

# A Parallel Framework for Video Super-Resolution

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- ▶ An approach to build systems for super-resolution.
- ▶ Super-resolution typically uses information from other images to increase resolution.
- ▶ Super-resolution is a costly operation.
- ▶ Video contain many images. Super-resolution is much costly operation.
- ▶ In this work, we propose a strategy to reduce the processing time of super-resolution algorithms.

# Proposed solution (the framework)

- ▶ The framework consists of two major approaches: “simplification” and “distribution” (parallel processing).
- ▶ The “simplification” takes the dataset and classifies between complex and simple region.
- ▶ The “distribution” process computes in parallel the simplification steps.

- ▶ Simplification consists in three steps:
  - ▶ Significant Information Selection (SIS): apply super-resolution algorithms only to the luminance channel,
  - ▶ Contour-guided Processing (CGP): create a region that is enlarged by the costly super-resolution algorithms,
  - ▶ Differential Coding (DC): processing the differential frames instead of each frame.

# Simplification



(a)



(b)



(c)

Figura : Selection of regions of interest. (a) original, (b) Canny, (c) partitioned using  $4 \times 4$  blocks.

# Distribution

- ▶ Simplification and classification: A process is assigned to a data set, proportional to available resources.
- ▶ The ROIs are computed in parallel

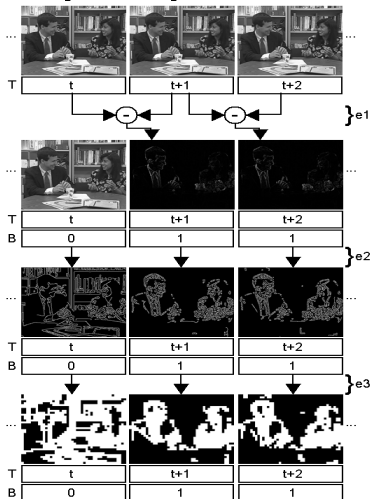


Figura : Parallel processing of simplification and classification steps.

# Distribution

- Block classification:

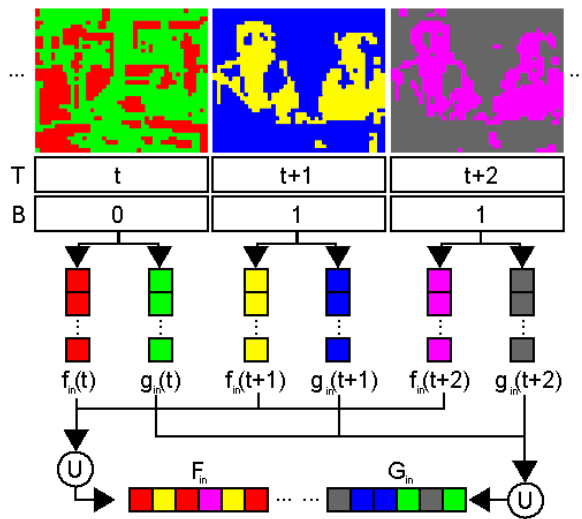
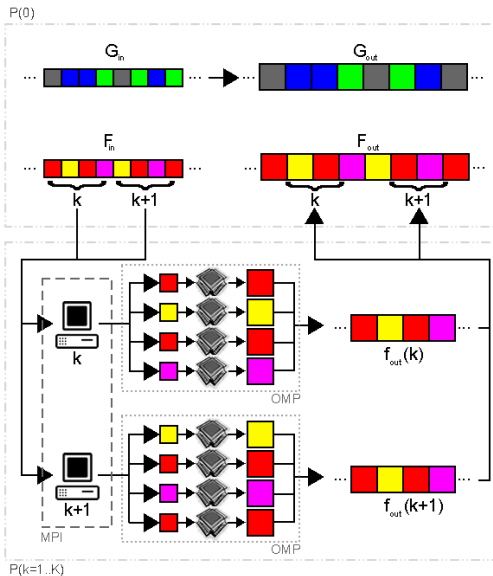


Figura : Block classifications.

