

CHAPTER 3

COGNITIVE OVERLAPS ALONG THE POLYREPRESENTATION CONTINUUM

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1. INTRODUCTION

The principle of polyrepresentation, proposed more than 10 years ago, provides a holistic and explicitly cognitive framework for understanding the processes involved in Information Retrieval (IR) (Ingwersen, 1994, 1996, 2001). While readily applicable to the phenomena encountered in mainstream algorithmic IR research, the main strength of the principle is that it can also be applied simultaneously to the cognitive space of the user—thus integrating the two perspectives into one coherent cognitive framework. The main idea in the principle is that document overlaps generated from representations of different cognitive and functional origins can improve performance in IR systems. This kind of overlaps we entitle “cognitive overlaps”.

This chapter outlines the principle of polyrepresentation with a focus on the representations involved. The potentials and problems of the principle are discussed in the light of recent empirical studies, and challenges and opportunities for future research are identified along a polyrepresentation continuum.

2. THE PRINCIPLE OF POLYREPRESENTATION—A HOLISTIC APPROACH TO IR

The principle of polyrepresentation originates in work on establishing a cognitive theory for interactive IR (Ingwersen, 1992). It can be regarded as a result of an effort to demonstrate the *applicability* of this theory (Borlund, 2000). The principle of polyrepresentation was developed during the 1990s. The principle is fully expanded in the *Journal of Documentation* article from 1996, which remains the main publication on the principle (Ingwersen, 1996). Prior to that, the idea of polyrepresentation is mentioned throughout Ingwersen’s book *Information Retrieval Interaction* from 1992 as a high precision tool, and an early version was presented at a SIGIR conference (Ingwersen, 1994).

A recent update on the principle appeared at the CoLIS4 conference (Ingwersen, 2002). This section briefly examines the cognitive foundation of the principle of polyrepresentation, outlines its main hypothesis, and gives examples of the kind of representations that can be captured from the cognitive space of the user and the information space of the IR systems respectively.

The cognitive foundation of the principle of polyrepresentation is very apparent in that it is assumed that every agent in IR contributes with their cognitive perceptions

and interpretations of a given document as seen from their own context. Based on the cognitive viewpoint in Information Science (De Mey, 1980) such interpretations are viewed as the result of transformations of cognitive models or knowledge structures of the agents involved. When recorded they are regarded as representations of the documents. Obviously, the same document may be interpreted by many different agents, which can result in several representations of the same document, representations that have *different cognitive* origins.

For instance, an academic article (itself a representation of the author's knowledge structures at a given point in time) may be represented by controlled and uncontrolled indexing terms assigned by an indexer, as well as subsequently cited by various authors in different contexts. In addition, a number of representations may derive from the same agent but be of different *functional* nature, e.g., the article title, abstract, table captions, references etc. all generated by the author of a text. These two types of representations are normally associated with subject access to the content or aboutness of the documents. Supplementary representations may be generated based on the actions of *selectors* in relation to the isness of the documents (Ingwersen, 2002). These selectors are agents that are responsible for the availability and accessibility of documents, e.g., journal boards, reviewers, and employers etc. who bestow cognitive authority by, e.g., allowing a paper to appear in a given journal.

The cognitive foundation is also apparent in the way the searchers' situations are considered. An information need is not seen as a static entity in its own right but rather as part of a causal structure in which a work or daily-life task to be solved plays an essential role. Based on an analysis of the user's mental structures in relation to the information need it is proposed to extract a number of representations related to the cognitive space of the user. This is discussed in some detail in Section 3 below.

We therefore define a representation as any tangible and recordable entity that has occurred as the result of a transformation of knowledge structures of a cognitive agent. As the number of representations with different cognitive and functional origins rises it is evident that quite a lot of uncertainties and inconsistencies will arise in the representation of documents and information needs. Seen from a cognitive viewpoint this is inescapable, but not necessarily a disadvantage when exploited constructively.

One may view all the communication processes in IR as consisting of interchanges that take place at the *sign level*, i.e., at a linguistic surface level (Smeaton, 1992). When humans are part of IR activities the communication between generators and recipients of information may in addition take place at a *cognitive level*. Thereby the knowledge structures of the human recipient could potentially be affected and modified, and the searcher thus receives information to help solve her work or daily-life task. Because we may only communicate via signs, the information sent by a generator will always be subjected to a cognitive "free fall", and has to be re-interpreted by a human recipient to achieve communication at the cognitive level (Ingwersen, 1996, p. 6). This essential act of interpretation means that uncertainties and unpredictabilities become inherent features of *any* representation in IR. Much of the research and development work, e.g., in Library and Information Science, has been done to reduce such uncertainties and unpredictabilities. Controlled vocabularies like thesauri or extensive cataloguing rules are constructed to create more uniform document representations, as well as to allow users to reduce their uncertainties when formulating their needs.