PhD position

Software Dynamic Remodularization for Embedded Systems

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Context: Embedded Software Development

Developing software for embedded systems is a challenging task. Targeted devices are subject to various constraints on computational resources (CPU, Memory), on energetic resources (battery) and on input/output peripherals (keyboard, mouse, screen...) to name a few. The traditional approach to deal with these constraints consist in using low-level languages such as C or even assembly. A more comfortable solution appeared in recent years consist in using higher-level languages such as Java with J2ME (Java 2 Micro Edition) or C# with .Net compact framework. However, developers have to use only a sub-set of libraries and language features used for developing desktop applications. For example, KVM the VM implementation for J2ME CLDC[1] does not support many features of the regular JVM such as reflection, generics, annotations, extended for loops, static imports, and auto-boxing/unboxing.

Besides, developers have to explicitly select libraries to use: desktop librairies or embedded libraries depending on the application purpose. This selection process of elements that have to be integrated in a final application is essentially a manually process (e.g declaration of import clause in Java). It is also a coarse-grained process because it only enables class or package selection. Therefore, the final application still contains unused code (methods, fields, ...).

Objectives

The work to be carried out as part of this PhD thesis aimed at providing a solution (model and tools) that unifies software development of both desktop and embedded software. Starting from the same library, the proposed solution will enable to develop software

[1] Connected Limited Device Configuration

either for desktop or embedded systems. During the deployment phase, an extreme remodularization will be applied to the software code according to the target system constraints. This automatic process will identify packages, classes, methods or even fields that are not used by the software and will remove them in the final version. Further, a dynamic remodularization process could also minimizes the memory footprint of the final software by loading and unloading the different parts of the program during its execution.

The Ph.D student will validate its results through experimentations on different embedded systems such as PDAs, Smartphones as well as mobile robotic systems[2].

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[2] `http://vst.ensm-douai.fr/robotics`