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

Left

Right

Input: Stereo Image pair

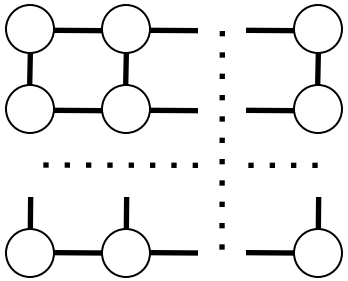
Stereo Matching

Output: Disparity Map

(Lighter colors represent closer objects)

Loopy Belief Propagation on Markov Random Field Graph

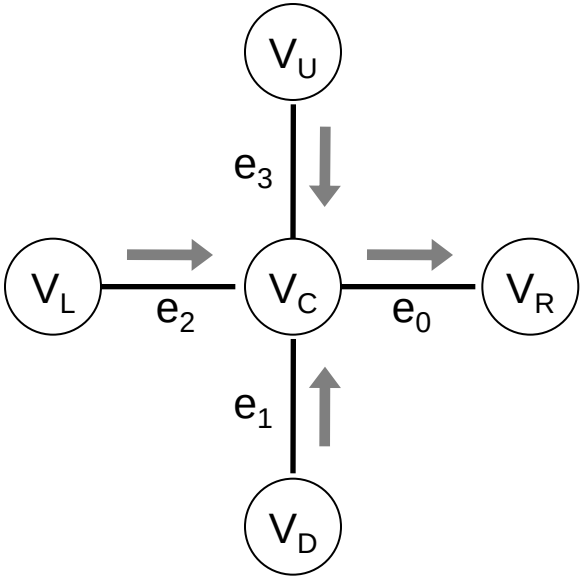
Popular method for stereo matching



MRF Graph

Node == pixel

Edge == neighbor



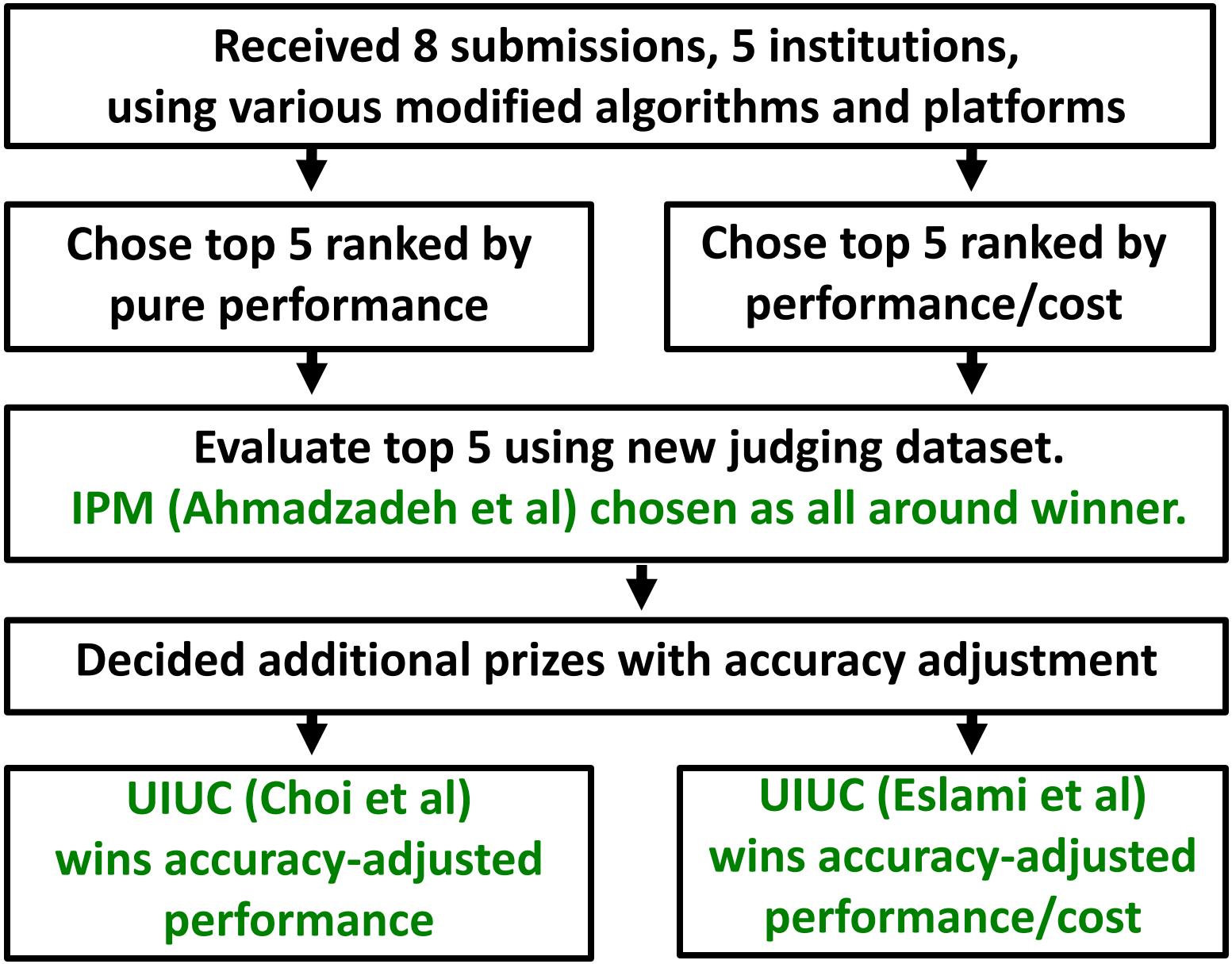
$e_0 = \text{msg\_update}\ (V_C, e_1, e_2, e_3)$

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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