THE SOLUTION OF DECISION MAKING PROBLEMS IN MATLAB

Abstract: *This paper deals with the way of solution of decision making problem by means of fuzzy logic in program language MATLAB where multiply rule boxes must be used. The fuzzy logic enables to work with vague terms that are quite used in business and public services. The designed solution could be used for decision making processes to be successful in business also at cross border regions of southeast Moravia.*

Keywords: *Fuzzy logic, decision making, multiply role boxes, MATLAB.*

1. INTRODUCTION

There are situations when it useful to use fuzzy logic for decision making processes because of their ability to use vague terms such as uncertainty, semi truth, unclearness etc. The applications include business and public services. There are various inputs that are necessary to take into consideration on the output and it will not be discussed in this article. The problem is when it is necessary to process the evaluation of multiply rule boxes in MATLAB. It could be done with the help of program via M-file.

2. CASE STUDY

The case study presents the example where there are some direct inputs I_1 and I_2 directly connected to final rule box B_F and inputs connected to partial rule box B_1 and B_2. The connection can be done by creation of M-file, that enables to read the input data, but also it transfers results to other blocks. The example is presented by following diagram. See Fg.1.
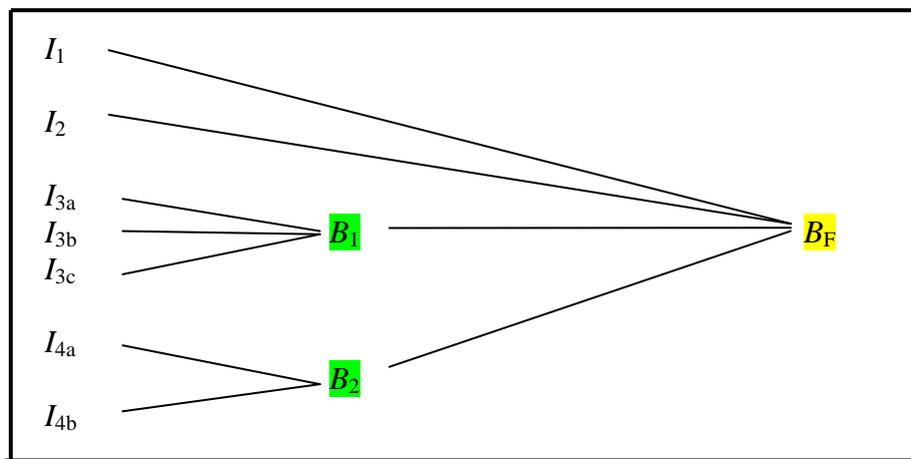

Fig. 1 Connection of rule blocks

The variables I_1 and I_2 are inputs to final rule box B_F (see Fig.2) together with output from rule box B_1 (see Fig.3) with inputs I_{3a}, I_{3b}, I_{3c} and output from rule box B_2 (see Fig.4) with inputs I_{4a}, I_{4b}.

