Processes, Methods and Tools for Engineering Embedded Systems

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Abstract. The processes, methods, and tools for engineering embedded systems (PROMOTE) workshop focuses on research topics on the intersection of software engineering and embedded systems. Nowadays embedded software plays an increasingly important role in embedded systems development, and urges for intense maintenance activities. Therefore, the embedded systems community is expected to benefit from sharing knowledge with the software engineering community, in the sense of applying accumulated experience in handling maintenance effort. However, successful software engineering processes, methods or tools are not usually found in the ES industry, whereas, others might not be even directly applicable, and require tailoring. PROMOTE attempts to bring together practitioners and researchers from both communities, to discuss progress on embedded software processes, methods and tools; to gather empirical evidence on their use; and to identify priorities for a research agenda.

1 Theme

Embedded software (ES), as a type of software targeting devices that are not typically thought of as computers, is usually specialized for one particular hardware (the one that it runs on) and therefore has hardware-specific run-time constraints (e.g., memory usage, processing power, etc.) [1]. The last decades, ES play an increasingly important role in the development process of embedded products: as suggested by Rauscher and Smith some embedded companies have increased the percentage of staff devoted to developing software in the organization—as much as 80% in some software-intensive companies [2]. A possible explanation for that is software’s negligible replication cost and its greater flexibility compared to hardware, which makes it easier to change. Thus, product development managers often allow for some software additions or changes late in the product development cycle to correct hardware problems or to add new functionality [2], urging for intense maintenance activities.

An additional challenge in embedded systems is a long lifetime expectancy, which is normally beyond one decade requiring the management of old systems in parallel to the design and implementation of new systems. State-of-the-art in electronics is advancing rapidly while old systems need to be maintained. Any decision to take advantage of novel hardware and software platforms means that companies need to
manage many different configurations. This leads to issues of retaining skills and knowledge crossing decades hindering the work of current staff and rendering maintenance for ES extremely challenging. However, maintenance is one of the most effort consuming activities in the software lifecycle, since it consumes 50 - 75% of the total time / effort budget of a typical software project [3]. In order for such maintenance activities to be efficient, the development of ES is expected to adopt software engineering processes, to apply software engineering methods and take advantage of sophisticated software engineering tools.

2 goals

In this context, the topic of software engineering for Embedded Systems needs to receive more attention and research effort, considering that the software part of Embedded Systems is becoming increasingly larger and complex. However, there is a lack of forums that discuss the particularities of Embedded Software Engineering. To this end, the PROMOTE workshop aims to bring together researchers and practitioners from the software engineering and the embedded systems communities, so as to discuss the progress on embedded software-specific processes, methods and tools; gather empirical evidence on their use; and identify priorities for a research agenda.

The main topics of interest include, but are not limited to:

- Process frameworks for embedded systems
- Processes for embedded systems development
- Software development for embedded systems
- Methods that are applied in ES architecture, design, and engineering
- Quality models for embedded systems
- Embedded software product quality improvement
- Business model innovations in embedded systems development
- Empirical studies (surveys, case studies, controlled experiments)

3 Accepted Papers

The workshop will include four accepted papers: (a) **Performance Engineering for Industrial Embedded Data-Processing Systems**, in which the authors present a model-based approach for performance engineering that has been applied in a printing industrial setting, (b) **Fault-prone Byte-code Detection Using Text Classifier**, in which the authors present a method for identifying fault-prone classes from java bytecode, (c) **Variability management strategies to support efficient delivery and maintenance of embedded systems**, in which the authors present a strategy for managing variability in communication industry, and (d) **Using Cross-Dependencies during Configuration of System Families**, in which the authors present a process for product configuration in the automotive industry.
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References