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

**Project Leader**
UGAWA Tomoharu, Dr. Info.
Associate Professor, Information Systems Engineering (Programming Languages and Systems Laboratory)

**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.

**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.

**1. 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.

**2. 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**

[1] Ugawa, T., Iwasaki, H., Yuasa, T.: Improved Replication-Based Incremental Garbage Collection for Embedded Systems. Proc. International Symposium on Memory Management (ISMM 2010), ACM, pp. 73--82 (2010)

[2] Ugawa, T., Iwasaki, H., Yuasa, T.: Starvation-Free Heap Size for Replication-Based Incremental Compacting Garbage Collection, Proc. 2010 International Conference on Lisp, ACM, pp. 43—52 (2010)

**See our admission guidelines:**
http://www.kochi-tech.ac.jp/kut_E/graduate/admission.html

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