The Fuzzy Neural Controller for CDMA Networks

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Abstract – **In the work it has been proposed to use fuzzy logic, neural networks and genetic algorithms in CDMA networks for channel allocation. Architecture of the fuzzy neural controller was developed. Linguistic variables, terms and membership functions for input and output values have been defined. Rules base has been developed.**

Keywords – **CDMA, Fuzzy-controller, Channel**

I. Introduction

Fuzzy systems, neural networks, and genetic algorithms have replaced conventional techniques in many engineering applications, especially in control systems [1]. In modern telecommunication networks the control techniques [2] are widely used. It is suggested to use a fuzzy neural controller for channel allocation in the CDMA system that allows avoiding calls dropping.

II. Architecture of the Fuzzy Neural Controller

We propose to use in CDMA networks a fuzzy neural controller having two input and one output linguistic variables (Fig.1). Input linguistic variables of the fuzzy-controller are a number of free channels and load in the cell, its output variable is channel transference.

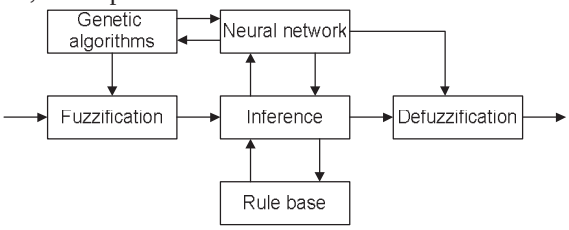

Fig.1. The architecture of the fuzzy neural controller

For defining the number of free channels N terms "few" and "many" are used (Fig. 2,a). Thus, the term set of the number of free channels N is:

$$T(N) = \{Few(F),\ Many(M)\}.$$

Membership functions for $T(N)$ are presented

For defining the load in the cell L terms "low", "moderate", and "high" are used (Fig. 2,b). Thus, the term set of the load in the cell L is:

$$T(L) = \{Low(L), Moderate(M), High(H)\}.$$

For defining the channel transference the terms "big transferring", "small transferring", "small acceptation", "big acceptation" are used. Thus, the term set for the channel transference C is:

$$T(C) = \{Big\ transferring\ (BT),$$

$$Small\ transrerring\ (ST), Small\ acceptation\ (SA),$$

$$Big\ acceptation\ (BA)\}.$$

Membership functions for *T(C)* are presented on Fig. 2,c.

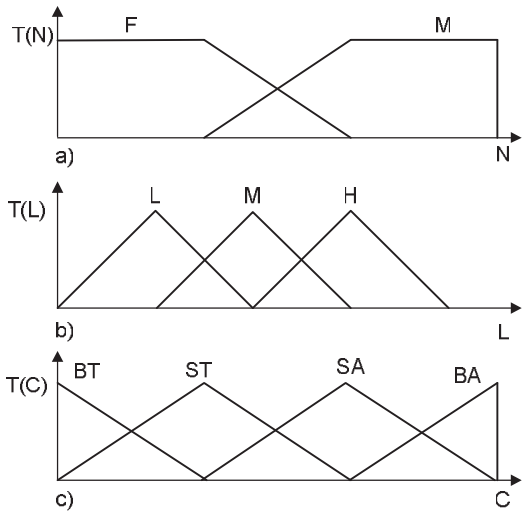

Fig.2. Membership functions for the linguistic variables

III. Operation of the Fuzzy Controller

The proposed fuzzy controller works according to a rules base consisting of six rules:

1. *if* $N = F$ *and* $L = L$ *then* $C = BT$;
2. *if* $N = F$ *and* $L = M$ *then* $C = ST$;
3. *if* $N = F$ *and* $L = H$ *then* $C = ST$;
4. *if* $N = M$ *and* $L = L$ *then* $C = SA$;
5. *if* $N = M$ *and* $L = M$ *then* $C = BA$;
6. *if* $N = M$ *and* $L = H$ *then* $C = BA$.

IV. Conclusion

So, the fuzzy neural controller for channel allocation in the CDMA-network has been designed. Two input and one output linguistic variables, their terms and membership functions have been defined. The rules base consisting of six rules have been developed.

References

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