LIBRARY DATABASE MANAGEMENT INPUTS FROM EXPERT SYSTEMS TECHNOLOGY

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ABSTRACT

The development in various processing stages of library and information systems and expert system as an information system and the vice-versa, are discussed. A curriculum for a course on Intelligent Knowledge Base System is presented.

1. INTRODUCTION

Development of library database is based on a set of decision made in terms of choice of data fields to describe the documents in library collections. It calls for decision making in relation to its use in the context of user needs. The development of expert systems help a library automation system to provide for rule-based systems for document descriptions. This calls for learning a variety of information handling skills.

Development of information handling skills in various information systems can be taken to be a case of unity in diversity. The main goal of a database is to fasten the information retrieval process. The main feature of information retrieval process may be stated as follows:

1. Articulation of an information need;

2. Processing the ambiguous and hazy statement to precisely formulated expression'

3. Structuring the relationship of component ideas;

4. Matching the same with organised surrogates of information;

5. Continuously updating the interactions of an information use and information products.

All these steps have been marked to indicate the different states and their focal contributions in seeking information retrieval further. However, it is possible

that more than one step can overlap in another step. Each of these steps move towards an effective information processing language. Such a language enables the system to develop principles and mechanisms for analysis and standardisation of information outputs and also as an aid to cooperation, convertibility, and compatibility among information systems and services.

2. INFORMATION PROCESSING LANGUAGE

An information processing language would have the following features.

1.It calls for concentration on the application of the specific universe of discourse or semantic domain; this is taken care of by the user's conceptualisation of the semantic world;

2.The modelling parameter in the information processing language is usually the object(s) of the world. Any object's features cannot always be represented by the name. The name is only a key external identifier.

3.There are relationships between the object's that are discernible. These relationships can be expressed as properties of interfacing objects;

4.There are also actions or activities generated from these objects and properties;

5.The objects, properties and action can individually and collectively change of these three concepts are space and time bound;

6.We can build a hierarchical classification of objects, properties and actions. Hierarchy is generally accepted as effective method of reducing the complexity of design, by making it more intelligible to designers and easier to process by design tool.s. However, heirarchy complicated the design description by introducing considerable additional structure, that is, configurations. The design database must now include information that describes how composite objects are built up from component objects;

7.Thus, a design of database consists of a collection of intermediate objects. These objects can have several instances. The objects can either be formative or composite. Formative objects cannot be further decomposed into components, while composite objects are composed of more primitive composite and primate objects. For example, steering wheel is a composite of motion dynamics part, which in turn is part of an automobile. This way, we create a configuration of hierarchies for objects;

8.Properties, associated with objects can have multiple values. Natural language can be used to express them;

9.Information modelling is capable of providing frames for variation in relationships, totality of functions and modifiability of relationship etc.

Thus an information processing language consists of:

a) variables, whose values represent the variability in representation within a conceptual framework;

b) constant with fixed operational meaning specifying realtions between variables;

c) syntax whose rules govern the well formulated expressions for adopting variables and constants; and

d) a logic that determines which expression implies each other or to be considered as equivalent. It specifies logical (a priori) dependencies among variables.

3. DEVELOPMENT OF A BASE FOR DECISION SUPPORT SYSTEMS

Information processing language can provide a base for an intermediate lexicon. The creation of an intermediate lexicon as a base for inputs and outputs in information referral helps to develop a information accessing systems. Such a system will have the following features.

1. It would accept statements made in a natural language as expression of the query by the information seeker.

2. It would structure this statements into descriptions or key words/ phrases for matching the same with system's thesaurus.

3. It arranges descriptions in a sequence wherein the search for information is conducted efficiently and productive retrieval results are provided.

4. It would interactively negotiate with the information retrieval system in modulating the response to a query. It would trigger interaction between user and the system.

5. It would ask the user for terminology modulation in understanding the user's request and system's term, (synonym, homonym and other hierarchical structuring). These actions would, of course, be well structured by:

a) Establishing the field of knowledge to be searched in the database boundaries and the comprehension of an information retrieval thesaurus;

b) Understanding of user's levels of expertise in the area concerned; and

c) Protocols in the system to negotiate with the user on and off of the search time and process.

