Abilities of a Class of Wavelet Hybrid Algorithms Related to Fault Detection in Power Systems

Ileana-Diana Nicolae[*], Petre-Marian Nicolae[†] and Lucian-Dinuț Popa[*]

[*] Department of Computers and Information Technology, Craiova, Romania,
nicolae_ileana@software.ucv.ro

[†,*] Department of Electrical, Energetic and Aero-Spatial Engineering, Craiova, Romania,
pnicolae@elth.ucv.ro

Abstract— The discussed class of original hybrid wavelet algorithms is analyzed firstly relative to the decomposition vectors shape and periodicity in stationary regime. The studied signal corresponds to a current from the supplying network and has medium distortions within its first 4 periods, the other 2 being seriously affected after a fault. The noticed differences are responsible for different decomposition vectors' energies (explaining other authors' results related to power quality obtained when the same algorithms were studied on different data) and respectively for the differences between fault detection abilities. To evaluate the edge effect (which provides an estimate of the decomposition level's intrinsic sensitivity), one determined in stationary regime for each decomposition level the ratio between two parameters: the maximum absolute value considering all details' components and the maximum absolute value of the details from a segment corresponding to a signal's regular median period. Levels' sensitivities to harmonic pollutions were found to follow certain patterns for all filters, these allowing the determination of ranges of harmonic orders corresponding to detectable faults. The filter of length 8 exhibited the most convenient fault detection abilities as its reliable sensitivities span over the highest number of levels and the corresponding ranges of harmonic orders associated to detectable faults are appropriate for practical uses.