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Knowledge Packages

The 12th E.C.O.O. and the 8th I.C.T.E. Joint Conference, Toronto, (May 1991), pp.757-759.

Abstract

The lecture, which corresponds to this paper, gives a demonstration of a databank on perspective on an IBM compatible Personal Computer using DBaseIII Plus. This paper gives reasons for the concept of knowledge packages, outlines their structure and explores implications thereof for new approaches to knowledge.

1. Introduction
2. Points of Entry
3. Kinds of Access (Hierarchy and Alphabet)
4. Screens of Access
5. Conclusions

1. Introduction

Knowledge has traditionally been scattered. This remains the case even in great libraries. The Robarts Library in Toronto offers an excellent case in point. With seven million books it ranks among the major libraries of the world. Even so, if one is interested in classification systems other than Library of Congress one needs to go to the thirteenth floor. If one wants definitions, most of the dictionaries are on the fourth floor. Encyclopaedias are found elsewhere on the fourth floor. If one is interested in books on a topic such as perspective, one learns that these are classed under four different headings by the Library of Congress system, namely, two in the arts section in connection with architectural drawing (NA 2710), and artistic drawing (NC 749), which are on the twelfth floor of Robarts; one in the science section, in connection with descriptive geometry (QA 515) and one in the technology section in connection with drawing instruments (T369), which are in the Sigmund Samuel Library several hundred yards away.

If one wishes to study secondary literature on perspective one goes to the periodicals section of the fourth floor in Robarts for arts journals and to the periodicals section of the Sigmund Samuel Library for current technical and mathematical journals, and to various basements for earlier issues. Some specialized journals are only in the Engineering Library, The Computer Sciences Library, the Royal Ontario Museum Library, the School of Architecture Library etc. Hence even a preliminary attempt to read the materials on a single subject will require walking over a mile while moving between at least a half dozen libraries. Even so, when one consults books in these places there is no indication how representative they are, namely, what subset of all books on the subject that they constitute. The concept of a knowledge package arose from a desire to have access to this scattered knowledge in a single databank arranged with multiple points of entry: namely, basic,

classification, definition, explanation, bibliography, contents, texts, analysis and indexes. Each of these will be considered in turn.

2. Points of Entry

Basic points of entry include modes of access such as names, subjects, keywords, and titles, which are already available in automated library systems such as Felix. In addition there will be geographical access such that one can begin with a satellite photo of earth and a world map, proceed to national maps, city maps, street maps to photos and drawings of a given building, to plans and elevations of its rooms. In the case of a museum such as the Uffizi one will be able to see where Botticelli's *Birth of Venus* is located on a wall and use this as an access point to studying Botticelli, other paintings with that subject, other paintings using those motifs, or other paintings using those techniques. There will also be a chronological access, such that one can choose a date, or span of dates and see which authors were active and which objects (e.g. paintings) and subjects (e.g. Annunciation), were produced.

A second point of entry is through classification. Traditionally a library has been organized using one classification system and entering a given library means accepting their way of cubby-holing knowledge. The knowledge package contains a series of basic classification systems (e.g. Art and Architectural Thesaurus, Bliss, Dewey, Göttingen, Library of Congress, Ranganathan and Riders) and allows one to see which terms they have in common, how the systems class these terms differently and permits one to explore related terms in these catalogues of different mind sets.

A third entry point is definitions. Unlike dictionaries which traditionally give only verbal definitions of terms, the knowledge package also provides illustrations of basic concepts and constructions. It provides translations into basic European languages and permits one to move directly from a definition to a more detailed explanation or to lists of primary or secondary literature on the subject. A fourth entry point involves explanations. Whereas explanations found in encyclopaedias are often strictly verbal, the knowledge package provides illustrations. These are animated such that one can follow the stages of a construction, demonstration, or proof step by step. If there are conflicting interpretations one can follow these.

A fifth entry point is bibliography. In addition to the usual strategies of searching by author, subject, keyword or title, this level permits one to distinguish primary literature (i.e. books by an author) from secondary literature (i.e. books about an author). Access by chronology, geography and language is also possible. Earlier bibliographies are integrated such that one effectively has an historical citation index of each author or title. The knowledge package can also be linked with local and other libraries to determine what subset of the titles are available in their particular collection. A sixth entry point provides various lists of contents for the titles in question. A seventh entry point leads to full text versions. An eighth entry point provides analysis of the text in question. A ninth entry point gives further indexes.

