Simulation techniques for Distributed Adaptive Systems

Embedded and distributed systems are becoming ubiquitous: everywhere electronic systems are connected in an ever growing “network of things”. At TNO, we investigate the design of such networked systems for application domains characterized by large scale, distributed, adaptive and high complex nature. For the design, we use a model based approach: a model expresses particular properties and behaviour of a (sub)system or process we are interested in while neglect others, which are considered irrelevant for a purpose. Models lend themselves for easy, cost-effective building and manipulation in computerised design environments, such as our in-house simulation tool DynAA.

In this MsC project, you will investigate — and develop yourself — techniques for the simulation of large, distributed systems. You will constantly be asking yourself how to translate the ideas of a system designer into an efficient and correct computation modules. Such modules are the basic blocks used in our simulation tool DynAA to analyse the behavior of large sensor networks, and to design the coming generation of embedded systems.

You will work with a dynamic, high skilled, multidisciplinary, and innovative team formed by researchers from TU/e, TU-Delft, and TNO. This research is part of the DynAA project which aims at analysis of dynamically adaptive systems. The research work will be carried out at TNO — location The Hague (Den Haag) — or at Embedded Systems Innovation (ESI) at TNO (Eindhoven).

What do we expect from you?

♦ A motivated, responsible, innovative, and hands-on attitude.
♦ Excellent study records and a drive for working with new, on-the-edge technology.
♦ Very good programming skills in OO and Java. Acquaintance with Matlab desired.
♦ A drive for clean, well documented work.

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Send us your CV and a motivation letter/email!
Research plan

Preparations

♦ Literature about model based design;
♦ Literature about simulation techniques;
♦ Acquaintance with the design of the DynAA simulation tool;
♦ Profile existing methods to characterize sensor nodes in terms of power consumption, performance, peripheral usage, etc...;
♦ Deliverable: A short document surveying how modeling concepts — such as task, component, communication channel, etc. — is handled in different simulation tools.

Research Activity

♦ Define syntactic and semantic representation for DynAA modeling basic blocks, such as task, nodes, channel, etc.
♦ Refine the DynAA implementation for efficiency and correctness.
♦ Develop and implement simulation mechanisms, such as aspect oriented logging or event handling.
♦ Deliverables: coded and benchmarked DynAA modules
♦ Thesis