

## Seminar at the French University in Egypt (UFE)

<http://cri-ufe.com/>

May 3rd 2017

10:00 am

Within the regular activities of the Informatics Research Center, (CRI, Centre de Recherche en Informatique), we organize a seminar with the following 4 talks:

### Room: Presidency meeting room

10:00 – 10:30

#### Talk 1

- **An Effective Stackelberg Game for High-Assurance of Data Trustworthiness in WSNs**

**Mohamed Abdelzaher, E-Just University**

**Abstract:** Wireless Sensor Networks (WSNs) security plays an intrinsic role to guarantee efficient data transmission, stable network topologies, and robust routing algorithms. This paper proposes a modified Stackelberg game of a previous work for high assurance of data trustworthiness in a Power Grid Network (PGN). The proposed approach is presented to mitigate a more severe attack scenario compared to that considered in the previous work; this attack scenario frequently manipulates sets of the deployed nodes in the PGN, which cannot be treated using the previously proposed approach. The proposed scheme reduces the required number of nodes to be protected to achieve the desired data trustworthiness. Simulation results prove efficient detection for corrupted transmitted data based on limited number of nodes as compared to the previously proposed approach.

10:30 – 11:00

#### Talk 2

- **Sensory-motor model**

**Eman Ahmad, Cairo University**

**Abstract:** Understanding biology by using modeling the biological system of the development of a fetus learning how to discover his own body and his surroundings by random movements.

The reality is very complex indeed; it involves a lot of processes, many relations, much noise and uncertainties. How the human learn and develop is not yet understood. But there exists some biological knowledge about how these biological processes are done. We should model this biological knowledge in terms of the biological system of the fetus learning.

From the origin of modeling the biological system, we will output a new model that can be tested on other applications.

**11:00 – 11:30**

**Coffee Break**

**11:30 – 12:00**

**Talk 3**

- **Optimized monitoring of the Internet of Things**

**Basma Mostafa, Cairo University**

**Abstract:** The emergence of the Internet of Things (IoT) is introducing more and more services and applications such as smart cities. IoT networks tend to experience unexpected communication problems during deployment, because resource-constrained embedded devices are unreliable by nature for a variety of reasons, such as uncertain radio connectivity and battery drain. Despite the fact that IoT networks are dynamic and vulnerable, the offered services need the continuous availability of defined network components. To that end, monitoring techniques for detecting, localizing and remedying network failures in IoT will definitely develop in significance. The objective of our work is to contribute to the optimization of IoT network monitoring for fault tolerance and quality of service purposes. We aim at the designing of optimized, efficient algorithms for monitoring of communicant elements in IoT networks. Additional monitoring will increase the network load; however, the added cost for link monitoring could be tolerated, especially for critical-time IoT applications. This is because monitoring will help in accelerating link recovery, and decreasing node unreachability times. Nevertheless, the monitoring algorithms must be optimized in order to minimize the energy requirements and the monitoring load.

In previous work, we proposed a polynomial-time algorithm that aimed to achieve distributed probe/monitor placement with minimal computational complexity. The proposed algorithm works in tandem with RPL. The problem was modeled as a Minimum Vertex Cover Problem (VCP).

In the current work, we developed an optimization model for scheduling of the monitoring role of the nodes in IoT networks to maximize the lifetime of the resource-constrained embedded devices while minimizing the overall cost of monitoring in the network. The scheduling of Vertex Covers across time periods is modeled as a Multiobjective Generalized Assignment Problem. The approach is currently being tested on randomly generated instances and the preliminary results prove to be very promising.

**12:00 – 12:30**

**Talk 4**

- **Limiting the number of trials during P300 signal classification process**

**Nader Nashat, CRI, UFE**

**Abstract:** A brain-computer interface (BCI) is a hardware and software communications system that permits cerebral activity alone to control computers or external devices. One of the major BCI applications is the P300 speller. All applications use an event related potential (ERP) component as a common way of linking between the potential and the person's reaction.

One of these applications is the P300 speller. The P3 speller introduces a method to write using flashing letters and numbers. A single character selection needs an average of 15 trials (approx. 2 minutes). In order to limit the number of trials during the selection process, we need to take into consideration two phases: the visual paradigm phase and the data analysis phase of the limited number of trials responses. In the data analysis phase, we mainly need to get a high signal-to-noise ratio (SNR) by isolating the phase-locked ERP signal from the interfering noise. However, the choice of a specific feature extraction method such as bandpass filters, principle component analysis (PCA) or more sophisticated techniques such as wavelet denoising, as well as a specific classification technique, whether linear or non-linear, affects the results significantly.