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## Efficient morphological tools for astronomical image processing

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## Research Activities

### Journal Papers

- U. Moschini, A. Meijster, and M.H.F. Wilkinson, *A hybrid shared-memory parallel max-tree algorithm for extreme dynamic-range images*, submitted (under review) to IEEE Transactions on Pattern Analysis and Machine Intelligence.
- P. Teeninga, U. Moschini, S.C. Trager and M.H.F. Wilkinson, *Statistical attribute filtering to detect faint extended astronomical sources*, *Mathematical Morphology - Theory and Applications*, Volume 1, Issue 1, pages 100–115. De Gruyter, 2016.

### Conference Proceedings

- P. Teeninga, U. Moschini, S.C. Trager and M.H.F. Wilkinson, *“Improving background estimation for faint astronomical object detection”*, in IEEE Proceedings of International Conference on Image Processin (ICIP), pages 1046–1050, 2015.
- U. Moschini, P. Teeninga, S.C. Trager and M.H.F. Wilkinson, *“Parallel 2D local pattern spectra of invariant moments for galaxy classification.”*, in *Computer Analysis of Images and Patterns (CAIP)*, vol. 9257 of LNCS, pages 121–133. Springer, 2015.
- P. Teeninga, U. Moschini, S.C. Trager and M.H.F. Wilkinson, *“Improved detection of faint extended astronomical objects through statistical attribute filtering”*, in *Mathematical Morphology and Its Applications to Signal and Image Processing*, LNCS vol. 9082, pages 157–168. Springer, 2015.
- U. Moschini and M.H.F. Wilkinson, *“Viscous-hyperconnected attribute filters: A first algorithm”*, in *Mathematical Morphology and Its Applications to Signal and Image Processing*, LNCS vol. 9082 of LNCS, pages 669–680. Springer, 2015.
- U. Moschini, P. Teeninga, M.H.F. Wilkinson, N. Giese, D. Punzo, J.M. van der Hulst and S.C. Trager, *“Towards better segmentation of large floating point 3D astronomical data sets: first results”*, in *Proceedings of the 2014 conference on Big Data from Space (BiDS’14)*, pages 232–235. Publications Office of the European Union, 2014.
- U. Moschini, S.C. Trager, and M.H.F. Wilkinson, *“Mask connectivity by viscous closings: linking merging galaxies without merging double stars”*, in *Mathematical Morphology and*

Its Applications to Signal and Image Processing, LNCS vol. 7883, pages 484–495. Springer, 2013.

- M. Pesaresi, G.K. Ouzounis, U. Moschini and M.H.F. Wilkinson, “Concurrent computation of connected pattern spectra for very large image information mining”, in ESA-EUSC-JRC 8th Conference on Image Information Mining, pages 21–25. Publications Office of the European Union, 2012.

## Posters and Talks

- U. Moschini, P. Teeninga, M.H.F. Wilkinson, N. Giese, D. Punzo, S.C. Trager and J.M. van der Hulst, “Towards Better Segmentation of Large Floating Point 3D Astronomical Data Sets: First Results”, NVPBV - Dutch Society for Pattern Recognition and Image Processing meeting in Eindhoven, The Netherlands, November 2014.
- U. Moschini, S.C. Trager and M.H.F. Wilkinson, “Mask Connectivity by Viscous Closings: Linking Merging Galaxies without Merging Double Stars”, ASCI.OPEN/ICT.OPEN - The interface for Dutch ICT-Research in Eindhoven, The Netherlands, November 2013.

## Summer Schools

- ICVSS, International Computer Vision Summer School, Calabria, 14–20 July 2013.

## Supervised students

- C. Arnoldus, *A Max-tree-based Astronomical Source Finder*, Master Thesis, University of Groningen, 2015.
- P. Teeninga, *Improved Detection of Faint Extended Astronomical Objects through Statistical Attribute Filtering*, Bachelor Thesis, University of Groningen, 2015.