This case study could represent for example the problem of decision making for choosing the best supplier in the region of southeast Moravia. The inputs I_1 represent the price of product and input I_2 the quality of the product. The block rule B_1 presents business conditions with inputs packaging I_{3a}, discount I_{3b} and guarantee I_{3c}. The block rule B_4 presents other criteria such with inputs reliability I_{4a} and willingness I_{4b} of supplier. The output presents decision making supported by vague terms of cooperation with supplier reject, monitor or accept it.
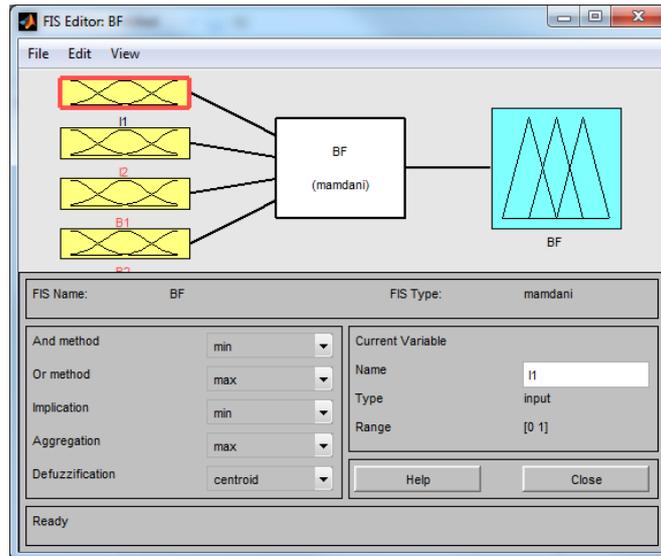
Fig. 2 Rule box B_F
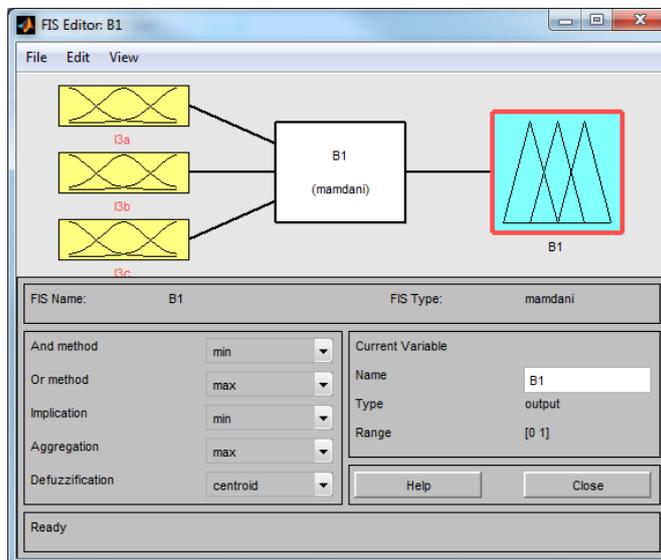
Fig. 3 Rule box B_1
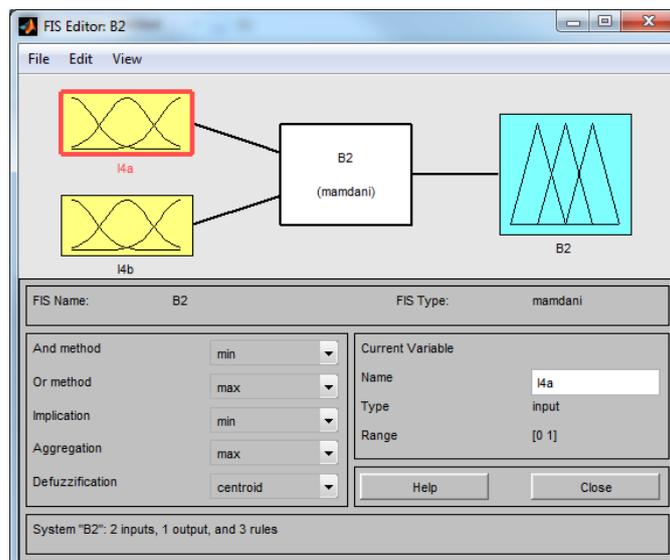
Fig. 4 Rule box B_2

The M-file *BF.m* provides the calculation. See prog.1.

```
clear all
B1v = readfis('B1.fis');
UdajB1 = input('Input values in the form [I3a; I3b; I3c]: ');
VyhB1 = evalfis(UdajB1, B1v);

B2v = readfis('B2.fis');
UdajB2 = input('Input values in the form [I4a; I4b]: ');
VyhB2 = evalfis(UdajB2, B2v);

BFv = readfis('BF.fis');
UdajBF=input('Input values in the form [I1;I2]: ');
UdajBF(3) = VyhB1;
UdajBF(4) = VyhB2;
VyhBF = evalfis(UdajBF, BFv);
if VyhBF<0.5 'Reject'
elseif VyhBF<0.8 'Monitor'
else 'Accept'
end
fuzzy(BFv)
mfedit(BFv)
ruleedit(BFv)
surfview(BFv)
ruleview(BFv)
```

Prog. 1 M-file *BF.m*

The results of calculation are presented by inputs $I_1, I_2, I_{3a}, I_{3b}, I_{3c}, I_{4a}, I_{4b}$ with values 0, 1 and 0.5. The results are Reject, Accept and Monitor. See res 1.¨

Input values in the form [I3a; I3b; I3c]: [0;0;0]
Input values in the form [I4a; I4b]: [0;0]
Input values in the form [I1;I2]: [0;0]
ans =Reject

Input values in the form [I3a; I3b; I3c]: [1;1;1]
Input values in the form [I4a; I4b]: [1;1]
Input values in the form [I1;I2]: [1;1]
ans =Accept

Input values in the form [I3a; I3b; I3c]: [0.5; 0.5; 0.5]
Input values in the form [I4a; I4b]: [0.5; 0.5]
Input values in the form [I1;I2]: [0.5; 0.5]
ans =Monitor

Res. 1 M-file *BF.m*

3. CONCLUSIONS

The above mentioned methods could be used for the solution of multi criteria, difficult to algorithm decision making processes. There is no limitation of number of inputs and rule boxes and the way of use for decision making processes.