
RESEARCH IN PROGRESS

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Past Research in Expert Systems at ETSU

Artificial intelligence research at East Texas State University (ETSU) began in the fall of 1983 with the development of a knowledge-based expert system to solve configuration problems. The intention was to develop a generic system that could be transferred from one problem domain to another. The problem domains selected on which the system was to be tested were the configuration of Hewlett-Packard Model 29 computer systems and the generation of degree plans for graduate students in the Computer Science Department at ETSU.

The configurator is based on a semantic network that utilizes frames as a method of representing knowledge. Frames are used as nodes in the network and can contain facts, rules, and links to other nodes. These links are semantic in nature; hence, there is a semantic net. Typical links used within the system are SEE-FRAME, IF-NEEDED, IF-PRESENT, and IF-REQUIRED. Frames are used to isolate the contexts of rules and to provide the required granularity of detail desired in the configuration process.

The inference engine is generic in scope and can be applied to many different problem domains easily. Domain-dependent routines are loaded for each problem domain attempted. The inference engine is comprised of generic functions and very few domain-dependent functions for both the computer configuration and the degree-plan design problems.

The configuration process proceeds in two phases. The initial phase is the configuration of those components known to be required in every configuration. The second phase is the configuration of options and extras selected from those components in an available list (Mosley, 1985).

Participants: Dr. Richard Detmer, Dr. Daniel Creider, Burt Mosley, and Scott Campbell

Current Research in Expert Systems at ETSU

Current expert systems research is concerned with developing object-recognition techniques based on a given complete or incomplete description. We plan to develop a generic system that can be transferred from one object class to another, or to multiple object classes. Emphasis is being placed on the representation of knowledge and

inferencing strategies to reduce search time and space in systems with knowledge bases comprised of many objects.

One method currently being researched is the notion that the given descriptions or characteristics of an object will provide the path to the goal object(s). A characteristic is represented as a semantic net node. A characteristic will consist of an attribute node, its value, and object nodes that are associated with the attribute. Each attribute is represented as a node, and each value associated with the attribute is represented as an arc directed to the object nodes. The object nodes are names of frames that provide a complete description of an object. The characteristics (semantic net nodes) are connected in a global network that facilitates efficient access to the object node(s) which can be described by the given characteristic(s).

The inference engine's task will primarily be to analyze the given characteristic(s) to derive a maximum set of objects that can be described by the characteristic(s). Then, an attempt to minimize the set of objects takes place by evaluating the intersection of the derived sets to determine which objects have more given characteristics associated with them. In the event that more than one object is found to contain the given characteristics, more characteristics will be required to enable further discarding of similar objects as a means of determining the actual goal node (object).

We are currently developing a prototype system employing this method to provide a more in-depth evaluation

Abstract

This article presents a summary of past and current artificial intelligence research within the Computer Science Department at East Texas State University (ETSU). The Computer Science Department at ETSU offers a master of science degree with an emphasis in artificial intelligence. AI research, both past and present, has been funded by a grant from E-Systems, Greenville Division. AI research projects thus far have been implemented in Domain LISP on an Apollo DN300 computer system provided by E-Systems. Other computing facilities available for artificial intelligence research are four workstations, each providing up to 20 users with LISP and PROLOG interpreters. Involved in the research are faculty and students at ETSU and personnel from E-Systems.

of this approach. Future enhancements under consideration are the design and development of a natural language front-end processor and the addition of rule-based processing that might enable the system to fill in incomplete descriptions.

Participants: Dr. Daniel Creider, Dr. Timothy Donovan, and Carey Bengé

The results of these research projects are expected to contribute to the theory and practice of AI techniques in the areas of knowledge representation, search algorithms and techniques with respect to reduction of search time and space, rule-based processing, inferencing strategies, and expert systems development. The artificial intelligence research undertaken at ETSU is expanding the newly added AI curriculum, which currently includes courses in algorithms and programming techniques for artificial intelligence applications, principles of artificial intelligence, and expert systems.

Reference

Mosley, Burt (1985) A semantic based expert configuration system Thesis. Computer Science Dept., East Texas State University

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