Literature Survey on Fuzzy Logic

Ms.C. Arul Sugana[1]. Mrs.S.ArokiaMagdaline[2]
[1]*B.E., M.E Communication systems', Department of ECE, Parisutham Institute of Technology & Science, Thanjavur*
[2]*M.E., Assistant professor, Department of ECE, Parisutham Institute of Technology & Science, Thanjavur*

***Abstract*- Fuzzy logic idea is similar to the human being's feeling and inference process. Unlike classical control strategy, which is a point-to-point control, fuzzy logic control is a range-to-point or range-to-range control. The output of a fuzzy controller is derived from fuzzifications of both inputs and outputs using the associated membership functions. A crisp input will be converted to the different members of the associated membership functions based on its value. From this point of view, the output of a fuzzy logic controller is based on its memberships of the different membership functions, which can be considered as a range of inputs. Computers can only understand either '0' or '1', and 'HIGH' or 'LOW'. Those data are called crisp or classic data and can be processed by all machines.**

***Index Terms*- VR head phone, fuzzy logic.**

1. INTRODUCTION

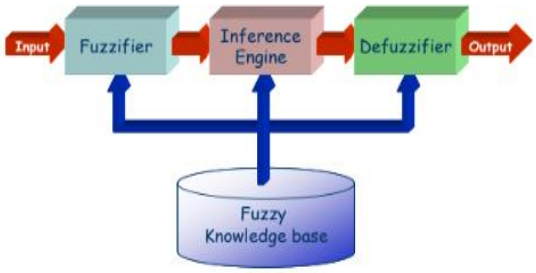
Problems in the real world are quite often very complex due to the element of uncertainty. Although probability theory has been an age old and effective tool to handle uncertainty, it can be applied only to situations where the system characteristics are based on random processes. In such situations, fuzzy logic exhibits immense potential for effective solving of the uncertainty in the problem.

Fuzzy logic is an extension of Boolean logic which handles the concept of partial truth, where the range of truth value is in between completely true and completely false In classical logic concept we can express everything in the form of 1 or 0, true or false, or, white or black. But fuzzy logic replaces Boolean truth-values with some degree of truth. This degree of truth is used to capture the imprecise modes of reasoning that play an important role in the ability of human being to make decisions in an environment of uncertainty and imprecision.

II.FUZZY LOGIC CONTROLLER

To tackle the load balancing problem, conventional control theory can be applied toestore system equilibrium.

Static two-dimensional images are often deceiving; it may be hard to reconstruct



Fuzzifier: The fuzzifier is the input interface which maps a numeric input to a fuzzy set
so that it can be matched with the premises of the fuzzy rules defined in the application-specific rule base.

Rule Base: The rule base contains a set of fuzzy if-then rules which defines the actions of the controller in terms of linguistic variables and membership functions of linguistic terms.

Fuzzy Inference Engine: The fuzzy inference engine applies the inference mechanism to the set of rules in the fuzzy rule base to produce a fuzzy output set. This involves matching the input fuzzy set with the premises of the rules, activation of the rules to deduce the conclusion of each rule that is fired, and combination of all activated conclusions using fuzzy set union to generate fuzzy set output.

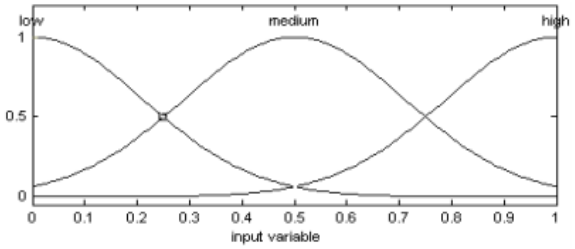
Defuzzifier: The defuzzifier is an output mapping which converts fuzzy set output to a crisp output. Based on the crisp output, the fuzzy logic controller can drive the system under control.

III. FUZZY SET THEORY

A fuzzy set is a set which has no crisp, clearly defined boundary. It's elements only have partial degree of membership.

a. Membership Functions

A curve that tells how all of the input points are mapped to the membership value is called a membership function (MF). This membership value is also known as degree of membership and its range is between 0 and 1. The input space here is known as the universe of discourse and the output-axis has the membership value which is in between 0 and 1. The curve known as membership function is represented by the symbol μ.



b. Logical Operations

The fuzzy logical reasoning is a superset of standard Boolean logic. If in fuzzy logic we keep the membership values at the two extremes of 0 (completely false) and 1 (completely true) it becomes the same as Boolean logic.. The statement A AND B is resolved using the min function, where A and B are limited to the range (0, 1). Similarly the OR operation is replaced by the max function, such that A OR B is equivalent to max (A, B).Similarly NOT A is same as the operation 1− A.

