Thesis Title: *Approximate Computing for Transiently-powered Systems*

Description of the Units

The Networked Embedded Systems (NES) group at RISE SICS is a part of the Computer Systems Laboratory. The current research focus is on the Internet of Things. Among the group's key technologies are the Contiki operating system, uIP stack, ContikiRPL, SICSLoWPAN, SICthSense, and lightweight implementation of IPsec and DTLS. The NES group conduct projects together with industry and academic partners from Sweden and across the world.

Thesis Description

**Background:** Transient computing is a field of autonomous systems in which tiny embedded devices get power right from the ambient energy harvester output to reduce their size, mass, cost, and battery charging time. However, energy provisioning from ambient harvesting (or wireless transfer) is generally erratic and exhibits high spatial and temporal variation. Therefore, to avoid the restart of computation of an application running on these systems after a power outage, state retention systems are deployed on these devices. These state retention systems make checkpoints of the system state into nonvolatile memory (NVM) and later restore this state so that the application can continue where it left off.

**Problem:** Transiently-powered systems have very limited resources both in term of power and computation. Decreasing the quality of the application output can reduce the computation time and energy, hence ensuring forward progress of the application even in very extreme energy harvesting conditions. The goal of this project is to introduce a “quality knob” which can adjust the quality of the application output at runtime by applying different approximation techniques based on the available energy. In this way, when the energy is available abundantly, application can produce high-quality results and when the energy is scarce it can reduce its quality to minimum threshold provided by the programmer.

You will be required to:

- Study the state-of-the-art of approximation techniques
- Propose approximation technique(s) that can reduce the computation time and energy without compromising much on the output quality
- Implement and evaluate experimentally the benefits of approximation technique(s)
- Document the results as a thesis document

**Competence**

We are looking for a good student with good embedded programming skills and with interest in IoT. Good skills in spoken and written English are required.

**Application**

Applications should include a brief personal letter, CV, and recent grades. Candidates are encouraged to send in their application as soon as possible. Suitable applicants will be interviewed as applications are received.

**Start Time**

As soon as possible

**Location**

RISE SICS Kista, Stockholm

**Contact**

Naveed Bhatti naveed.bhatti@ri.se