3. Kinds of Access (Hierarchy and Alphabet)

At present the knowledge package is designed for two different kinds of access. One is hierarchical, which is logical and will appeal to those preferring a highly structured approach. If one wishes to

proceed systematically one can go down level by level. Or one can enter at any level and proceed hierarchically from that point downwards. The second kind of access is alphabetical for those who find carefully defined paths too constraining, or for those who know precisely for that which they are searching. This can also be entered at any level. Individuals wishing to create their own combinations of queries, e.g. geographical as well as chronological will be able so to do. At present choices are made by entering a number or a letter. Some persons think mainly in terms of words. Others are more visually oriented. The same information should be accessible by both paths, such that one person may prefer browsing through titles of images whereas another will prefer to browse through the images themselves, using iconic rather than verbal signposts. In future a choice between this approach and use of a mouse is planned. The profound potential of the computer lies a) in a new capacity to store all information on a given subject in one place and b) in permitting as many kinds of access to that corpus of knowledge as one wishes. This multi-valence of access applies also to screens of access.

4. Screens of Access

Children in elementary and even secondary school will have limited interest in the details of a knowledge package such as that listed above. They will be interested in some of the material but not all of it. They will, for instance, want definitions of basic terms, but not at the level of complexity given in the unabridged version of the *Oxford English Dictionary*. Hence there is a challenge of translating the definitions into different formulations in tune with different stages of development. For example, if a child in first grade asks for a definition of perspective they would be told that this is a method for creating space in a picture. In most cases it is not a question of creating a new database for children at each phase of development, but rather a challenge of creating different screens (or masks) which capture smaller or larger subsets of the whole. Hence if a child in grade one asked for bibliography they would be directed to a list of simple books, which would be a very small subset of all the titles in the list. Each level of development would offer a child a larger subset of the whole until at the university level they are presented with the entire corpus of knowledge that is available in the field. Coded textbooks as described in the other paper given at this conference would be one obvious means of introducing children to these ever larger subsets. From the ninth grade onwards it might be useful to indicate to children with what subset of the whole they are dealing at a given stage. This will have an appropriate sobering effect on individuals whose confidence and claims are greater than their achievements or their ability.

Becoming aware of history is an important dimension in these subsets of knowledge. At the outset a child will be given a simplified explanation of a concept as it is understood today. As a child progresses they will increasingly be introduced to the ways in which our understanding of a subject has changed with time. In the case of perspective, for instance, they will learn that in Antiquity there were only pseudo-perspectival methods, that perspective in its modern sense evolved empirically in the fourteenth, began to be codified in the fifteenth century, and has continued to develop in the centuries since.

Gradually children will learn that interpretations of the past have also changed with time: that some cultures have assumed that the Greeks had knowledge of perspective, others doubted it, while some have given clear evidence against this claim. In so doing they will learn how what is accepted as evidence has changed with time, how some early scholars were content with written testimony of a

respected authority even if ambiguous; while others turned to archaeological and art historical evidence. They will learn that the same evidence is open to radically different interpretations, some of which are political or cultural: that a victory of the Indians is described as a defeat by the cowboys, and conversely.

Textbooks have traditionally given only one point of view. Computers could easily make accessible differing and even conflicting viewpoints and use this to make children aware of multiculturalism, as they discover that the history of Canada as told by the Indians is very different than the history of Canada as told by the English or the French Canadians. Children will also learn how the gamut of interpretative tools used as evidence has expanded enormously with time: they will learn to see how sketches, measured drawings, geometrical figures, photographs and digital images constitute a spectrum of recording methods and to discern both connections and distinctions between these methods. Part of the challenge is learning to see that various levels of abstraction are simply tools for understanding a given piece of knowledge at different scales of precision.

5. Conclusions

The knowledge package on perspective is intended as a prototype for new approaches to knowledge. The full consequences thereof for education will become apparent when knowledge packages are made of the basic curriculum subjects, notably: English, mathematics, science, geography and history. Children need to discover that our heritage of visual images is an important dimension of western culture, that knowledge of a field changes with time but is not merely relative. A revolution in knowledge is happening in our midst. This involves new access to the sources and evidence of knowledge. It also involves a new awareness of different kinds of knowledge, points of access and screens of access to that knowledge, as well as different interpretations thereof. If misused, this will generate new confusion and obscurity. If used wisely these tools can bring about a new synthesis whereby we see the interrelatedness of all knowledge and comprehend better where we stand in relation to its many facets.