A	B	Min(A,B)
0	0	0
0	1	0
1	0	0
1	1	1

Figure 4.3: Truth table for AND operator

A	B	Max(A,B)
0	0	0
0	1	1
1	0	1
1	1	1

Figure 4.4: Truth table for OR operator

c. If-Then Rules

We have the concept of a subject and a verb in fuzzy logic and if-then rule statements are used to make conditional statements that are the building blocks of fuzzy logic. The form of a single fuzzy if-then rule is if x is A then y is B

d. Interpretation of If-Then Rules

The interpretation of the if-then rule is done in three parts:

1. FUZZIFY INPUTS: All the fuzzy statements in the antecedent are resolved to a degree of membership between 0 and 1. If the antecedent has only one part then this is the degree of support for the rule.

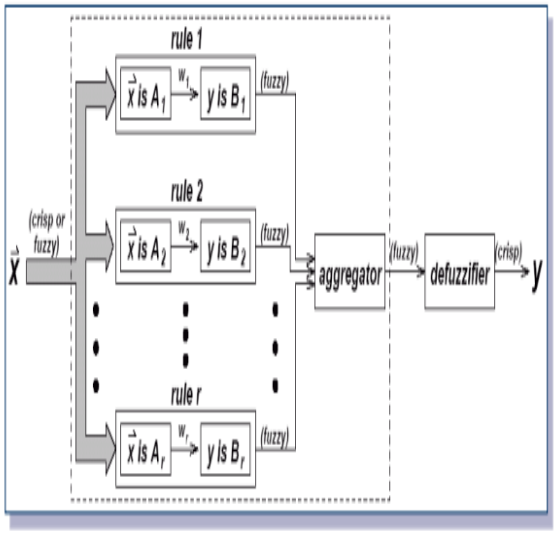
2 APPLY FUZZY OPERATOR TO MULTIPLE PART ANTECEDENTS: If the antecedent has more than one part then we apply fuzzy logic operators to resolve the antecedent to a single number between 0 and 1. This becomes the degree of support for the rule.

3 APPLY IMPLICATION METHOD: Now the degree of support for the entire rule is used to shape the output fuzzy set. An entire fuzzy set is assigned to the output by the consequent. This fuzzy set is represented by a membership function indicates the qualities of the consequent. The fuzzy set is truncated according to the implication method if the antecedent is only partially true, (i.e., is assigned a value less than 1).

IV. FUZZY INFERENCE SYSTEM

The process of creating a mapping between input and output using fuzzy logic is known as fuzzy inference. The mapping is the base from which decisions can be made, or patterns discerned. Two types of fuzzy inference systems can be implemented in the toolbox: Mamdani-type and Sugeno-type. The description of these two methods is given in [94, 95]. The most commonly used method is the Mamdani's fuzzy inference system. This was one of the first control systems built using fuzzy set theory proposed by Ebrahim Mamdani [96] in 1975. It was developed in an attempt to control a steam engine and boiler combination by synthesizing a set of linguistic control rules obtained from experienced human operators. Lotfi Zadeh's 1973 paper on fuzzy

algorithms for complex systems and decision processes [97] was the driving force behind this work of Mamdani. After the aggregation process, we get a fuzzy set for each output variable which is defuzzified to get the crisp values.



Terminology

- Fuzzy set
- A set X in which each element y has a grade of membership μX (y) in the range 0 to 1, i.e. set membership may be partial, e.g. if cold is a fuzzy set, exact temperature values might be mapped to the fuzzy set as follows:
- 15 degrees → 0.2 (slightly cold)
- 10 degrees → 0.5 (quite cold)
- 0 degrees → 1 (totally cold)
- Fuzzy relation
- Relationships can also be expressed on a scale of 0 to 1, e.g. degree of resemblance between two people
- Its best-in-class technology and content mark it out as a powerful, sleek, and innovative piece of kit. HTC are delivering breakthrough room-scale technology and fully immersive gaming experiences, and they've chalked up a fair few awards to further underline their capabilities.

V. FUZZY SETS AND CRISP SETS

The very basic notion of fuzzy systems is a fuzzy (sub)set. In classical mathematics we are familiar with what we call crisp sets. For example, the possible interferometric coherence g values are the set X of all real numbers between 0 and 1. From this set X a subset A can be defined, (e.g. all values $0 \leq g \leq 0.2$). The characteristic function of A, (i.e. this function assigns a number 1 or 0 to eac element in X, depending on whether the element is in the subset A or not).

