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Research Paper

Kriging Empirical Mode Decomposition via support vector machine learning technique for autonomous operation diagnosing of CHP in microgrid

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HIGHLIGHTS

- Negligible none detection zone for CHP generator.
- Avoiding of threshold selection.
- Suitable for microgrid application.
- Usable in noisy condition.
- Best data selection method.

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ABSTRACT

Combined Heat and Power (CHP) is the one of new energy resources which has been added to power system in recent years. High efficiency, Loss reducing of power system and etc, are the main advantages of CHP as same as other distributed generations. But, unwanted islanding is one of the main problems for this generation. This article presents a novel technique for CHP unit islanding detection using Kriging Empirical Mode Decomposition (KEMD) and Support Vector Machine (SVM) pattern learning technique. In this technique the variation of Intrinsic Mode Functions (IMF) of local signals in two-dimensional mode is utilized as input data of relay. An optimal signal selection model is applied to the proposed relay in order to Non-Detection Zone (NDZ) and fails detection reducing. The best signal selection is introduces based on mean square value between islanding and non-islanding conditions. Also, by considering Optimal SVM model for the proposed relay as a pattern recognizing and weighing it using shark smell optimization, this technique has overcome the threshold selection problem. This relay is applied to CHP system in a microgrid system contains various types of DGs. Many islanding and non-islanding situation in various operation conditions in the studied microgrid are simulated. The results of simulation results are show that the proposed relay is suitable for microgrid application. Negligible NDZ, high detection time, zero fail detection and low cost of this relay are the main advantages of the proposed technique.

1. Introduction

With the increasing energy consumption, environmental carbon release and depletion of fossil fuels, Energy manufacturers tend to increase the use of renewable energy such as wind power, solar photovoltaic and landfill gas [1]. Individual Distributed Generation (DG) connected to the power system has intermittence, randomness and the uncertainty character, which are difficult to troubleshoot in some cases in power systems [2]. In order to solve these problems, some solutions are suggested in microgrid [3]. The microgrid is a subsystem

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