TAKEHOME-3 PROPOSAL

Harmonic distortion diagnosis using fuzzy logic in fuzzy clips

Introduction

The way that people think is inherently fuzzy. The way that we perceive the world cannot always be defined in true or false statements. Fuzzy logic allows for the members of a set to have degrees of membership. The number assigned to an object in the set is called its degree of membership in the set and it can value between 0 and 1.

The intention of this project is to use fuzzy logic in fuzzy clips to analyse,compare and diagnose harmonic distortion in power systems. Harmonic distortion may or may not create a problem for a power system. However, as harmonic levels increase, the likelihood of experiencing problems also increases. Typical problems include:

- malfunctioning of microprocessor-based equipment.
- overheating in neutral conductors, transformers or induction motors.
- deterioration or failure of power factor correction capacitors.
- erratic operation of breakers and relays.

Harmonics can sometimes be transmitted from one facility back through the utility's equipment to neighboring businesses, especially if they share a common transformer. This means harmonics generated in one system can stress utility equipment or cause problems in the neighboring system.Hence it is necessary to diagnose the level of harmonic distortion so that necessary actions can be taken to reduce it.

References

- Bryan Klingenberg ,“A Time-Varying Harmonic Distortion Diagnostic Methodology Using Fuzzy Logic”.

Goals

Harmonic distortion basically depends on two parameters-voltage and temperature. The voltage values can be between 0 to 10 and can fall in one of the following category- very low,low,medium,high and very high ; the temperature can be of any value between 30 to 100 degrees and can fall in any of the following categories- below normal,normal,very hot and over

heating. Based on the voltage and temperature given by the user, the fuzzy clips program will output whether the harmonic distortion will be of problem to the power system or not. The inputs will be used to determine the fuzzy membership sets. **Mamdani method is used for fuzzification and centroid method will be used for defuzzification as given in the reference paper**.The harmonic voltage membership functions define anything below 0 as **very low**, anything from 0 to 5 as **low**, anything from 2.5 to 7.5 is **medium**, and anything from 5 to 10 is **high** and anything above 10 as **very high**. The temperature membership functions are triangular and define anything between 30 and 53 as **below normal** with below normal centered at 30 , anything between 30 and 76 is defined as **normal** with normal centered at 53 , anything between 30 and 76 is defined as **overheating** with overheating centered at 76 and anything greater than 76 as **very hot**. The following table is used for determining what the output should be(given in the reference paper):

Harmonic voltage	Temperature	Output
Very low	Below normal	No problem
Very low	Normal	No problem
Very low	Overheating	No problem
Very low	Very hot	Caution
Low	Below normal	No problem
Low	Normal	No problem
Low	Overheating	Caution
Low	Very hot	Possible problems
Medium	Below normal	No problem
Medium	Normal	Caution
Medium	Overheating	Possible problems
Medium	Very hot	Possible problems
High	Below normal	Caution
High	Normal	Possible problems
High	Overheating	Possible problems
High	Very hot	Imminent problems
Very high	Below normal	Possible problems
Very high	Normal	Possible problems
Very high	Overheating	imminent problems
Very high	Very hot	Imminent problems

Outcome

The outcome will be a fuzzy clips program which can obtain input temperature and voltage in non fuzzy terms and display the output in fuzzy terms ,that is, whether the harmonic distortion generated will affect the power system or not. A few sample results will also be enclosed in the archive for reference.