Attribute Morphology Diagrams

A set of diagrams illustrating attribute morphology

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Please credit Matt Foster (http://my-mili.eu)

Contents

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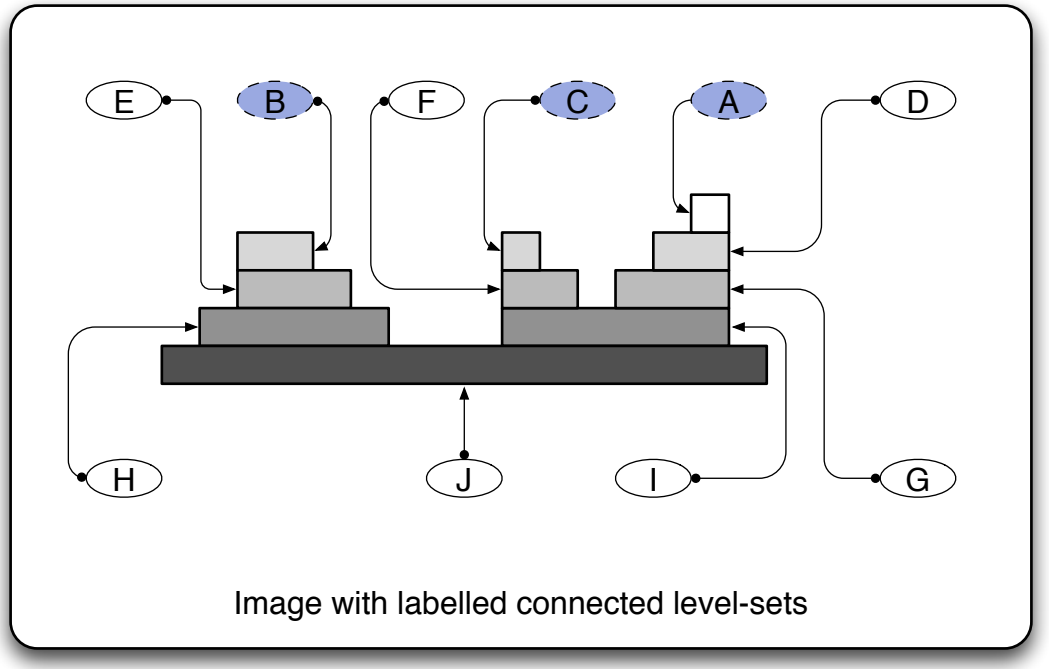
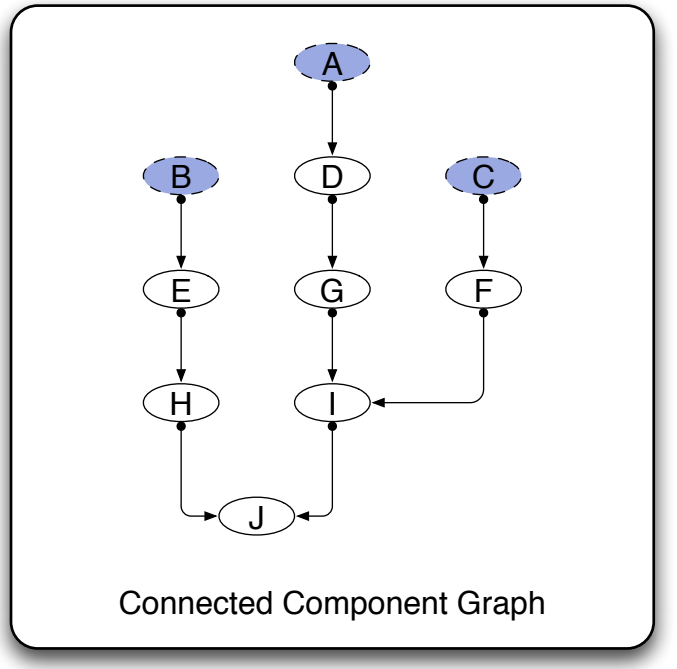
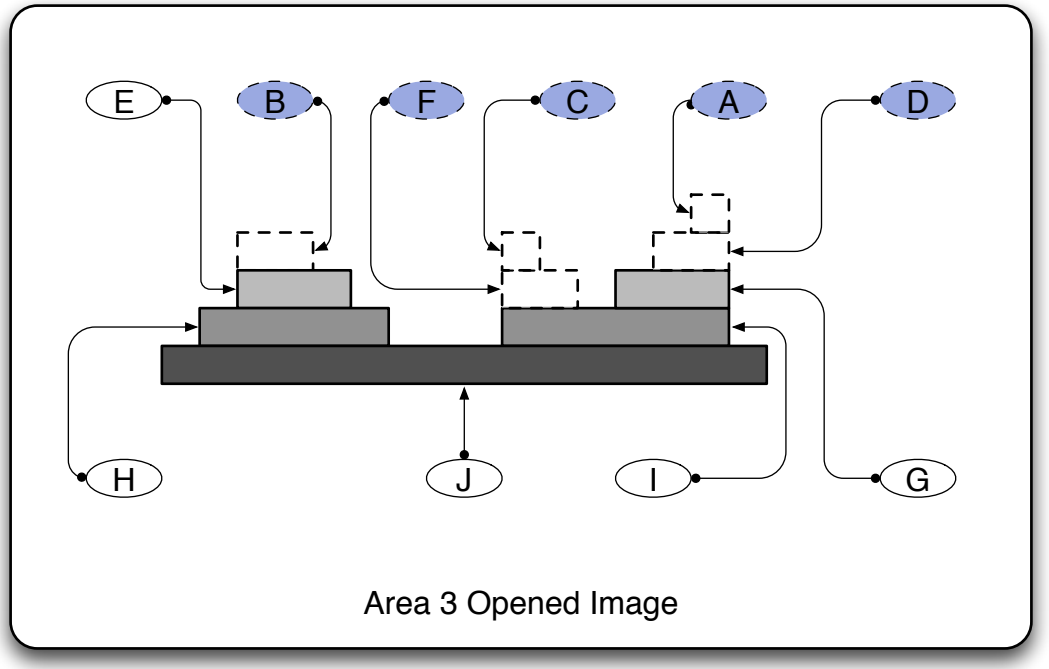


