

Cognitive Reasoning

A Formal Approach

Bearbeitet von
Oleg M. Anshakov, Tamás Gergely

1. Auflage 2009. Buch. x, 437 S. Hardcover
ISBN 978 3 540 43058 2
Format (B x L): 15,5 x 23,5 cm
Gewicht: 830 g

[Weitere Fachgebiete > EDV, Informatik > Informationsverarbeitung > Künstliche Intelligenz, neuronale Netze](#)

schnell und portofrei erhältlich bei


DIE FACHBUCHHANDLUNG

Die Online-Fachbuchhandlung beck-shop.de ist spezialisiert auf Fachbücher, insbesondere Recht, Steuern und Wirtschaft. Im Sortiment finden Sie alle Medien (Bücher, Zeitschriften, CDs, eBooks, etc.) aller Verlage. Ergänzt wird das Programm durch Services wie Neuerscheinungsdienst oder Zusammenstellungen von Büchern zu Sonderpreisen. Der Shop führt mehr als 8 Millionen Produkte.

Chapter 2

Introductory Explanation

In this chapter we develop the first constituent of the proposed formal approach, namely the conceptual theory of cognitive reasoning. In the course of this discussion, the key topics included in this book emerge at the conceptual level. We will describe the main processes and their cognitive reasoning constituents which permit going beyond the readily available information. We will develop a model which represents the processes occurring as common forms of reasoning in the case of insufficient and incomplete information. In order to characterise and model cognitive reasoning processes we will describe the systems where these processes take place. Thus we will model cognitive reasoning with respect to a general cognitive system able to interact with its environment to obtain data, facts and information, and to process these in order to extract new information and relationships. These will be used to augment the system's knowledge about the environment or about a problem domain. The model of cognitive reasoning will be developed with respect to a model of the cognizing agent.

The proposed approach will concern both the rationalist and the empiricist theories of knowledge. The rationalist tradition focusses on the reasoning processes on the basis of the existing information and knowledge, while the empiricist theory concentrates on the processing of the data and facts obtained from experimentation. That is, the possible sources of information to be extracted are various internal or external bases of knowledge, facts and data and are also results of specially planned experiments. Cognitive processes are strongly intertwined with knowledge, which is not passively received, e.g. by way of communication, but is actively built up by using cognitive reasoning. Intuitively, cognitive reasoning processes are oriented to the analysis of the initial data, generation of hypothesis, hypothesis checking and acceptance or rejection of hypothesis.

Developing the conceptual level of our approach we intend to achieve the following goals:

- (i) The theory should provide appropriate methods and tools for:
 - The description of the observed events and objects
 - The description and representation of knowledge

- The cognitive reasoning processes from observation to extracting information and knowledge
- (ii) The theory should provide a special framework, which permits application of different types of reasoning operators in the development of one and the same cognitive reasoning process. Thus different types of information-processing operators can be combined in one process.
- (iii) The methods and tools to be introduced should be appropriate for further formalisation.

While developing the conceptual theory of our approach the following postulates will be taken into account:

- (a) Cognitive processes aim to extract new information and knowledge from the data and facts obtained from the environment.
- (b) Cognitive reasoning is the skeleton of these processes which is realised by the appropriate information-processing processes according to the cognitivist approach.
- (c) The main actor that can realise cognitive reasoning is the cognizing agent that, we suppose, has no other motivations than the formation of an adequate model of the environment.
- (d) A cognitive process is a discrete process in which perception and reasoning alternate. Within reasoning a cognizing agent deals with data and facts that contain uncertainties and are obtained as results of perception. During reasoning the agent extracts regularities and formulates hypotheses which reduce the domain of uncertainty.
- (e) The decrease of the domain of uncertainty results in a better model of the environment w.r.t. the actual situation. This model will support more adequate decision making and problem solving related to the environment.
- (f) The dynamics of cognitive reasoning processes can be represented as a motion from ignorance to knowledge.
- (g) In a cognitive reasoning process contradictions may appear with a temporal character. This means that a contradiction may appear at one of the stages of a reasoning process and then it may disappear.
- (h) A cognizing agent possesses knowledge and experience about itself and about the situations of the environment it met. A collection of statements can be used to represent the knowledge of a cognizing agent.

In the next chapter the main notions on which our approach will be based will be introduced and discussed. The main aim of this chapter is not to define these notions but to explain how they will be understood and used in our approach in the forthcoming sections.

In Chap. 4 we will describe the structure, processes, techniques and methods at the conceptual level that, according to our approach, will be necessary (i) to understand cognition and (ii) to support its modelling. This conceptual structure together with all the constituents is what we call a “cognitive architecture”. This architecture will be developed w.r.t. a cognizing agent, which is the main actor in our approach.

In Chap. 5 we will describe the cognitive reasoning framework (CR framework), which permits the realisation of a cognitive reasoning process by the use of different types of information-processing operators. The cognitive reasoning processes will be discussed in detail in this framework.