THE USE OF FUZZY LOGIC AT SUPPORT OF DIRECT MAILING

1. INTRODUCTION

The use of fuzzy logic is the advantage especially at support of direct mailing where the evaluation is very complicated. The advantage is that the linguistic variables are used. The fuzzy logic measures the certainty or uncertainty of membership of element of the set. Analogously the man makes decision during the mental and physical activities. The solution of certain case is found on the principle of rules that were defined by fuzzy logics for similar cases. The fuzzy logics belong among methods that are used in the area of direct mailing.

2. THE FUZZY PROCESSING

The calculation of fuzzy logics consists of three steps: fuzzification, fuzzy inference and defuzzification.

• The fuzzification means that the real variables are transferred on linguistic variables. The definition of linguistic variable goes out from basic linguistic variables, for example, at the variable risk it is set up the following attributes: none, very low, low, medium, high, very high. Usually there are used from three to seven attributes of variable. The attributes are defined by the so called membership function, such as Λ, π, Z, S and some others. The membership function is set up for input and output variables.

• The fuzzy inference defines the behavior of system by means of rules of type <When>, <Then> on linguistic level. The conditional clauses evaluate the state of input variables by the rules. The conditional clauses are in the form

<When> $Input_a$ <And> $Input_b$ ….. $Input_x$ <Or> $Input_y$ …….. <Then> $Output_1$,

it means, when (the state occurs) $Input_a$ and $Input_b$, ….., $Input_x$ or $Input_y$, …… , then (the situation is) $Output_1$.

The fuzzy logic represents the expert systems. Each combination of attributes of variables, incoming into the system and occurring in condition <When>, <Then>, presents one rule. Every condition behind <When> has a corresponding result behind <Then>. It is necessary to determine every rule and its degree of supports (the weight of rule in the system). The rules are created by the expert himself.

• The defuzzification transfers the results of fuzzy inference on the output variables, that describes the results verbally (for example, whether the risk exists or not).

The system with fuzzy logics can work as an automatic system with entering input data. The input data can be represented by many variables.

3. DIRECT MAILING

The case presents the use of fuzzy logic at direct mailing, whether the client visit personally, sent him a letter or not to speak to him. See the model on fig.1.

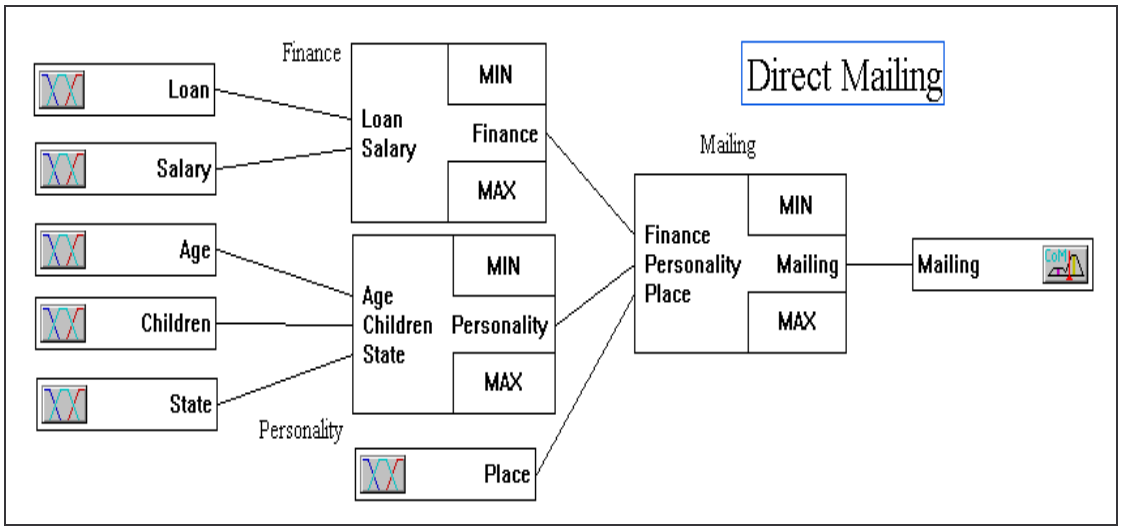

Fig.1 Project chart

The input variables and their attributes are Loan (fig.2) (none, small, medium, high), Salary (fig.3) (low, medium, high), Age (fig.4) (young, medium, old, very old), Children (no, a few, many), State (single, married, divorced) and Place (big city, city, village).