Image with labelled connected level-sets

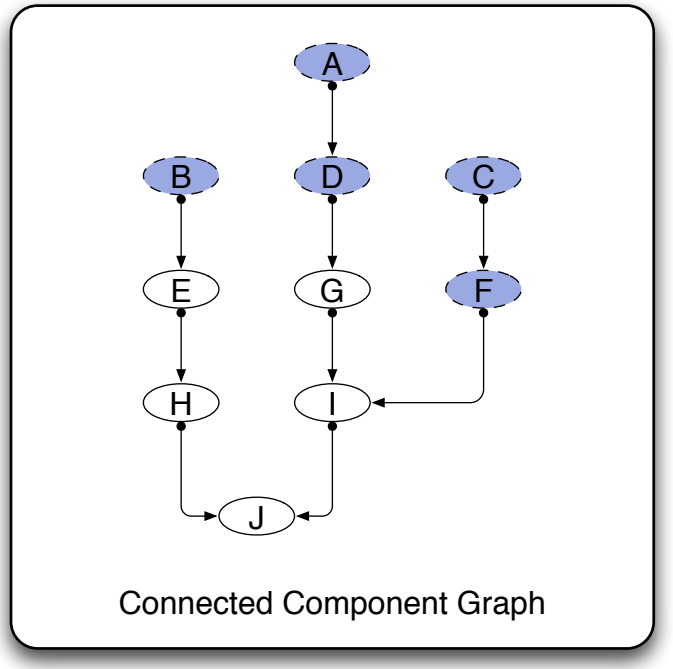


Connected Component Graph

This diagram shows the example (cross section) image which is used in the other diagrams. The connected component diagram on the right shows how the different level sets are related to one another. The blue ellipses represent local maxima, which are in turn connected to levels with decreasing value.