# Distribution

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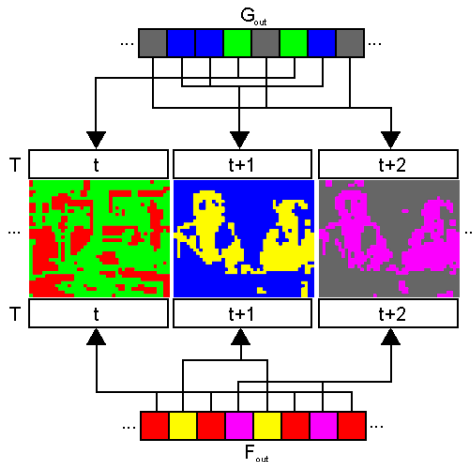
- ▶ Parallel super-resolution:





# Distribution

- Block reordering on frame reconstruction:

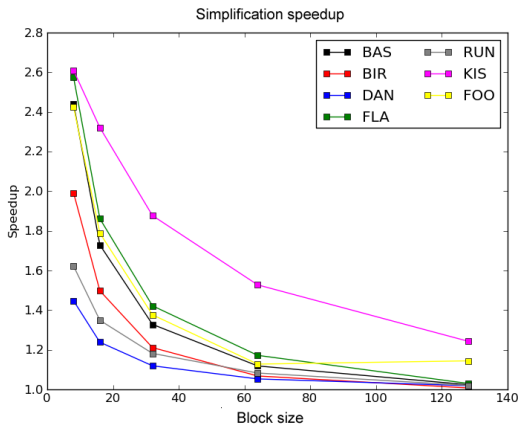


► Figura : Block reordering on frame reconstruction.

# Results

- ▶ Simplification Performance Analysis
- ▶ Visual Quality Analysis
- ▶ Parallel Computing Analysis

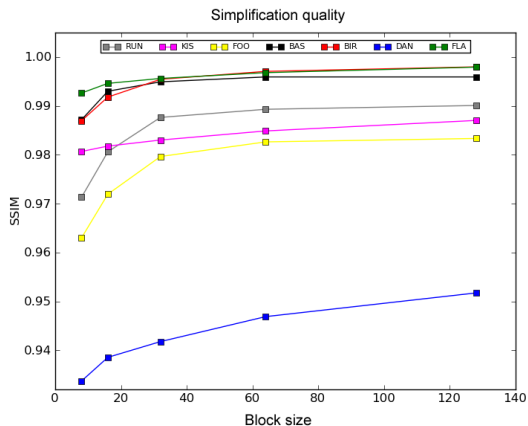
## ► Simplification Performance Analysis



► Figura : Simplification performance gain (simplification speedup).

# Results

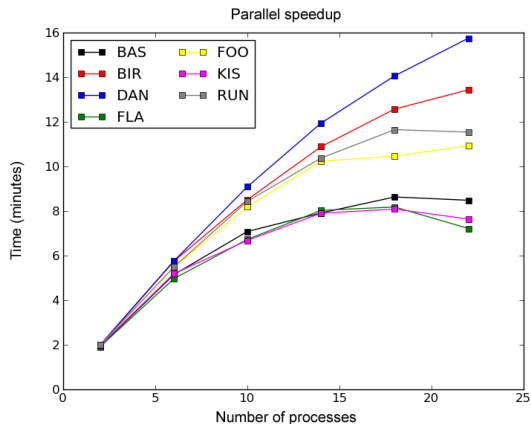
## ► Visual Quality Analysis



► Figura : Quality (SSIM) depending on the block size.

# Results

## ► Parallel Computing Analysis



►

Figura : Parallel speedup.

# Conclusion

- ▶ The framework as proposed in this work is applicable for many applications. The more evident usage consists of the online hosting video applications.
- ▶ The framework propose a new approach combining “simplification” and distribution.
- ▶ This work was accepted for publication at SYNASC 2013.