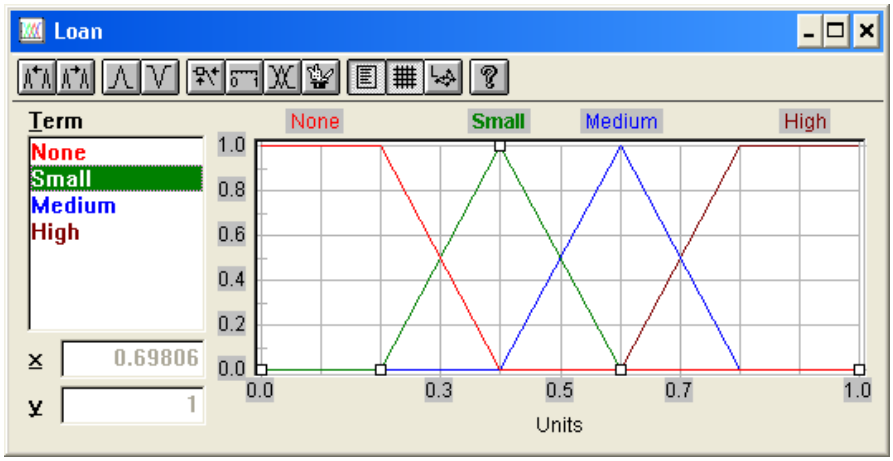

Fig.2. The attributes and membership functions of variable Loan

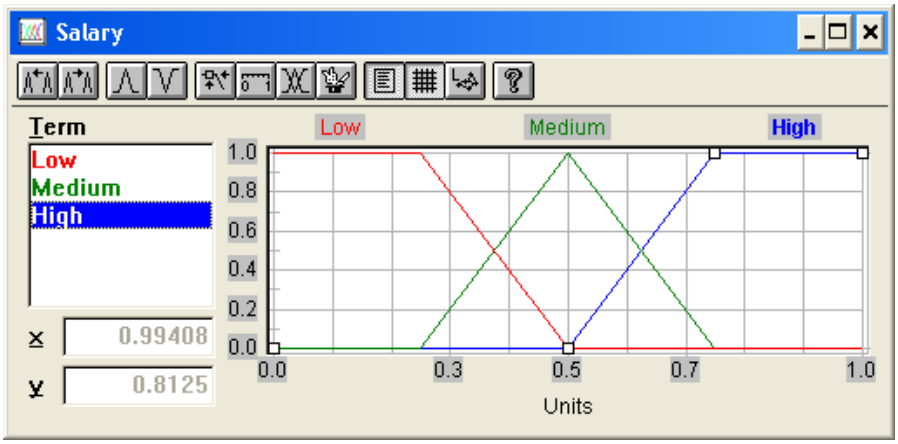

Fig.3. The attributes and membership functions of variable Salary

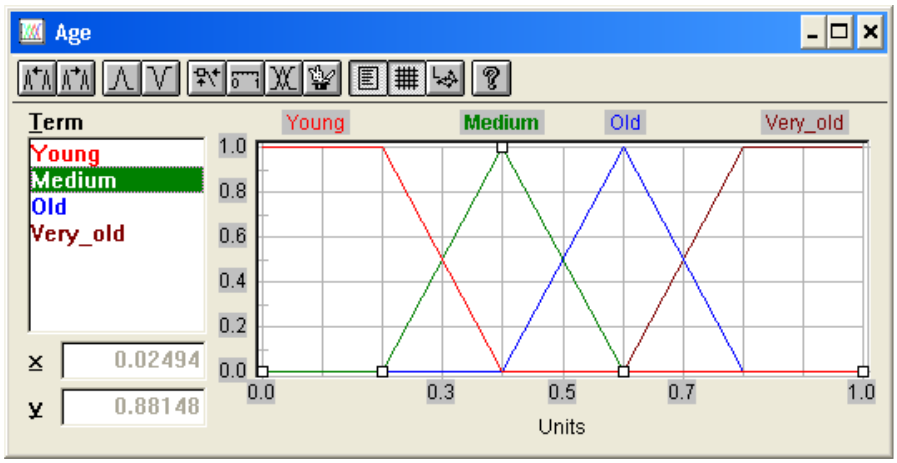

Fig.4. The attributes and membership functions of variable Age

The rule blocks with attributes are Finance (excellent, good, bad), Personality (unsuitable, suitable, good, excellent). The fig.5 shows the attributes and membership functions of the Finance.

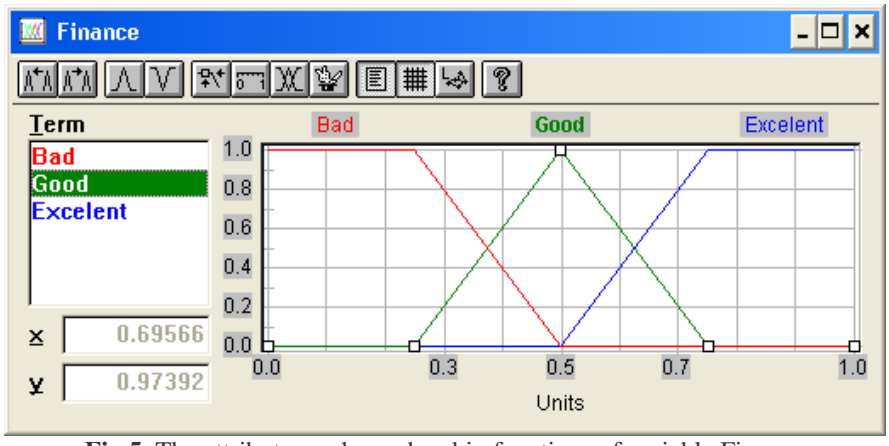

Fig.5. The attributes and membership functions of variable Finance

The output variable Mailing with the attributes evaluates whether the client will be visited or a letter will be sent to him or he will not be spoken to him. See fig.6.

