Announcing the Final Examination of Hector Lugo-Cordero for the degree of Doctor of Philosophy

Time & Location: April 5, 2018 at 3:30 PM in Harris Engineering Center (HEC) 356

Title: ENHANCING COGNITIVE ALGORITHMS FOR OPTIMAL PERFORMANCE OF ADAPTIVE NETWORKS

This research proposes to enhance some Evolutionary Algorithms in order to obtain optimal and adaptive network configurations. Due to the richness in technologies, low cost, and application usages, we consider Heterogeneous Wireless Mesh Networks. In particular, we evaluate the domains of Network Deployment, Smart Grids/Homes, and Intrusion Detection Systems.

Having an adaptive network as one of the goals, we consider a robust noise tolerant methodology that can quickly react to changes in the environment. Furthermore, the diversity of the performance objectives considered (e.g., power, coverage, anonymity, etc.) makes the objective function non-continuous and therefore not have a derivative. For these reasons, we enhance Particle Swarm Optimization (PSO) algorithm with elements that aid in exploring for better configurations to obtain optimal and sub-optimal configurations. According to results, the enhanced PSO promotes population diversity, leading to more unique optimal configurations for adapting to dynamic environments. The gradual complexification process demonstrated simpler optimal solutions than those obtained via trial and error without the enhancements.

Configurations obtained by the enhanced PSO are further tuned in real-time upon environment changes. Such tuning occurs with a Fuzzy Logic Controller (FLC) which models human decision making by monitoring certain events in the algorithm. Example of such events include diversity and quality of solution in the environment. The FLC is able to adapt the enhanced PSO to changes in the environment, causing more exploration or exploitation as needed.

By adding a Probabilistic Neural Network (PNN) classifier, the enhanced PSO is again used as a filter to aid in intrusion detection classification. This approach reduces miss classifications by consulting neighbors for classification in case of ambiguous samples. The performance of ambiguous votes via PSO filtering shows an improvement in classification, causing the simple classifier perform better the commonly used classifiers.

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Bachelor's of Computer Engineering, BS, 2006, University of Puerto Rico
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Approved for distribution by Ratan K Guha, Committee Chair, on March 20, 2018.

The public is welcome to attend.