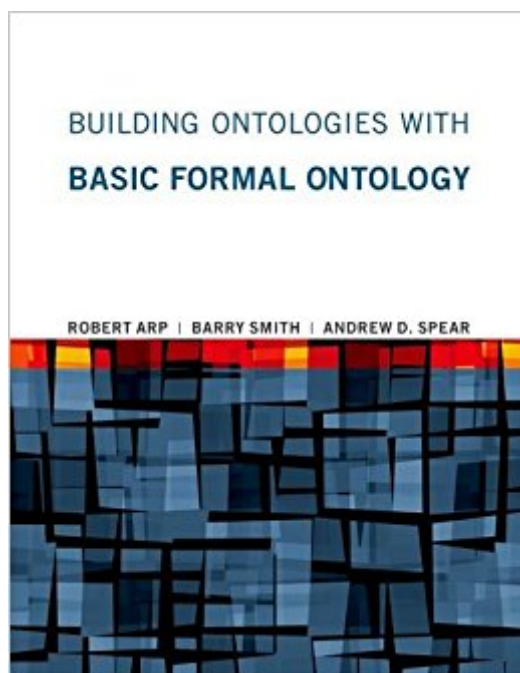


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Building Ontologies With Basic Formal Ontology (MIT Press)



Synopsis

In the era of "big data," science is increasingly information driven, and the potential for computers to store, manage, and integrate massive amounts of data has given rise to such new disciplinary fields as biomedical informatics. Applied ontology offers a strategy for the organization of scientific information in computer-tractable form, drawing on concepts not only from computer and information science but also from linguistics, logic, and philosophy. This book provides an introduction to the field of applied ontology that is of particular relevance to biomedicine, covering theoretical components of ontologies, best practices for ontology design, and examples of biomedical ontologies in use. After defining an ontology as a representation of the types of entities in a given domain, the book distinguishes between different kinds of ontologies and taxonomies, and shows how applied ontology draws on more traditional ideas from metaphysics. It presents the core features of the Basic Formal Ontology (BFO), now used by over one hundred ontology projects around the world, and offers examples of domain ontologies that utilize BFO. The book also describes Web Ontology Language (OWL), a common framework for Semantic Web technologies. Throughout, the book provides concrete recommendations for the design and construction of domain ontologies.

Book Information

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Customer Reviews

This book addresses the important, 2,000-year-old challenge of how to soundly formalize the

content and organization of scientific knowledge. As a user and teacher of ontological methods in medicine and engineering I have for years warned my students that the design of domain ontologies is a black art with no theoretical foundations and few practical principles. Without progress on the problem, I argue, many fields ranging from informatics and computer science to AI and cognitive science will struggle to achieve their enormous potential, or to do so in a way that is convincing or safe. I now have a much more positive story for my students. Arp, Smith, and Spear have combined years of experience and lessons learned in diverse application domains into this treasure trove of guidance and good practice for the ontology builder. In the journey from black art to a truly scientific theory for ontology design, this book is an important milestone. (John Fox, Department of Engineering Science, University of Oxford; Director, OpenClinical knowledge sharing project) The only way you can teach computers 'things' is by building an ontology. This book is an excellent guide to designing ontologies. With the help of this book, you can make computers seem to understand materials, diseases, or any concept you want. (T. Bedirhan Aest n, M.D., World Health Organization)

Robert Arp is a researcher and analyst for the U.S. Army at Fort Leavenworth, Kansas, who has worked on ontologies for the U.S. Air Force and the National Institutes of Health. He is the author of *Scenario Visualization: An Evolutionary Account of Creative Problem Solving*. Barry Smith is SUNY Distinguished Professor of Philosophy at the University of Buffalo and Director of the National Center for Ontological Research. Andrew Spear is Assistant Professor of Philosophy at Grand Valley State University in Allendale, Michigan.

A superb monograph that collects material previously available only from journal articles and expository videos. Tremendously helpful on a project of mine. I had access to a version through a university library, but I purchased the Kindle edition here because the formatting is much better for an eReader. Like other "mathy" books, there were some issues with the Kindle display of figures and tables, but this wasn't severe enough to affect my ability to understand the material. The best single reference I am aware of for anyone interested in the BFO approach to computational ontologies.

