understood by a ‘language of thought’ representationalist theory of mind. Concerning logical reasoning and deliberation in general the book neglects any form of inference which is linear or not probabilistic conditionalization.

Reviewer: Manuel Bremer (Düsseldorf)

MSC:

68-02 Research exposition (monographs, survey articles) pertaining to computer science
00-01 Introductory exposition (textbooks, tutorial papers, etc.) pertaining to mathematics in general
68M99 Computer system organization
00A69 General applied mathematics
00A72 General theory of simulation
68N99 Theory of software
68T99 Artificial intelligence
91-02 Research exposition (monographs, survey articles) pertaining to game theory, economics, and finance

Keywords:
human inference processes; modelling semantic links; conceptual graphs

Software:
Matlab