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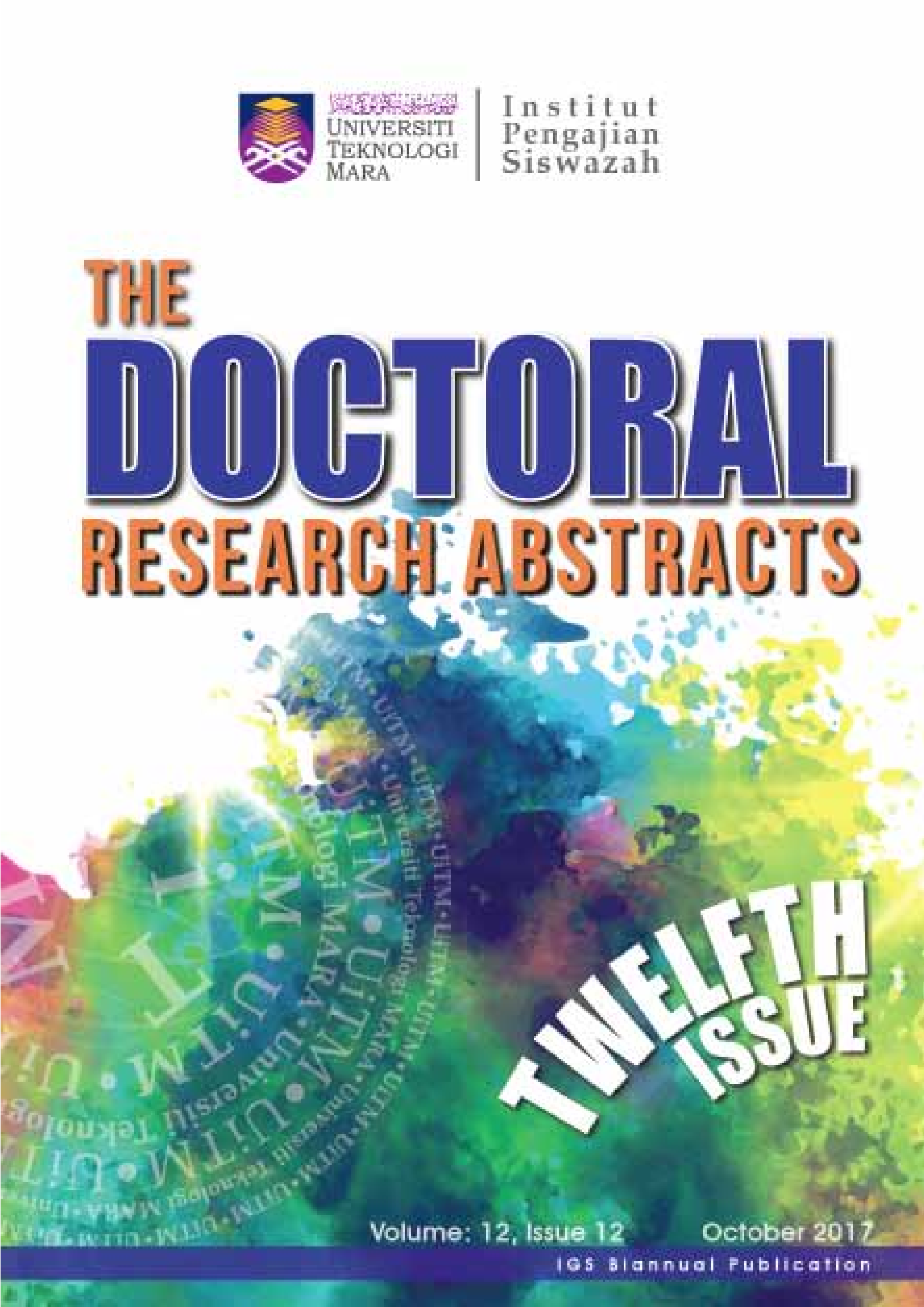
THE DOCTORAL RESEARCH ABSTRACTS



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Title : DEVELOPMENT OF NOVEL DISTANCE RELAY SCHEME TO PREVENT FALSE TRIPPING DURING POWER SWING

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Contingencies in a power system such as a sudden change of load, a power system fault, or a trip of large generation unit, may cause instability issue in which eventually may lead to the power swing phenomenon. During a power swing, the distance relay is prone to operate falsely and, as a result, this false operation has often contributed to major power outages. Therefore, there is a need for development of a comprehensive protection scheme to improve sensitivity of the distance relay operation during power swing. The objectives of the research are to develop new intelligent schemes for preventing false relay operation during power swing. The initial work carried out in this study focuses on developing a new detection scheme that able to detect a fault that occurs during power swing. Another new detection scheme is also developed in this study for identifying the type of power swing. These two detection schemes are conceptually based on S-Transform feature extraction of the distance relay input signal. Moreover, a new adaptive distance protection algorithm is also developed to block the false tripping operation during power swing and unblock the operation if a fault occurs during power swing. The proposed adaptive algorithm has been developed by employing the combination of both detection schemes, as well as based on an adaptive setting of Under Impedance Fault Detector (UIFD) tripping characteristics to dynamically adjust its tripping region during power swing and stop the adjustment if a fault occurs during power swing. To illustrate the effectiveness of the proposed schemes, the simulations were carried out on the selected IEEE 9 bus system, IEEE 14 bus system, IEEE 39 bus system and IEEE 39 bus system connected with Distributed Generation (DG) using the PSCAD™/EMTDC™ and MATLAB® software. Test results of the detection schemes show that the proposed S-Transform based scheme can effectively detect various type of fault during power swing, and differentiate between stable power swing and unstable power swing, unlike the existing detection schemes which are based on wavelet transform. In addition, the test results show that the proposed detection schemes are able to operate correctly even with the presence of DG in the test system. Test results of adaptive setting of UIFD tripping characteristics show that the combination use of fault detection scheme and power swing detection scheme are proven to effectively block the operation of distance relay during power swing and adjust the relay setting accordingly in response to false relay operation. Such intelligent schemes are useful for improving the sensitivity of the distance relay operation, along with preventing false relay operation during power swing.

*** (MS) = Main Supervisor (CS) = Co Supervisor**