Construction of Reliable and High Performance Managed Language Virtual Machines for Embedded Systems

Project Leader
UGAWA Tomoharu, Dr. Info.
Associate Professor, Information Systems Engineering

1. Objective
This project is aimed at:
Establishing techniques for construction of advanced managed language virtual machines for embedded systems. Using managed programming languages such as Java, C#, Python, JavaScript, or Ruby is a promising approach to improve productivity in software development. In this project, we will develop a virtual machine for JavaScript that meets the requirements of embedded systems, e.g., high reliability, small memory footprint, deterministic and real-time response, and low energy consumption, as well as light and fast execution.

2. Project Outline
To that end, the project will consist of the following topics:
(a) Develop a memory manager to handle low-energy-consuming on-the-fly compacting garbage collection for embedded systems. Our previous work [1] would be a starting point. For reliability, we will prove the correctness of the garbage collection algorithm, as well.
(b) Establish techniques for synthesizing order-made virtual machines to minimize memory footprint. The virtual machines are based the specification of a generic virtual machine and match the specific requirements of the application software.

3. Expected Performance
In this project, the successful candidate would be expected to:
(a) Become a driving force of the assigned research topic.
(b) Introduce ideas/techniques from other fields of the arts.
(c) Contribute to the project and project leader’s lab.

4. Required Skills and Knowledge
The successful candidate for this project will have the following knowledge and skills:
(a) Fundamental knowledge on discrete math and algorithms
(b) Superior skills in programming (C, C++, Java, and JavaScript) and experience in large scale (5000 loc -) software development (individually or as a main contributor of a group)
(c) Wide knowledge in computer science

References
See our admission guidelines:
https://www.kochi-tech.ac.jp/english/admission/ssp_aft19oct/ssp_application_guideline.html

Contact
E-mail: ugawa.tomoharu@kochi-tech.ac.jp