International Journal of Engineering & Technology, 7 (2.20) (2018) 394-395

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Fuzzy Logic Based Technique for Propeller Noise in Mechanical Structures

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Abstract

The determination of the propeller of submarines is of great importance particularly when the measurable parameters are not within the reach using the membership function concepts. The paper has a solution of certain conditions which are of practical resolve.

Keywords: *Fuzzy logic, blades, propellers, submarines, noise.*

1. Introduction

There are many areas in which propeller noise is a serious problem in submarine applications concern. The commercial usage of propeller driven aircraft is limited by due to acceptable limits of cabin noise. Ship propellers are a major cause of both shipboard noise, and radiation tactical operations. Submarines need quiet propellers to be stealthy in tactical operation. Submarines rotors have many of the same characteristics as propellers. In all these examples the dominant processes depend on the application [1]. This paper has given a fuzzy logic based solution for determining noise parameters under uncertain conditions. Rotating blades emit two distinctly different types of acoustic signature. The first is referred to as tone or harmonic noise, and is caused by sources that repeat themselves the second is broadband noise which is a random, non-periodic, signal due to turbulent flow over the blades.

2. Literature Review Fuzzy System

An object of the present innovation is to provide a practical control for coordinating pitch engagement and selection between a motor and a brake for controlling blade pitch in a turbo fan engine [2]. According to the present rotation a major parameter of engine command and condition signals are fuzzified into a corresponding first parameter of engine command. Fuzzy set signals are operated upon by a set of fuzzy rules in order to provide request fuzzy set signal, which is then defuzzified to provide a crisp. Either the fuzzy position lock disable request signal or the defuzzified, crisp position lock disable request signal is provided, along with a second profusion of engine condition signals, for fuzzification which is observed in figure 2 and 3 into a second corresponding profusion of engine condition fuzzy set signals[3]. A second profusion of fuzzy rules are applied to the second profusion of engine condition fuzzy set signals and a position lock disable fuzzy set signal is provided after application of the rules. This signal is defuzzified, and a crisp position lock disable signal is provided in figure 4. Finally, a third profusion of engine condition signals are fuzzified to provide a corresponding third profusion of engine condition fuzzy set signals which are operated on by a third profusion of fuzzy rules for providing a device fuzzy set signal in figure 5.

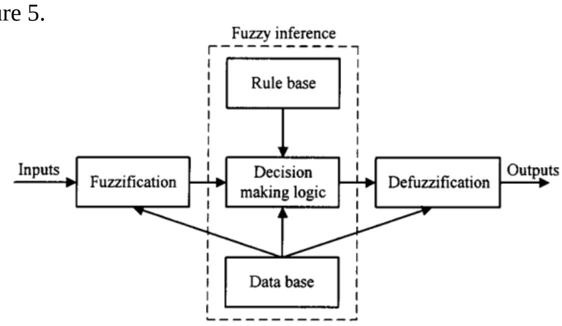

Fig. 1: Represents the block diagram of fuzzy logic

The device fuzzy set signal may be defuzzified directly to provide a crisp device signal subjected to a process that first provides a fuzzy set that is operated on by a specific rule set in order to provide a device output fuzzy set signal that may then be defuzzified to provide another crisp device signal that has been protected against noise [4]. The present invention provides a heuristic and elegant solution to what would otherwise be an extremely complicated task which would be extremely difficult to carry out using classical logical techniques. A block diagram of the fuzzy logic shown in figure 1 [5] [6] .

3. Fuzzy Rules

Rules which represented in figure 5
If blade is b1 or propeller is p1 then noise is very low
If blade is not b1 or propeller is p2 then noise is low
If blade is not b1 or propeller is p2 then noise is very low
If blade is b2 or propeller is p2 then noise is low
If blade is b2 or propeller is p2 then noise is medium
If blade is b2 and propeller is p3 then noise is medium
If blade is b3 and propeller is p4 then noise is high
If blade is b5 and propeller is p5 then noise is very high
If blade is b5 or propeller is p5 then noise is very high
If blade is not b5 or propeller is p4 then noise is higher

