ABSTRACT

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The main purpose of this work is to investigate the application of some techniques of intelligent systems in the area of digital communication, in order to evaluate the performance obtained in specific case studies. These techniques were applied in three case studies. In the first case study the use of a hybrid neurofuzzy recognized system, the ANFIS (Adaptive Network based Fuzzy Inference System), was evaluated in the supervised equalization of digital communication channels. More specifically, a cellular communication scenario modeled with linear and time invariant channels serves as an environment for the evaluation of the hybrid system as an equalization technique. Results are presented of computational simulations performed with several configurations of the selected hybrid system and with some types of communication channels. In the second case study, a fuzzy inference system was used to select the data transmission path in a wireless sensor network. Wireless sensor networks are applied in several areas and need to have efficient operation with fast transmission of information and extended lifespan. For proper transmission of the sensor information, a fuzzy system was conceived considering that the distance traveled to transmit the information should be as small as possible and that the battery life of the routers in the network should be maximized. Some network simulation tests were performed, and the results achieved were satisfactory and showed adequate behavior of the implemented system. The third case study seeks to optimize the positioning of routers in a field scenario with automation for data acquisition based on a mesh network. A versatile fuzzy-genetic hybrid evolutionary technique has been proposed and tested to evaluate multiple objectives. The case study is presented, the applicability of evolutionary techniques is discussed and the results indicate the feasibility of the proposed method for this type of automation.

Keywords: Intelligent Systems; Digital communication; Hybrid systems; Equalization; ANFIS; Routing; Fuzzy system; Fuzzy-Genetic System.