

PREESM - Dataflow Programming of Multicore DSPs

Presenters: Maxime Pelcat, Clément Guy, Karol Desnos

IETR/INSA Rennes, France

Emails: Maxime Pelcat: mpelcat@insa-rennes.fr

Clément Guy: cguy@insa-rennes.fr

Karol Desnos: kdesnos@insa-rennes.fr

Web: <http://preesm.sourceforge.net>

Talk Summary:

The increasing parallelism and heterogeneity of signal processing systems foster the development of new design methods and tools. Dataflow models of computation offer advanced semantics that can feed efficiently the design process of parallel systems. This presentation will concentrate on dataflow-based automation of design of signal processing systems using the PREESM Eclipse-based tool.

PREESM is an open-source dataflow framework for rapid prototyping of multicore DSP systems. It is used in research, educational and industrial environments. Rather than replacing the compiler, PREESM complements it by generating coarse-grain parallel C/C++ code with predictable properties. Predictability is provided by a parameterized dataflow Model of Computation (MoC) and an automatic multicore scheduler. PREESM is primarily employed to simulate signal processing applications and generate code for multi-core Digital Signal Processors. It is developed at IETR in Rennes in collaboration with Texas Instruments France.

During this tutorial, the use of PREESM to program the C66x multicore DSPs will be explained. An overview of dataflow Models of Computation (MoCs) will be presented and the choice of the PiSDF MoC as PREESM dataflow representation of an application will be motivated. Advantages and limitations of dataflow programming methods will be discussed for the optimisation of memory, latency, energy consumption and throughput in a signal processing system.

Authors: Maxime Pelcat, Clément Guy, Karol Desnos,

Lab Biography:

During the last decade, IETR/INSA has acquired a strong experience in the design of software/hardware systems. The laboratory develops rapid prototyping methods to assess at compile time the future performance of MPSoC-based systems. Runtime methods are also experimented to deploy applications dynamically on embedded MPSoCs. Algorithm constraints, hardware constraints and their combination (throughput, latency, memory, energy...) are studied in the context of telecommunication systems (3G, 4G, 5G) and video applications (MPEG4 Part 2, H.264/AVC, SVC, HEVC, SHVC).

IETR is especially active in the MPEG consortium as a member of the French National Body (FNB). IETR participates to the MPEG Reconfigurable Video Coding (RVC) and MPEG Green Metadata initiatives. Several dataflow models and Eclipse-based tools (Orcc, PREESM, DFTools) have been proposed in the last years. The tools are available on GitHub and they are open source projects.

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