Issues in using heterogeneous HPC systems for embedded real time signal processing applications

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Abstract:
Embedded signal processing systems have traditionally been built using custom VLSI to meet real-time requirements. This leads to limited programmability and restricted flexibility. With recent technological advances in high performance computing, scalable systems based on heterogeneous "off the shelf" modules are attractive as computing platforms in real-time embedded environments, leading to an emerging class of Scalable Heterogeneous High Performance Embedded (SHHiPE) systems. These systems offer advantages of low-cost, scalability, easy programmability, software portability, and the ability to incorporate evolving hardware technology. In order to satisfy the timing and predictability requirements that arise in embedded environments, several issues must be considered. These issues arise at the hardware level-such as choice of processing element architecture, and also at the software level-issues related to operating system and communication libraries. We propose an integrated methodology to develop efficient parallel solutions for signal processing applications on the SHHiPE platforms. Our approach is to develop scalable portable algorithms based on accurate computational models of the hardware platforms. We present preliminary performance results of such an approach applied to a radar signal processing problem.

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