Such access will require techniques that are analogous to and generalization of traditional parsing algorithms to achieve reasonable response times. A substantial challenge lies ahead of to combine the insights of natural language understanding and knowledge representation research with those of database organisation and retrieval. Such combination help to develop the techniques necessary to handle large knowledge bases of rules like formation.

4. DEVELOPMENT FOR EXPERT SYSTEMS AS INFO SYSTEMS

The trends in information systems discussed earlier have led to the developments of what is called intelligent knowledge-based systems -in particular to the design and development of Expert Systems. According to the British Computer Society, an Expert System is recognised as the embodiment within a computer of a knowledge-base from an expert skill, in such a form that the system can offer intelligent advice or take an intelligent decision about a processing function. A desirable additional characteristic, which many may consider fundamental is the capability of the system, on demand, to justify its own line of reasoning in a manner directly intelligible to the enquirer[1]. According to A.S. Politt, information management hinges on the three aspects of the Expert Systems[5]. They can be stated as follows:

1. They provide new mechanisms for capturing information in a very immediate and verifiable form with respect to a collection of knowledge elements.

2. Experts Systems forces us to rethink of the methods of organising and representing information and knowledge in order to make it dynamic and interactive.

3. The Expert System should enable end users to access and questions an information collection or knowledge base without requiring them to learn the procedural expressions required of a many current systems.

One more advatnage is that such systems can also learn. Learning is another area of Artificial Intelligence. It is useful Information Retrieval Systems. It is based on getting the feedback from the user regarding relevance of a text of a document to his momentary request. Depending on the feedback, the query could be expanded or terms could be removed from it. This is short term learning, in the sense that once the user's query has been changed, the system forgets all about the documents that were retrieved or its contents. This feature could be easily incorporated in the above mentioned system. The other type of learning would be long-term learning. The contents of the retrieved documents could be used to expand the knowledge base of the system thereby increasing its subject knowledge. This could be done by comparing the index terms of a document with the knowledge base and if a particular index term is missing then these terms could be stored away along with the abstract and the user's query in a separate area. The updating of the knowledge base could be done with the aid of specialist. This type of learning is both incorporation of human as well as machine intelligence.

Thus, the advent of intelligent knowledge base system has brought together on-line information system as well as knowledge base. The essential hardware system in the form of superconductor is made available. A number of areas of information handling can be enhanced with the aid of expert system. The valuable area of course is online searching. However, it could also be used for developing vocabulary control systems such as glossary, thesaurus and classification systems. It can also be used as a kind of concept of information professional skills can be used to develop expert systems. Therefore, it becomes imperative on the part of information system designers to gain skills on the various aspects of the design on intelligent Knowledge Base Systems.

5. TOWARDS A COURSE ON SYSTEMS FOR INFORMATION PROFESSIONAL

The foregoing presentation suggests that in order to participate in the information retrieval process in consonance with the adaptation of intelligent knowledge base systems, it is necessary to learn about the various aspects of the KBS and the associated field of cognitive science. The succeeding part of paper indicates the course module for such an education. This can term an optional part of Master of Information Science course, or even provide a Post-Master Diploma course. The course module can be scheduled as follows:

6. OUTLINE OF THE COURSE ON EXPERT SYSTEMS

Module 1 :

1. Definitions and Components

2. Varieties of Expert Systems.

3. Procedure for Developing Information Services and Expert Systems

4. Expert System for Bibliographic Retrieval

5. Knowledge Base Retrieval Logical Frame Work for Information Retrieval.

6. Overview of methods for Computer-Assisted Decision-making. Decision analysis and Clinical Judgement. Pattern based Interactive Diagnosis of Multiple Disorder.

7. Rule-based Systems.

   a) Production Rules as a Representaltion for a Knowledge-based Consultation Program.

   b) Problems in the Design of Knowledge Bases for Medical consultation.

   c) Production Rule System for Specific Diagnostic Problems.

   d) Production Rule for Prescribing Review : Solution alternatives.

   e) Heuristic approach to risk analysis in computer-assisted Problem management.

8 Cognitive models :

   a) Clinical Problem Solving - A behaviour analysis.

   b) Simulation of Clinical Cognition

   c) Diagnostic Expert System

   d) Constructing Expert Knowledge Base

e) Knowledge Base Structure Definition for an Expert System

f) Explaining and justifying Expert Consulting System

Module 2 : Information processing

1. Information science as Question-Answering

2. Data Collection and Analysis

   Data Collection Methods
   Data Analysis
   Making Predictions

3. Data Organization and Use

   Understanding the Data
   Estimating and Using data Values

4. Coding the Data

5. Storing Data

6. Communication of Data

7. Retrieving Data

8. Displaying Data / Multiple Representations and Presentations

Module 3 : Metalanguage for Knowledge Representation

1. Knowledge

   Definition. Data. Information.
   Judgement. Wisdom.

