

## APPLICATION OF FUZZY LOGIC IN DECISION MAKING SYSTEMS

**Animesh Kumar Sharma**

Lecturer, Department of Mathematics, Raipur Institute of Technology, Raipur  
Email: animatte.sharma@gmail.com

### **ABSTRACT**

*In this paper I explain the new ideas by means of a rating system for checking the credit solvency of small business firms. By means of a pilot software we are going to demonstrate that fuzzy decision support systems offer more information to the user than classical aggregation processes. Moreover, they provide a simple way for explaining the rating result.*

**Keywords:** Fuzzy Controller, Fuzzy Logic, Expert Systems, Human Reflection Process, Linguistic Variables, Membership Functions, Aggregation, DOF.

### **INTRODUCTION**

Decision Support systems are a specific class of Information Systems that support business and organizational decision-making activities. They are interactive software-based systems intended to help decision-makers to take decisions, to identify and solve problems, all that accomplished by compiling useful information from simple data, documents, personal knowledge, and/or business models..

Decisions and evaluations in economic and business problems are usually complex. A lot of variables and relations have to be specified. The expectations of the fifties and sixties of these centuries - that it would be possible to model all problems in form of adequate mathematical systems - could not be satisfied. Today we know this can only be achieved in case of relatively simple problem.

However, it has always been necessary to make decisions in complex situations. A circumstance which is still valid, no matter whether it concerns economic, business respectively jurisprudential problems or everyday situations for example, driving a car during rush hour. Based on qualifications and practical knowledge, individuals attempt to come to a satisfying solution. A person who obtains extraordinarily good results is called an "expert" in this field.

The motivation within the last 20 years was to model the decision process of experts instead of the decision situation. Expert knowledge does normally not consist of confirmed theories, it is rather composed of heuristic rules the expert obeys during his own decision making. Expert rules are usually formulated by linguistic terms and therefore it is difficult to

transform them into classical mathematical terms or to apply them to computer-aided processing.

By modeling linguistic variables in form of fuzzy sets, it is possible to transform expert rules into mathematical terms. Moreover the fuzzy set theory offers a great variety of operators which are able to aggregate and combine these rules. The advantages of fuzzy logic for controlling technical processes have become well-known, not only in Japan but during the last decade as well in America and Europe. Now the question arises, whether the procedures, used very successfully in fuzzy control, can also be applied to non-technical expert systems.

At the institute of Statistics and Mathematics of the University Frankfurt am Main we are working at the following Research projects using expert rules and fuzzy logic processing: -

- Checking the creditability of small business firms
- Checking the credit solvency of persons buying a car on installment plan
- Evaluating the capital structure, financial assets and revenue of firms in order to support the business of auditors
- Analytical procedures in the course of audits
- Portfolio management
- Evaluating suppliers

With the fuzzy logic based decision support system the following goals should be achieved:

- Construction of a transparent support system, which could be accepted by the users
- Reproduction of the behavior of experts concerning
  - subjective selection of attributes
  - classification of the attributes by evaluation classes stepwise and rule-based aggregation of the partial evaluations to an overall rating judgment
- Use of external data (branch of industry, country)
- Use of linguistic evaluations (poor, medium, good)
- Use of quantitative and qualitative information
- Processing of data measured on different scales (nominal, ordinal, cardinal)
- Softening of the crisp borders of evaluation classes
- Use of fuzzy inference
- Use of expert knowledge and of data banks
- Creating a rating judgment with accompanying commentary. Subsequent to the introduction, the paper is recognized in 6 chapters which are described with few comments