Cell Based Motion Estimators for Reconfigurable Platforms

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Abstract

Many scientific and engineering applications are data intensive. Their data-flow is often the performance limiting factor. When these applications are implemented on a reconfigurable system, the use of long routing resources usually limits the performance. This paper compares cellular design methods for reconfigurable devices which reduce the need for long paths. Two different approaches are presented: a heterogeneous approach with centralised control, and a homogeneous approach with distributed control, both performing full search motion vector estimation. Our heterogeneous approach, which is based around the NIOS II processor, is easy to develop; when extended with custom instructions, it can process a 16 by 16 pixel macroblock in about 23 msec and uses 5099 LEs (Logic Elements). Our homogeneous approach, which contains one or more copies of an optimised cell and a system control block, can process a macroblock with larger search area in 4.6 msec using only 950 LEs. Additionally, the homogeneous approach can exploit more parallelism and shows nearly linear scaling to cope with larger frame-sizes, search-area and frame-rate.