

A Comparison between Conceptual Graphs and KL-ONE

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Abstract. In this paper is presented a comparison between conceptual graphs and KL-ONE semantic networks. For non-specialists, the two systems are based on similar principles : those of structured inheritance networks. They are conceived to provide term descriptions in the shape of necessary and sufficient conditions, and these terms are hierarchically structured. It seems so necessary to place them more precisely one with respect to the other.

Conceptual graphs allow to represent finer points of natural languages, keeping a relative syntactic clarity. KL-ONE networks contain only a few primitives which are well defined and have semantic interpretation into model theory.

The main characteristics of KL-ONE is described first and then the two formalisms are compared, with emphasis on the differences of expressiveness, in particular about quantifiers processing.

Both of these formalisms belong to the tradition of structural inheritance networks. The two of them are well-known and they have applications in the same domains: natural language and knowledge based systems. A lot of systems have been developped using them, with multiple variations. A community of developpers and users is born for each of them. It seems so necessary to place them more precisely one with respect to the other. We will first describe the main characteristics of KL-ONE, and then we will compare them.

1 KL-ONE

KL-ONE has been the first knowledge representation system based on term subsumption and classification. It provides simple and easily understandable representation primitives. From 1978 (Brachman's PhD) till now, a community of researchers came out, organizing workshops in US in 81, 86 and 89. The reference paper describing the formalism was published in 1985 [2]. A number of systems were built on the basic ideas of KL-ONE. All are defined as "term subsumption language", i. e. terminological knowledge representation formalisms using a formal language, with a

semantic interpretation given most often in logic; they allow to define terms (or concepts, or classes) by specifying necessary and sufficient conditions, and they deduce when a term subsumes (is more general than) another one. They generalize semantic networks and frames, with classification to organize terms into a taxonomy. Most of them are hybrid systems clearly distinguishing a terminological part from an assertional one. The main differences between systems lie in the assertional languages: from NIKL[8] where there is no assertion beside those expressed in terminological part, to KRYPTON [1] which offers the whole first order predicate calculus. A detailed and comparative report on the KL-ONE family is presented in [6].

Conceptual graphs also are knowledge representation formalism to define terms in a hierarchical way, without classification nor specific assertional ability. So we focus this paper on the common characteristics of the terminological part of KL-ONE and its descendants. We briefly describe a kernel that we will further compare to conceptual graphs.

A KL-ONE network includes nodes which graphically represent concepts and links which represent relations between those concepts. A concept is defined by its relations with others. They are organized into a taxonomy on subsumption links, along which properties are inherited.

Fig.1 below represents the following knowledge:

men, women and parents are persons

a parent is a person with at least a child (which is a person)

a father is a parent and a man

John is a father and has Chaïbia for child

Chaïbia is a woman

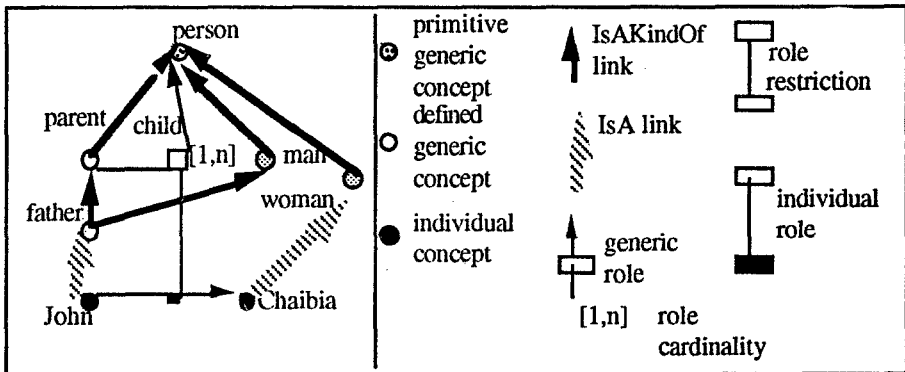


Fig.1 Structuration primitives