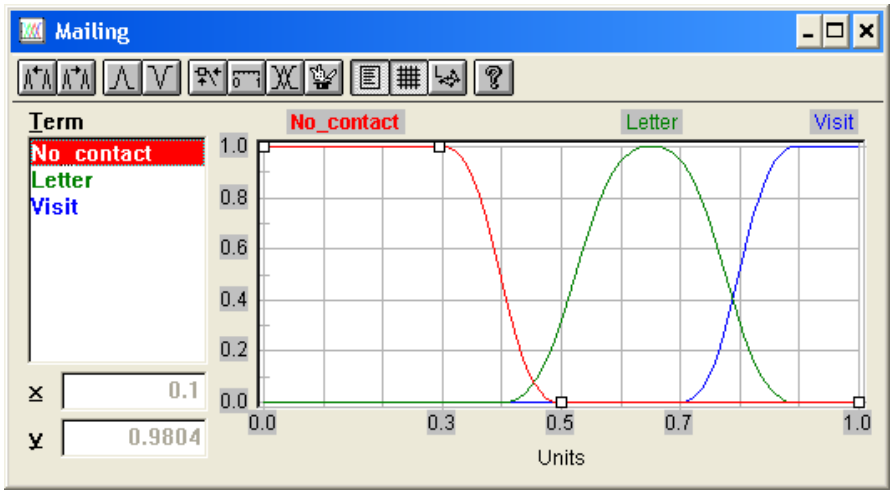

Fig.6 The attributes and membership functions of variable Mailing

The fig.7 show one from two rule blocks Finance with their rules and degree of support that set up the relation between input and output variables.

Spreadsheet Rule Editor - RB1

	IF		THEN	
	Loan	Salary	DoS	Finance
4	None	Medium	0.60	Bad
5	None	Medium	0.80	Good
6	None	Medium	0.60	Excelent
7	None	High	0.00	Bad
8	None	High	0.50	Good
9	None	High	1.00	Excelent

Fig. 7 Rule block

When the model is made, it is necessary to tuned it (to set up the inputs on known values, evaluate the results and to change the rules or weights, if necessary). If the system is tuned, it is possible to use it in practice.

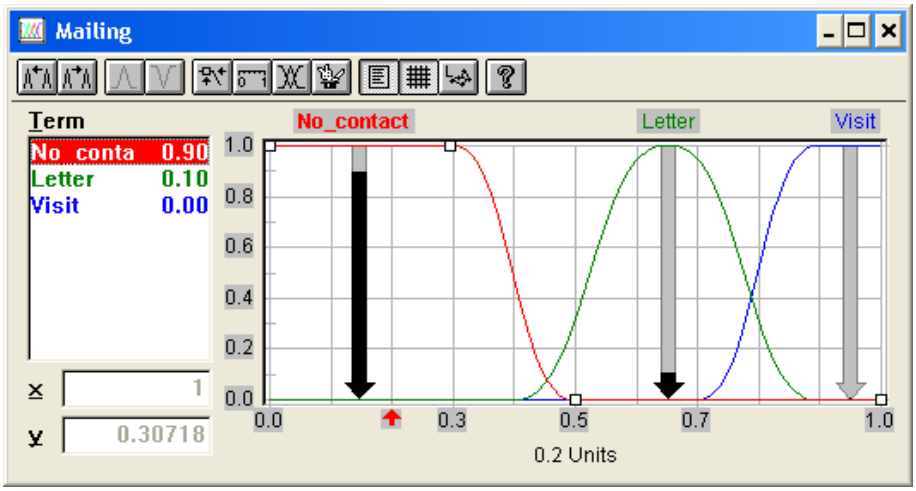

Fig.8 The attributes and membership functions of output variable Mailing

The set up of the rule block distinguish single cases. For example, the result of decision making is the no contact with client in case when the person has a low salary and a lot of loans, he lives in a village, he is of old age, he is single and without children. The fig.8 shows this result, where the mailing is evaluated not to contact the client.

The effort is to bring the profit in future from the investment into the marketing. The evaluation, whether the marketing project is profitable or loss-making, is possible to evaluate after certain time.

4. CONCLUSION

The mentioned case is only the fraction of possible variants of the use of fuzzy logic in various areas of decision making. The theory of fuzzy logic contributes to the quality of decision making. The decision making process is an important activities of the firms. It is possible to say, that the successful decision making make the firm successful.

It is necessary to emphasize, that these methods support the decision making and that the responsibility of optimal variant or variants are on those, who makes the decision.

The fuzzy logic besides artificial neural networks and genetic algorithms belongs to relative strong methods as a tool of artificial intelligence for the support of decision making.