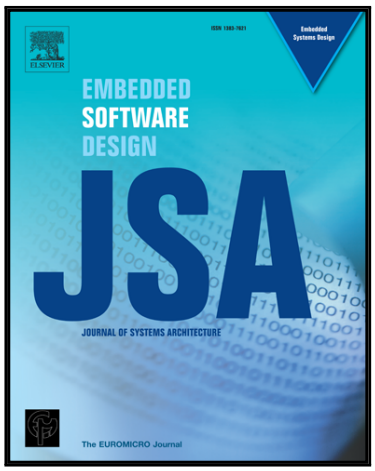

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Fast Heterogeneous Computing Architectures for Smart Antennas

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Abstract

The usage of locating systems in sports elevates match and training analysis to a new level. By tracking players, balls and other sports equipment during matches or training, the performance of players can be analyzed, the training can be adapted and new strategies can be developed. The radio-based RedFIR system equips players and balls in soccer with miniaturized transmitters, while antennas distributed around the playing field receive the transmitted radio signals. A cluster computer processes these signals to determine the exact positions based on the signals' Time Of Arrival (TOA) at the back end.

While such a system works well, it is neither scalable nor inexpensive due to the required computing cluster. Also the relatively high power consumption of the GPU-based cluster is sub optimal. Moreover, high speed interconnects between the antennas and the cluster computers introduce additional costs and increase the installation effort. However, a significant portion of the computing performance is not required for the synthesis of the received data, but for the calculation of the unique TOA values of every receiver line.

Therefore, in this paper we propose a smart sensor approach: By integrating some intelligence into the antenna (smart antenna), each antenna correlates the received signal independently of the remaining system and only a comparably small amount of resulting data is sent to the backend. While the idea is quite simple, the question of a well suited computer architecture to fulfill this task inside the smart antenna is more complex. Therefore, this paper provides an evaluation of embedded architectures, such as FPGAs, GPUs, ARM cores as well as a many core CPU (Epiphany), regarding processing performance and energy consumption. Additionally, we show that performance and energy consumption

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