

ABSTRACT

CESAR, Eduardo Lenz. **The application of intelligent systems in industrial power systems protection coordination using digital relays**. 2013. 180f. Dissertação (Mestrado em Engenharia Eletrônica) – Faculdade de Engenharia, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 2013.

Nowadays there are several computational tools applied to the protection coordination studies, which allow observe the curves of the relays, according to the parameters chosen by the designers. However, the process of choosing the curves considered acceptable, with a great number of possibilities and variables involved, is difficult and, moreover, requires simplifications and some trial and error iterations. In this process, the key factors are the expert experience and knowledge as well as a hard work. The protection coordination is described by IEEE Std. 242 as “more of an art than a science”. This paper presents the development of a genetic algorithm and an algorithm based on an ant colony optimization to automate and optimize the coordination of overcurrent curves using intelligent electronic devices (IEDs) in industrial substations. Six case studies, obtained from a database model based on an actual industrial electrical system, were evaluated. The developed algorithms generated, in all case studies, coordinated curves, complying with all previous established restrictions. The temporal differences of the curves, at three-phase short circuit current values, were very close to the set as optimal. The developed tools are a valuable contribution to the protection coordination studies, improving the safety of the equipment and the people, the process reliability and the prevention of harmful emissions to the environment.

Keywords: Genetic algorithm; Ant colony optimization; Overcurrent coordination; Industrial power systems protection; Digital relays.