Excellent

Very easy to read for the basics on BFO

Complete. Easy to read. Consolidated well.

Excellent BFO introduction.

fine

Review - Building ontologies with basic formal ontology [originally published in Oil IT Journal (N^o 3 2016)] Today's linked open data has resulted in a 'hairball' of incompatible data sets (which was actually the problem the semantic web set out to solve!) To be interoperable, an ontology needs an overarching 'basic formal ontology' (the USGS has one) as is explained in this ambitious new book. Building ontologies with basic formal ontology* (Bobfo) is a 200 page introduction to the subject by Robert Arp, Barry Smith and Andrew Spear.* While ontology in its broad sense, the theory of what exists, is all-encompassing and philosophical in scope, Bobfo focuses on analyzing the 'information domain' with an intended application in IT and data modeling. The ontologist is therefore a journeyman modeler who can identify and extract the essence of data, relationships and indeed, everything else in a field of activity. In the case of Bobfo's authors this is medicine and the biological sciences, but the approach is intended to have application everywhere. To understand the basic formal ontology itself we would recommend viewing co-author Smith's video which succinctly explains the failure of the semantic web, linked open data (LOD) and ontology to date. Smith categorizes the much-vaunted constellation of semantic LOD as a 'hairball' from which information can only be extracted with considerable manual effort. The BFO sets out to fix linked data's 'anarchy and chaos' with domain-neutral standards for building ontologies, shared by all. Bobfo defines an ontology as follows, 'a representational artefact, comprising a taxonomy as a proper part, whose representations are intended to designate some combination of universals, defined classes and certain relations between them.' A taxonomy is then defined as a simple hierarchy while 'universals', 'classes', 'types' and 'synonyms' are defined as groups of the entities in the world that is being described. As you will have gathered this is a pretty dense oeuvre as perhaps befits a field so close to philosophy. On page 6 we are plunged into a discussion on terminology research, on how the 'concept orientation' of ISO, the international standards association was derived from the 'phenomenalist' ideas of the Vienna Circle. This approach has been replaced by

the $\hat{\mathcal{A}}$ -realist orientation. $\hat{\mathcal{A}}$ ™ The realists downplay the $\hat{\mathcal{A}}$ -ideas in people's heads $\hat{\mathcal{A}}$ ™ to focus exclusively on $\hat{\mathcal{A}}$ -labels that represent entities in reality. $\hat{\mathcal{A}}$ ™ Following two chapters on best principles for ontology design, the book gets down to business with the BFO itself. The BFO is a small, top-level (a.k.a. upper level) ontology designed to support data integration in scientific research. It addresses the time-dependent nature of measurement by distinguishing between a continuant and an occurrence. Other BFO concepts include role, disposition, boundary, spatial region and relation. These get rather thorough treatment, with erudite and interesting asides such as a digression on Arthur Eddington's two tables. The rubber hits the road in chapter 8 describing the BFO at work. Concretely this means the use of the web ontology language OWL, the W3C's resource description framework RDF and the ontologist's favorite tool of the trade Protégé. A short section on $\hat{\mathcal{A}}$ -facilitating interoperability $\hat{\mathcal{A}}$ ™ outlines the potential benefits, with a pointer to the work of the Open biological foundry, an $\hat{\mathcal{A}}$ -expanding virtual framework for navigating massive amounts of biological and clinical data. $\hat{\mathcal{A}}$ ™ BFO's users are mostly in biosciences as shown on the Ifomis website. In our quick spin through the list we found ontologies for email, economics and petrochemicals. But not all appear to be maintained, far from it. One noteworthy use case is the USGS that has leveraged the BFO in its surface water ontology. Bobfo underscores the weakness of current domain-specific attempts at semantics and enumerates many of the modelers' $\hat{\mathcal{A}}$ ™ pitfalls. In the end, the success or otherwise of the BFO approach depends on whether the benefits that accrue from decomposing a specific domain into its ontological components exceed the considerable intellectual effort that this requires. Those interested in such matters may like to sign up for the upcoming International conference on formal ontology in information systems in the beautiful town of Annecy, France next July.* By Robert Arp, Barry Smith and Andrew Spear. 2015 MIT Press. ISBN 978-0-262-52781-1.

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