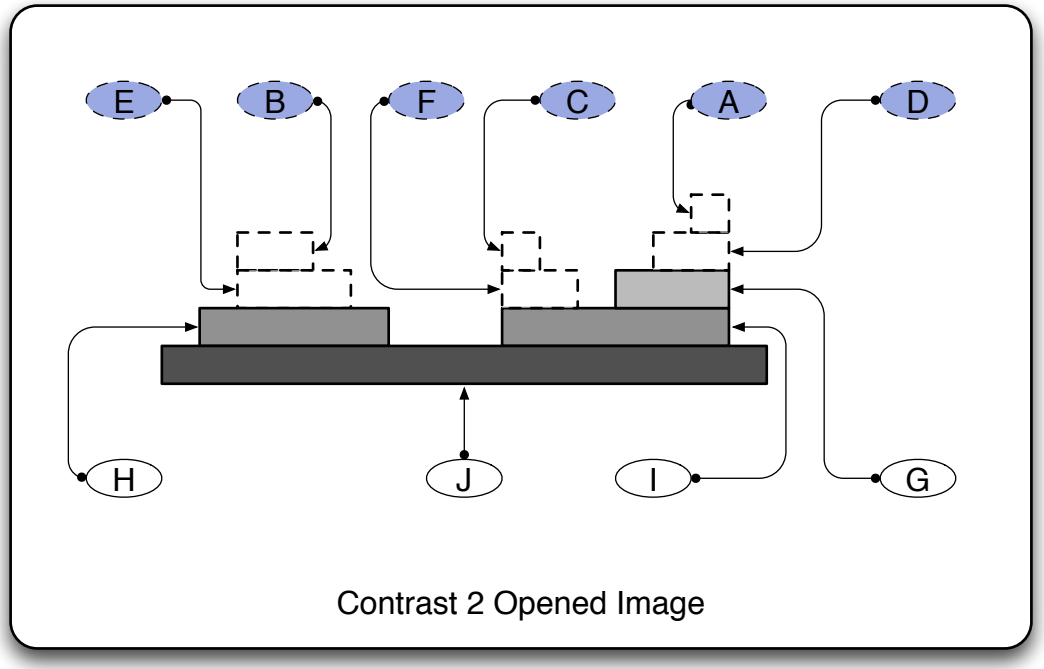
Area 3 Opened Image



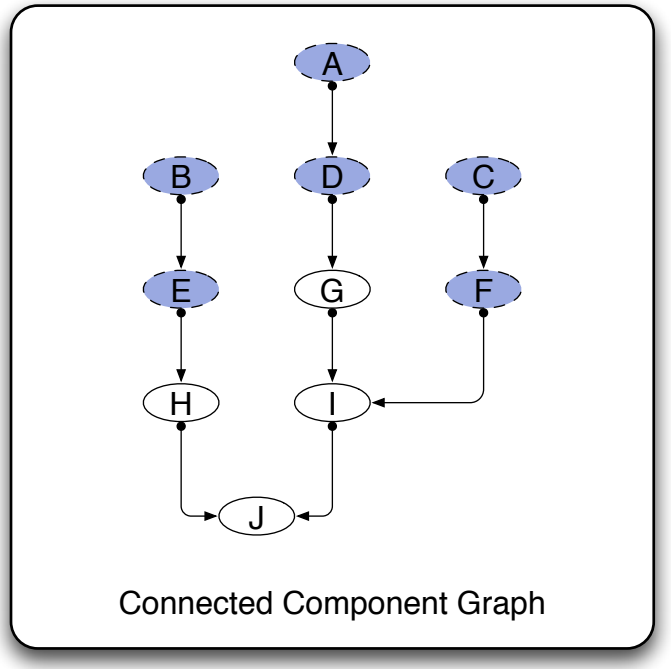
Connected Component Graph

X Set to be removed from output image

In area morphology, features whose area is less than a given threshold are removed. In the example above (opening with area 3), we start with bright objects, and continually remove level sets with areas < 3.



Contrast 2 Opened Image



Connected Component Graph

X Set to be removed from output image

In contrast morphology, features are removed based on their contrast. In the example above, features with a contrast of less than or equal to 2 are removed. Others are left intact.

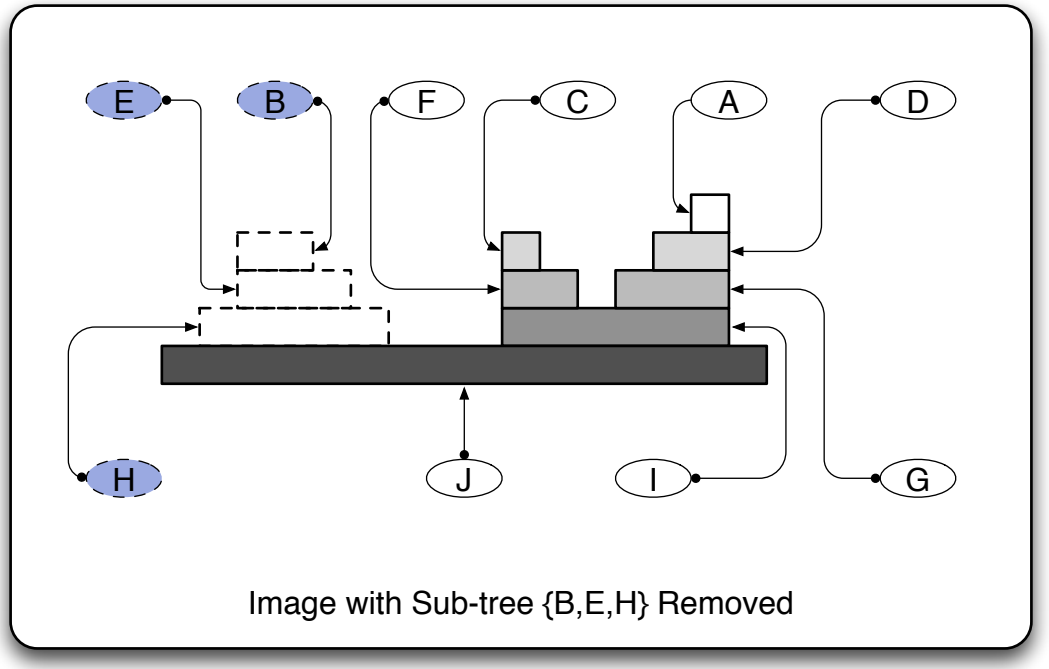
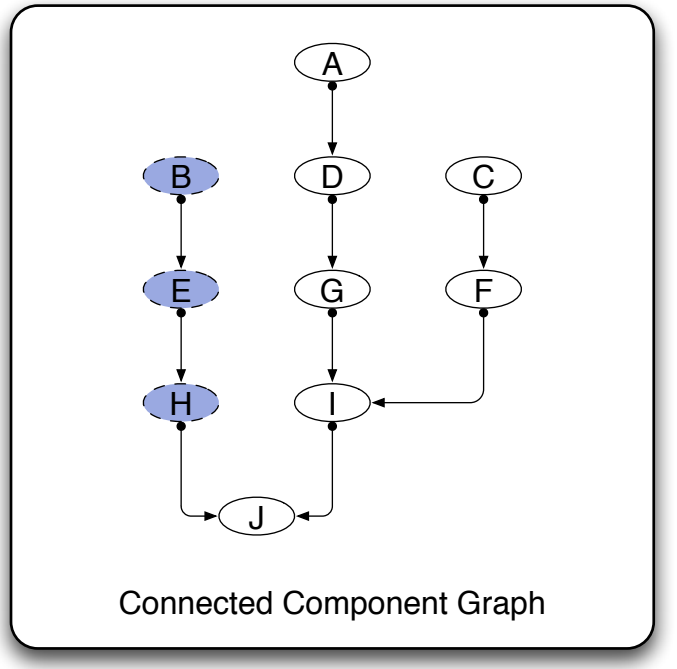