4. Simulation Results

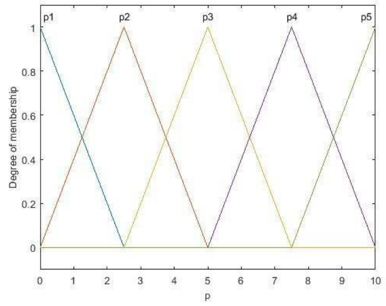

Fig. 2: Representing about the input 1 as blades

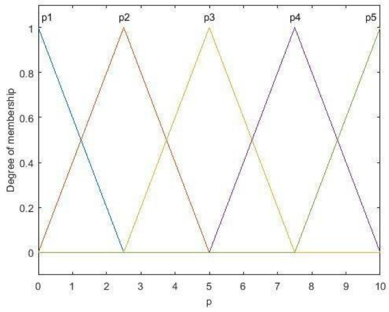

Fig. 3: Representing about the input 2 as propellers it represented as p

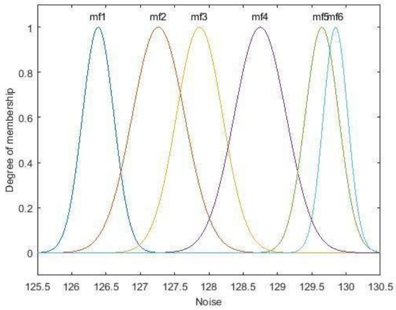

Fig. 4: Representing about the output as noise ranges

Figure 4 representing the membership Gaussian function to reduce the error between the blades and propellers in between the range of 125.5 to 130.5 where mf1 represent as very low ,mf2 represented as low ,mf3 represented as medium , mf4 represented as high , mf5 represented as very high and mf6 represented as higher.

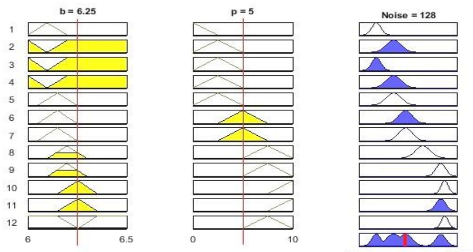

Fig. 5: Representing about the fuzzy rules

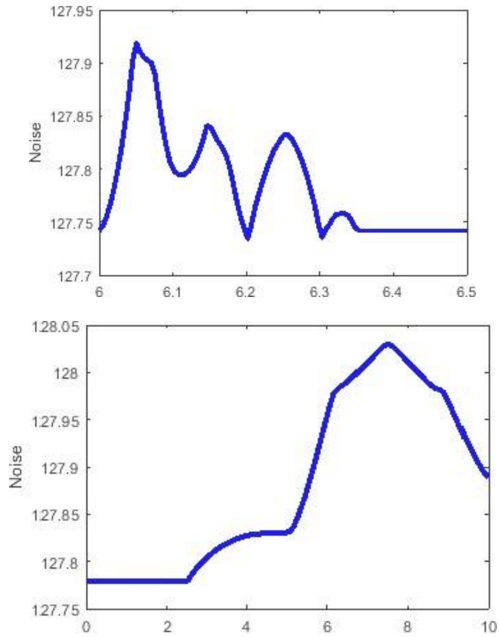

Fig. 6: Representing about the noise between blades and propellers

5. Conclusion and Future Scope of Work

Double precision membership function can also be used whenever required. Overall, this techniques is helpful in determine the non-condition with difficult areas of measurements.

References

[1] Mouritz AP, Gellert E, Burchill P & Challis K, “Review of advanced composite structures for naval ships and submarines”, *Composite structures*, Vol.53, No.1,(2001), pp.21-42.

[2] Merz S, Kinns R & Kessissoglou N, “Structural and acoustic responses of a submarine hull due to propeller forces”, *Journal of Sound and Vibration*, Vol.325, No.1-2,(2009), pp.266-286.

[3] Das RP & Sreedhar L, *Neural Networks and Fuzzy Logic*, SK Kataria and Sons, (2012).

[4] Mamdani EH & Assilian S, “An experiment in linguistic synthesis with a fuzzy logic controller”, *International journal of man-machine studies*, Vol.7, No.1, (1975), pp.1-13.

[5] Mendel JM, “Fuzzy logic systems for engineering: a tutorial”, *Proceedings of the IEEE*, Vol.83, No.3, (1995), pp.345-377.

[6] Sampath Dakshina Murthy A & Koteswara Rao S, “Application Of Fuzzy Logic Based Kalman Filter and Vehicle Rate Sensor in Optimizing Differential Global Position System”, *Journal of Advanced Research in Dynamical and Control Systems*, Vol. 9, No.2, (2017).