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"Busca Numérica de Medidas e Conjuntos Críticos para a Observabilidade de Sistemas de Potência"

Data redundancy is an important prerequisite for the State Estimation function in Energy Management Systems. With an adequate redundancy level, State Estimation can deal with the problem of detection, identification and elimination of bad data, as well as withstand a temporary loss of measurements without compromising the quality of the estimated values. Data redundancy is evaluated accounting the number, type, and topological distribution of measurements, to meet network observability, reliability and accuracy requirements. Highly redundant metering systems are always desirable. However, considering the costs involved, network changes and spurious data elimination, frequently power systems are not monitored with the ideal redundancy level. Even critical redundancy levels can be reached, creating situations of impending lack of system observability and inappropriate performance of data validation routines. These redundancy levels are associated with the presence of critical measurements and sets. Some measurements in the dataset become critical when the loss of any of them makes the system unobservable. Also, a critical set is defined as a group of measurements in which the removal of any of such measurements makes the remaining of the group critical. This Dissertation addresses the problem of the identification of critical measurements and sets. A numerical, simple algorithm, based on the properties of the estimation residuals of these measurements, is proposed. Results covering the application of the proposed methodology to different networks and levels of data redundancy deterioration are presented and discussed.