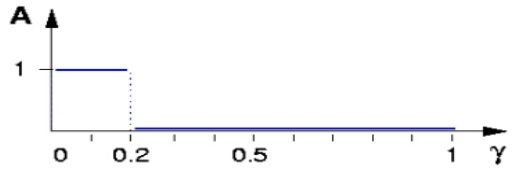


Figure 1: Characteristic Function of a Crisp Set

The membership function, operating in this case on the fuzzy set of interferometric coherence g, returns a value between 0.0 and 1.0. For example, an interferometric coherence g of 0.3 has a membership of 0.5 to the set low coherence (see Fig. 2). It is important to point out the distinction between fuzzy logic and probability. Both operate over the same numeric range, and have similar values: 0.0 representing False (or non-membership), and 1.0 representing True (or full-membership). However, there is a distinction to be made between the two statements: The probabilistic approach yields the natural-language statement, "There is an 50% chance that g is low," while the fuzzy terminology corresponds to "g's degree of membership within the set of low interferometric coherence is 0.50." The semantic difference is significant: the first view supposes that g is or is not low; it is just that we only have an 50% chance of knowing which set it is in. By contrast, fuzzy terminology supposes that g is "more or less" low, or in some other term corresponding to the value of 0.50.

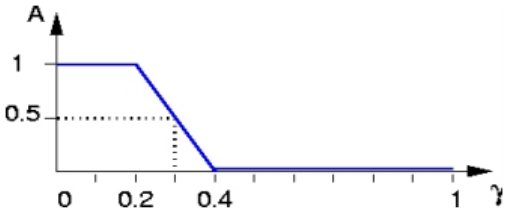


Figure 2: Characteristic Function of a Fuzzy Set

We can introduce basic operations on fuzzy sets. Similar to the operations on crisp sets we also want to intersect, unify and negate fuzzy sets. In his very first paper about fuzzy sets [1], L. A. Zadeh suggested the minimum operator for the intersection and the maximum operator for the union of two fuzzy sets. It

can be shown that these operators coincide with the crisp unification, and intersection if we only consider the membership degrees 0 and 1. For example, if A is a fuzzy interval between 5 and 8 and B be a fuzzy

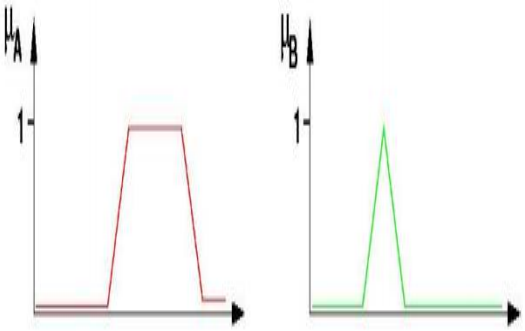


Figure 3: Example fuzzy sets

et between 5 and 8 AND about 4 is

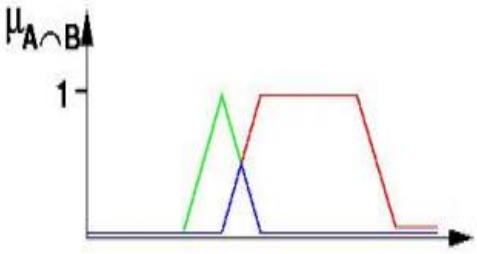
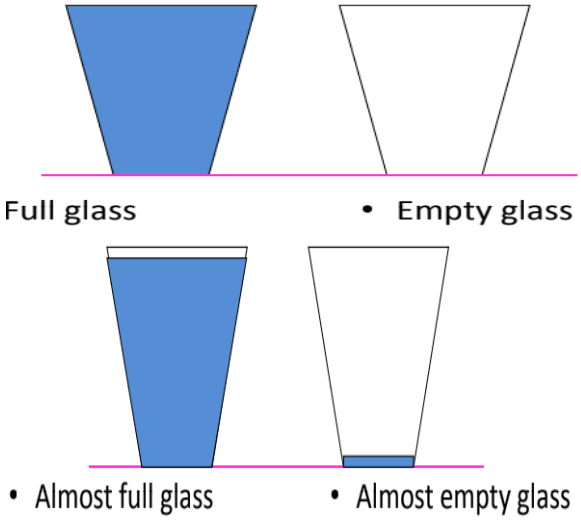


Figure 4: Example: Fuzzy AND

Fuzzy classifiers are one application of fuzzy theory. Expert knowledge is used and can be expressed in a very natural way using linguistic variables , which are described by fuzzy sets Now the expert knowledge for this variables can be formulated as a rules like IF feature A low AND feature B medium AND feature C medium AND feature D medium THEN Class = class 4

VI. CONCEPTION OF FUZZY LOGIC

- Many decision decision-making and problem problem solving solving tasks are too complexto be defined precisely
- However, people succeed by using imprecise knowledge
- Fuzzy logic resembles resembles human reasoning reasoning in its use of approximate information and uncertainty to generate generate decisionsgure



VII. CONCLUSION

Fuzzy mapping rules provide a functional mapping between the input and the output using linguistic variables. The foundation of a fuzzy mapping rule is a fuzzy graph, which describes the relationship between the fuzzy input and the fuzzy output. Sometimes, in real applications, it is very hard to derive a certain relationship between the input and the output, or the relationship between those inputs and outputs are very complicated even when that relationship is developed.

