Chapter VIII

How to Reason about the World: The Common Reasoning Platform

Introduction

Along with substances of all kinds, states of all manner, and changes of all types and exemplifications, relationships of all sorts and instances appear to be among the prime constituents of the universe as a whole and its realms, regions, and domains as the world of nature, the universe of society, and the domain of minds. Hence, knowledge of relations, as the cause-effect relationship, constitutes the basic core of real knowledge and, consequently, the logical fundament for all basic kinds of reasoning about the world. All true and effective reasoning upon reality, its particular classes, parts and features, is eventually to be founded on the underlying relations of substances, states, changes, and analogies, as well as on the meta-relations of whole-part, comparison, contrast, identity, resemblance, and difference.

To adequately represent and consistently reason about reality is vitally important not only for human beings but also for prospective intelligent machines driven by the ontological models of the world comprehending the logical models of possible worlds. A widely practiced logical tradition to represent the world in terms of abstract classes, properties, and relations or purely mathematical objects, functions, and relations looks to be a main conceptual obstacle to creating effective reasoning systems. Since the likewise artificial conceptualizations of the world are missing out the core of things, their nature and reality, providing the ontological ground and making true the truth. These would-be reasoning systems will not work effectively because of their built-in incapacity to work out any complex real problems or situations or challenges. Above all other things, such intelligent systems will be unable to see the difference of physical, mental, or social objects so that to recognize their attributes, qualities, properties, states, changes, and relations.

Then the challenging questions arising is how to design a versatile reasoning application both able to represent generic entities as well as capable to compute the meanings of their species and instances, such as places, times, words, wars, geological periods, justice, irrational numbers, artifacts, and so forth.

First and foremost, for a machine to become a really intelligent transducer, it should have the capacity to classify world things or tell apart such fundamental modes of reality as substances, quantities, qualities, places, times, positions, states, events, actions, processes, and relations. That is, it has to be endowed with the capacity of ontological reasoning about the world and its parts by "representing real-world objects, actions, and relationships internally as interconnected structures of symbols, and applying symbol manipulation procedures to those structures" (Newell & Simon, 1976). In other words, the key for designing reasoning machines is an adequate representation of the basic kinds of entities and relationships, their subordinate kinds, species, and individuals with the basic features, properties, characters, attributes, and traits.

So, what is laid down in AI as *the physical symbol system hypothesis* (the digital computing machine as a physical symbol system has the necessary and sufficient means for general intelligent behavior (action) through such an entity-centered representation and reasoning) is just another appeal to the world knowledge representation and reality-centric, ontological reasoning. Since real ontological dynamic modeling involves both encoding world knowledge and organizing reasoning rules by using the fundamental axioms and truths about relationships.

The whole point is here that a true and actual and valid reasoning about things in the world implies dynamic ontological reasoning. For, as a real science, Ontology deals with the substantial parts of Discourse about Anything or Everything, while Logic as a formal science is concerned only with the formal parts of it. And Logic considers the elements (the terms, propositions, inferences, or syllogisms) of the whole discourse aside from their reference to the world (or their real semantics). Then logical reasoning covers the formal patterns of discourse common to any reasoning, having little to do with reality, real significance, or real meanings. By contrast, ontological reasoning addresses the matter and content, the real components of discourse about anything, so forming the fundamental basis for any formal logical reasoning and rules, thus also underpinning the Web rules, a major part of the Semantic Web (A Proposal for an OWL Rules Language, 2003; the Rule Markup Initiative, 2007; Semantic Web Topic Hierarchy, 2007).

The Real Logic of Things: The Kinds of Human and Machine Thinking

To find out what ontological reasoning (argument, deduction, or inference) is, it is of necessity to address first to the content of the conception of reasoning as abstract thought standing as the general class to its numerous species and kinds, like as abstraction, analysis, argument, argumentation, demonstration, deduction, synthesis, computation, conjecture, analogy, regress, inference, cognition, and so forth. Such diversity is connected with the

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