2. Representation Techniques

   1) Natural Language Representations

   2) Data Processing Language for representations

   3) Representation in formal Logic

   4) Propositional logic and representation languages

   5) Production Rules Based Systems

   6) Knowledge in functional approach

   7) Knowledge in programming language

   8) Concepts and techniques from data base technology, Formal logic, Expert Systems Work and Natural Language Processing Research.

Module 4 : Knowledge Base Architectures :

1. Information flow systems

2. Architecture for Production Based Rules

3. Parallel Computation

4. AI Work Stations

5. Connective and Netting Process

6. PSM-The Persistent Store Machine

7. UM - Unification Machine

8. Role of Programming in Knowledge.

Module 5 : Content Analysis Techniques

1. Conceptual, Elaboration, Framework and Distinction.

2. Conceptual Inference

   Kinds of Inference Systems
   Standards. Symptoms and Indices
   Linguistic representations. Communications.
   Institutional Processes

3. Logic of Content Analysis

   Information processing, types of Design
   Components of Content Analysis

4. Unitizing

   Types of Unit Analysis
   Ways of Defining Units
   Efficiency and Reliability

5. Sampling

   Types of Sampling schemes
   Sample size

6. Information Languages

   Definition
   Variables
   Order
   Metric analysis

7. Interference Base

Uncertainties/ Certainties
Constraints

8. Analytico-Synthetic Process

Associations. Correlations
Cross Tabulations. Images. Portrayals
Discriminant Analysis
Contingencies. Contingency Analysis
Clustering and contextural classification

9. Reliability

Reliability Designs. Agreement
Data Reliability and Standards. Diagnostic Devices

10. Validity

Typology for Validation Efforts
Semantical Validity
Correlational Validity
Predictive Validity
Construct Validity

7. PROFESSIONAL COMPETENCE FOR IMMEDIATE FUTURE

The Decision Support Systems were developed to aid an understanding and quantification of external data, accelerated development and acceptance of information science techniques, and the proper distinction between facts and relational logics. These are important elements in facilitating computer-assisted decision making.

The type of change in job content illustrated by the numerical control systems can be expected to progress upward to a higher level of problem-solving and management. Whether tomorrow's executive or researcher will be of the keyed-in variety is still open to speculation. The information personnel will continue to play a strong role, even though the gap between the information seeker and the machine will be marginally lessened.

The ability of information professional to gather, accumulate, and turn out information rapidly and effectively from the databases has produced a syndrome of Information Consciousness. All these effects have called for the following skills :

1. Knowledge of specialised reference materials;

2. Specialised analytical skills and techniques;

3. Knowledge of information collection development theories and practices;

4. Knowledge of information processing theories and practices;

5. On-line retrieval skills;

6. Supervisory skills;

7. Counselling skills;

8. Knowledge of policy making aspects;

9. Knowledge of cost effective and cost-efficient techniques;

10. Knowledge of document reproduction technologies;

11. Knowledge of information modelling techniques;

12. Knowledge of teaching and research skills;

13. Knowledge of computer hardware and novelties in architectures of computers-especially Super Computers;

14. Knowledge of intelligent knowledge systems and their developmental constructs.

In general, knowledge of the conceptual aspects of information storage and retrieval would help the following aspects :

1. Provide better access;

2. Narrow down or broaden the research results;

3. Project and explore alternative search patterns. .

4. Distinguish between no matches due to a search error; and

5. No matches between items not in the data bases.

8. CONCLUSION

There appears to be abundant, evidence in the innovation and invention clusters in computer-communication fields affecting the information environment. Many old techniques may still persist, and some may totally perish. The new skills emerge with sharper emphasis. Professional skills in design and developments of expert systems is that information modelling, knowledge representation, inference logic and consolidation towards knowledge,wisdom, intelligence and ultimately culminating in Knowledge for Productivity or Knowledge for better quality of life. The information profession has to raise the level of cognitive science studies in its educational infrastructure.

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