Fuzzy mapping rules are a good solution for those situations.

Fuzzy mapping rules work in a similar way to human intuition or insight, and each fuzzy mapping rule only approximates a limited number of elements of the function, so the entire function should be approximated by a set of fuzzy mapping rules.

REFERENCES

[1] Chris Morris (Dec 2015), “Is 2016 the year of virtual reality?,” Fortune, Vol. Tech,.

[2] Daniel Wright (2015), “Dynamic occlusion with signed distance fields,” in ACM SIGGRAPH, vol. Advances in Real-Time Rendering in Games.

[3] Google Cardboard – Google VR https://vr.google.com/cardboard/

[4] J. Kim and H. Jun (Aug. 2008), “Vision-based location positioning using augmented reality for

indoor navigation," IEEE Trans. Consum. Electron., vol. 54,no. 3, pp. 954–962

[5] M. Kalkusch, T. Lidy, M. Knapp, G. Reitmayr, H. Kaufmann, and D. Schmalstieg, (2002) "Structured visual markers for indoor pathfinding," in Proc. 1st IEEE Int. Workshop Augmented Reality Toolkit,p. 8.

[6] Pantelidis, V. S. (2010), "Reasons to use virtual reality in education and training courses and a model to determine when to use virtual reality". Themes in Science and Technology Education, 2(1-2), 59-70.

[7] Schofield, D. (2012). Mass effect: A chemical engineering education application of virtual reality simulator technology. Journal of Online Learning and Teaching, 8(1), 63.

[8] Tinsley A. Galyean and John F. Hughes. (1991), "Sculpting: an interactive volumetric modeling technique" In Proceedings of the 18th annual conference on Computer graphics and interactive techniques (SIGGRAPH '91). ACM, New York, NY, USA, 267-274.

[9] Winn, W. (1993), "A conceptual basis for educational applications of virtual reality"(Technical Report TR-93-9). Seattle, Washington: Human Interface Technology Laboratory, University of Washington. Retrieved fromhttp://www.hitl.washington.edu/publications/r-93-9/

[10] Young blut, C. (1997), "Educational uses of virtual reality technology". Executive report. Reprinted from Educational uses of virtual reality technology (IDA Document Report Number D-2128). Alexandria, VA: Institute for Defense Analyses, 1998. VR in the Schools, 3(1).

[11] S. Emmitt and K. Ruikar, Collaborative Design Management. Evanston, IL, USA: Routledge, 2013.

[12] S. L. Joseph, X. Zhang, I. Dryanovski, J. Xiao, C. Yi, and Y. Tian, "Se- mantic indoor navigation with a blind-user oriented augmented reality," in Proc. IEEE Int. Conf. Syst., Man, Cybern., 2013, pp. 3585–3591.

[13] M. Kalkusch, T. Lidy, M. Knapp, G. Reitmayr, H. Kaufmann, and D. Schmalstieg, "Structured visual markers for indoor pathfinding," in Proc. 1st IEEE Int. Workshop Augmented Reality Toolkit, 2002,p. 8.

[14] J. Kim and H. Jun, "Vision-based location positioning using augmented reality for indoor navigation," IEEE Trans. Consum. Electron., vol. 54, no. 3, pp. 954–962, Aug. 2008.

[15] J. B. Kim, "A personal identity annotation overlay system using a wearable computer for augmented reality," IEEE Trans. Consum. Electron., vol. 49, no. 4, pp. 1457–1467, Nov. 2003.

[16] S. Kasprzak, A. Komninos, and P. Barrie, "Feature-based indoor navigation using augmented reality," in Proc. 9th Int. Conf., ACM Intell. Environ., 2013, pp. 100–107.

[17] A. Mulloni, H. Seichter, and D. Schmalstieg, "Handheld augmented reality indoor navigation with activity-based instructions," in Proc. 13th Int. Conf. Human Comput. Interact. Mobile Devices Serv., 2011, pp. 211–220.

[18] L. C. Huey, P. Sebastian, and M. Drieberg, "Augmented reality based indoor positioning navigation tool," in Proc. IEEE Conf. Open Syst., 2011, pp. 256–260.