MEMOCODE 2013 Hardware/Software Co-design Contest: Stereo Matching

• 14:00-14:10 Contest Overview (Eriko Nurvitadhi, Contest Chair)

• 14:10-14:30 Fast and Adaptive BP-based Multi-core Implementation for Stereo Matching (Ahmadzadeh et. al., IPM)

• 14:30-14:50 FPGA acceleration of Markov Random Field TRW-S Inference for Stereo Matching (Choi and Rutenbar, UIUC)

• 14:50-15:10 A GPU Implementation of Tiled Belief Propagation on Markov Random Fields (Eslami et. al., UIUC)

• 15:10-15:30 Award Ceremony

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The Problem: Stereo Matching

Input: Stereo Image pair

Output: Disparity Map

(Lighter colors represent closer objects)
Loopy Belief Propagation on Markov Random Field Graph

Popular method for stereo matching

MRF Graph
Node == pixel
Edge == neighbor

e_0 = \text{msg}_\text{update} (V_C, e_1, e_2, e_3)

Both compute and data intensive
The Contest

• We provided reference LBP software, test input, reference output, and ground truth

• A month to implement system for platform of contestant’s choice (multicores, FPGAs, GPUs)

• Modifications to reference LBP algorithm allowed, but inference accuracy should not be worse than reference
  □ accuracy: # correctly inferred labels vs. ground truth

• Winners to be decided based on pure-performance and cost-adjusted performance
Results

Received 8 submissions, 5 institutions, using various modified algorithms and platforms

Chose top 5 ranked by pure performance

Chose top 5 ranked by performance/cost

Evaluate top 5 using new judging dataset.
IPM (Ahmadzadeh et al) chosen as all around winner.

Decided additional prizes with accuracy adjustment

UIUC (Choi et al) wins accuracy-adjusted performance

UIUC (Eslami et al) wins accuracy-adjusted performance/cost
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