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ABSTRACTS

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INFERENCE ENGINES BASED ON FUZZY REASONING

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The MILORD* system contains a management module of the knowledge bases and three inference engines (forward, backward and mixed). It has been developed using NIL-LISP and it is compatible in any common-LISP enviroment.

KNOWLEDGE BASE DESCRIPTION

The knowledge Base has been designed to enable the engines have a fast access to the information. This is done by transforming the external high level structure of the rules and facts into an apropriate internal structure.

The result gives a very good performance in the followings aspects:

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* Motors d'Inferència basats en la Lògica del Raonament Difús (Inference Engines based on Uncertain Reasoning).

- Easy access to the certanity value of an event
- Easy access to the components of the rules
- Easy access to rules which conclude a given fact
- The identification of the non-deducible events of the aplicable rules.

The main element in the achivement of such efficiency is the appropriate use of the atomic properties of LISP instead of the sequential access to the information common in other systems. This has also the advantage that the efficiency is less dependent on the size of the knowledge base.

INFERENCE ENGINES

The inference engines use several tecniques in order to improve its speed and in order to prune the paths which would lead to a failure suase techniques are bases on:

- the use of a minimum certainty validisy for the validation of the concluded facts
- the use of a backward chainning with lookahead to eliminate deduction which have no chance to end up with a fact than the validity level
- the use of a dynamic interaction between the engines in order to switch from one another acording to the particular situation
- the selection of the rule to apply acording to diferent criteria:
    * the number of conclusions
    * the number of non-instanstiated premises
    * the certainty values of the rules
    * combinations of the previous criteria.

The system has communication facilities, in order to assist the user and to explain its reasoning process, the functions used in the propagation and combination of certainty values, in the interval 0,1 , are those of MYCIN i.e.:

The certainty value CF of a fact deduced by means of a rule with certainty value CR is given by:

$$CF = CR \cdot \min c_{p_i}$$

being C_{p_i} de certainty values of the premises of the rule.

The certainty value CF of a fact deduced by means of two different rules with certainty values C_1 and C_2 is:

$$CF = C_1 + C_2 - C_1 \cdot C_2$$

Although MILORD due to its modularity, easily accepts the definition of new propagation and combination functions this allows us to easily compare the results using different functions working with the same application. We are working on an extension in order to deal with possibility distributions modelizing the imprecision of fuzzy predicates in the premises and/or the uncertainty expressed using linguistic values instead of numerical values.