Chapter 3.5
An Implemented Representation and Reasoning System for Creating and Exploiting Large Knowledge Bases of "Narrative" Information

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ABSTRACT

In this chapter, we evoke first the ubiquity and the importance of the so-called 'narrative' information, showing that the usual ontological tools are unable to offer complete and reliable solutions for representing and exploiting this type of information. We then supply some details about NKRL (Narrative Knowledge Representation Language), a fully implemented knowledge representation and inferencing environment especially created for an 'intelligent' exploitation of narrative knowledge. The main innovation of NKRL consists in associating with the traditional ontologies of concepts an 'ontology of events', in other words, a new sort of hierarchical organization where the nodes correspond to n-ary structures representing formally generic classes of elementary events like 'move a physical object', 'be present in a place', or 'send/receive a message'. More complex, second order tools based on the 'reification' principle allow one to encode the 'connectivity phenomena' like causality, goal, indirect speech, coordination, and subordination that, in narrative information, link together 'elementary events'. The chapter includes a description of the inference techniques proper to NKRL, and some information about the last developments of this language.

INTRODUCTION

A big amount of important, 'economically relevant' information, is hidden within the huge mass of multimedia documents that correspond to some form of 'narrative' description. Examples of narrative documents are many of the 'corporate knowledge' documents (memos, policy statements, reports, minutes, etc.), the news stories, the normative and legal texts, the medical records, many intelligence messages, as well as, in general, a huge fraction of the documents stored on the Web. In these narrative documents, or 'narratives', the main part of the information content consists in the description of temporally and spatially bounded 'events' that relate the behaviour or the condition of some 'actors' (characters, personages, etc.). They try to attain a specific result, experience particular situations, manipulate some (concrete or abstract) materials, send or receive messages, buy, sell, deliver, and so forth. For simplicity's sake, the term 'event' is taken here in its most general meaning, covering also strictly related notions like fact, action, state, situation, episode, activity, and so on. All these notions, both the 'stative' and the 'eventive', have been sometimes grouped under the generic label of 'eventualities' (see Bach, 1981), which is, however, less evocative in our opinion than the standard term 'event'. Note that, in the events evoked by the narrative documents, the actors or personages are not necessarily human beings; we can have narrative documents concerning, for example, the vicissitudes in the journey of a nuclear submarine (the 'actor', 'subject' or 'personage') or the various avatars in the life of a commercial product. Note also that, even if a large amount of narrative documents concerns Natural Language (NL) texts, this is not necessarily true. A photo representing a situation that, verbalized, could be expressed as "Three nice girls are lying on the beach" is not of course an NL text, yet it is still a narrative document.

Because of the ubiquity of these 'narrative' resources, being able to represent in a general, accurate, and effective way their semantic content — in other words, their key meaning — is then both conceptually relevant and economically important.

In this chapter, we will present the main properties of NKRL (Narrative Knowledge Representation Language), a language expressly designed for representing, in a standardized way, the 'meaning' of complex multimedia narrative documents. NKRL has been used as 'the' modelling knowledge representation language for narratives in European projects like Nomos (Esprit P5330), Cobalt (LRE P61011), Concerto (Esprit P29159), Euforbia (IAP P26505) and Parmenides (IST P2001-39023). Many of the examples used in this chapter to illustrate the NKRL's characteristics have been developed in a Parmenides context during an in-depth application of NKRL techniques on data concerning the 'terrorism in the Philippines'; these data have been supplied by the Greek Ministry of Defense (MoD), one of the Parmenides partners, see (Zarri & Bernard, 2004a). The main references for NKRL are (Zarri, 1997; 1998; 2003a); with respect to these last papers, the present chapter is more oriented towards a general discussion about the desirable characteristics of a formal language for dealing with narratives.

In the next section, *Background*, we will examine previous and current solutions proposed for the representation and processing of narratives, their strengths, and weaknesses. The following section, *The NKRL Approach*, will represent the main thrust of the chapter and will include, among other things, a relative in-depth description of the inference techniques proper to NKRL. After a section on the future developments, a short *Conclusion* will end the chapter.

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