KNOWLEDGE-BASED AND EXPERT SYSTEMS:
REPRESENTATION AND USE OF KNOWLEDGE

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ABSTRACT

The rapid development of data processing, data management, and artificial intelligence techniques made it possible to design systems based on a large amount of expert knowledge. The following sections will give an overview of this area. First the combination of data processing, building large information systems, and integrating knowledge-based systems will be illustrated. A definition of the terms 'knowledge-based systems' and 'expert systems' is suggested by choosing examples among the growing number of existing systems, and by specifying components or modules of such a system. One chapter will be dedicated to a system for the automatic analysis of heart scintigrams developed at the University of Erlangen. The last chapter reports on experiences, possibilities for use and further expansions.
1. INTRODUCTION

There has been a rapid development in computer-based management and processing of information. The way led from simple programs to complicated program systems. So called information systems are concerned with storing, managing and evaluating large amounts of data which are found in administration, economy or control, for instance. Since data to work on are getting more complex, this requires a good deal of data management using complex strategies for using the stored information. Up to now those special program systems are concerned with alphanumeric data most of the time. The scale runs from database systems up to systems, which contain methods and offer the possibility of program synthesis [GRE 79], and further on systems for evaluating data [HAR 68, LOC 78]. An important expansion of information systems are pictorial information systems (PIS), which work on pictorial data, additionally. The question raises how to combine digital and perhaps analog images with alphanumeric and graphical information. The resulting problems are:

- accuracy, and on the other hand, fuzzy data
- availability and reliability
- time variant data
- access time.

So, the representation of data in the system and to the user is one major objective. The storing of information and its management has occupied many database administrators for the last 20 years. All these problems of data independence, reducing redundancy, avoiding inconsistency, integrity, data protection and privacy (which is very important if there are confidential data) have been the reason for intensive research in this field. Among all publications we will cite only one example, [OAT 81].

Further developments in network technology support data distribution between different departments, even between countries. The result in doing research affecting (pictorial) information systems, should be modular systems which allow easy integration of new developments and expansions as well as easy modifications.

Another important aspect in building an information system is to look at the environment in which it will be used. Each special application