"Stamatis Vassiliadis Best Paper Award" for L3S Members

Professor Guillermo Payá-Vayá and Professor Holger Blume - both L3S members - won the "Stamatis Vassiliadis Best Paper Award" at the 17th International Conference on Embedded Computer Systems: Architectures, Modeling and Simulation (SAMOS XVII).

Title: Balanced Application-Specific Processor System for Efficient SIFT-Feature Detection

Due to its computational complexity, the Scale-Invariant Feature Transform (SIFT) algorithm poses a challenge for use in embedded applications. To meet real-time at low power, hardware acceleration is necessary. This paper presents an FPGA-based balanced processor system for real-time SIFT feature detection, containing a dedicated hardware coprocessor coupled to a custom VLIW soft-core processor using a FIFO memory. The coprocessor calculates the scale-space and performs the extrema detection for the extraction of feature candidates, whereas the VLIW soft-core processor performs sub-pixel localization and stability checks to get stable SIFT-features. The system achieves a peak frame rate of up to 338 fps on 1024\texttimes376 px images at less than 3 W on a Xilinx Virtex-6 FPGA. The filters within the Gaussian pyramid operate in a time-multiplexed scheme on clock frequencies up to 400 MHz. Furthermore, this paper presents a comprehensive design space exploration, evaluating architectural performance, hardware resources and power consumption trade-offs as well as exposing performance-balanced and pareto-optimal design variants.

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