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Information Retrieval and Automatic Structure-Matching Procedures

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This thesis is concerned with a techinique of matching abstract graphs and its applications in information retrieval system.

Information retrieval system is composed of three major components:
(1) identifying and tagging of information for effective retrieval, (2) searching strategy; how to enter the file to circumvent the scanning of irrelevant material, and (3) file organization to make efficient accees to information.

In Chapter One concept of information retrieval is given. Tne following chapter is concerned with some problems of information retrieval, e. g. how to tag stored information, how to search information file etc.

Many data-processing applications are concerned with the manipulation of units of information by rearrangment of their order or selection of units according to some prescribed criterion. The former is serting and the latter is searching. Algorithms for sorting and searching rely upon the detection of equality between units or the determination of one unit is contained within (i. e., smaller than) another. In information retrieval, however, not only the units themselves are of interest but relations between units are also important. That is, the structure of the data must be processed, and to carry out searching and sorting operations it is necessary to be able to detect equality between structures and to detect substructures.

Chapter Three is concerned with the technique of matching those structures which may be represented as abstract graphs, that is, as a set of points (nodes) and a set of interconnections (branches) between certain pairs of points. A graph is represented schematically by drawing a small circle as a node and a line with an arrowhead as a branch.

The proposed procedure for matching abstract graphs relies on determining simple properties of the nodes of the structures being matched. Subsets of nodes which exhibit equivalent properties are equated. A standard procedure is then used to breakdown already existing subsets into sets with fewer members and to construct new matching subsets. Eventually either an incompatibility results between matching subsets or else the membership of each subset is reduced to one, thereby exhibiting explicit correspondences between the node of the structures.

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In Chapter Three, some simple definitions are presented and the algorithm is discussed in more detail. The algorithm is illustrated for testing whether or not two graphs are isomophic. The mechanization of the algorithm for a digital computer is also discussed. For instance, sets may be represented by their characteristic vector (e. g. subset $\{n_2, n_3, n_6\}$ of set $\{n_1, n_2, n_3, n_4, n_5, n_6\}$ is represented by vector (0, 1, 1, 0, 0, 1)) and graphs may be represented by their connection matrices. Set operations (union, intersection, complementation) correspond to built-in logical operations (and, or, not). Therefore, the mechanization is simple.

Finally, the system applying a technique for matching graphs is suggested.