INTRODUCING MULTIVARIATE CONNECTED OPENINGS AND CLOSINGS

Edwin Carlinet, Thierry Géraud
EPITA Research and Development Laboratory (LRDE), France
edwin.carlinet@lrde.epita.fr

At a Glance

Problem:
- the morphological trees (Min-tree, Max-tree, ToS) are great structures and support connected filters (see right)
- ... but they are not well-defined for color images

Common Solution:
- Imposing an arbitrary total ordering relation between colors [2, 3]
  → false color when reconstructing
  → ordering requires an apriori about the data (background/foreground)

Our approach:
- Merging marginal trees based on the inclusion relation only
- The level of inclusion defines the order

The Multivariate Component Tree that we want

From a depth map to the Multivariate Component Tree

• The starting point

Max-Tree of \( \omega\) \( \equiv \mathcal{T} \)

• Multivariate Component Tree construction process (inspired from MToS [1])

1. Marginal tree construction
2. Inclusion graph \( \mathcal{G} \) of every component
3. \( \mathcal{G} \) nodes depth \( \rightarrow \) depth map \( \omega \)
4. Max-tree of \( \omega \)

Tree filtering and reconstruction [4]

Some great morphological structures...

... used for connected filtering [5]

More formally; a transformation that:
- is invariant to any marginal change of contrast
- is equivalent to the regular Component Tree for a single channel image
- preserves the maximum number of shapes (all of them, if there are not conflicting)

Experiments

Marginal openings leading to false colors, fake flat-zones, and blurry boundaries.

Openings with the Multivariate Max-Tree combining the strength of vectorial approaches and the perceptual quality of a marginal filtering.

Selected bibliography