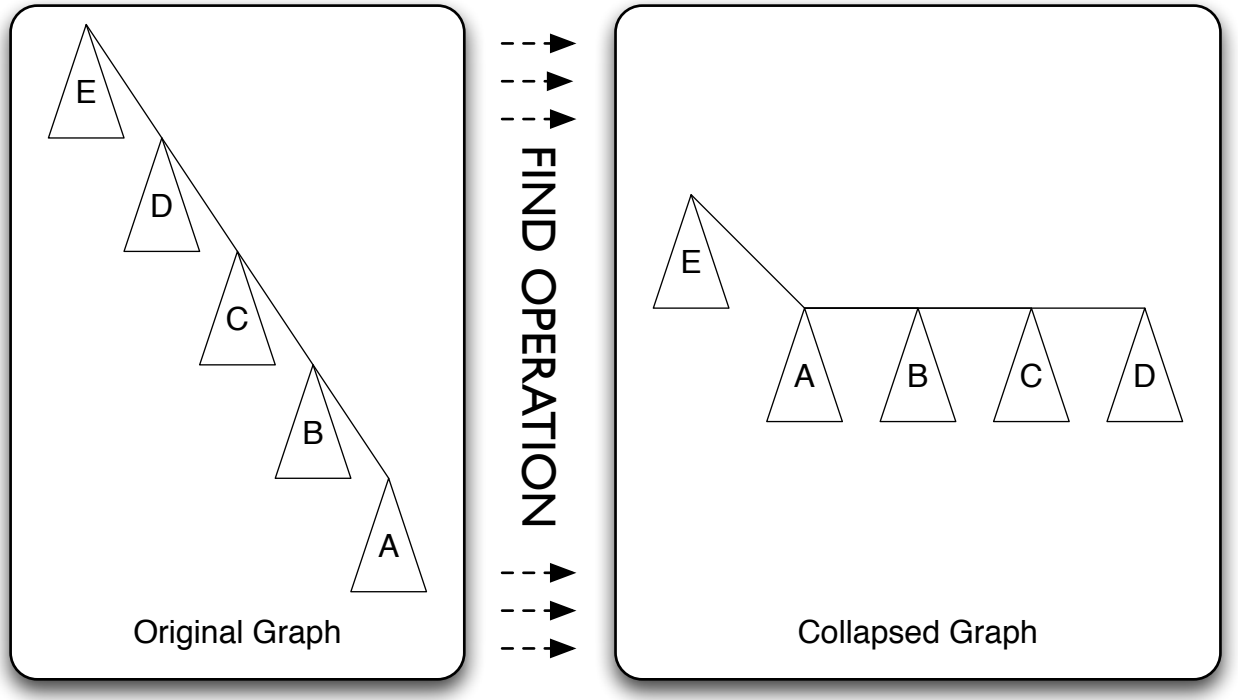
Image with Sub-tree {B,E,H} Removed



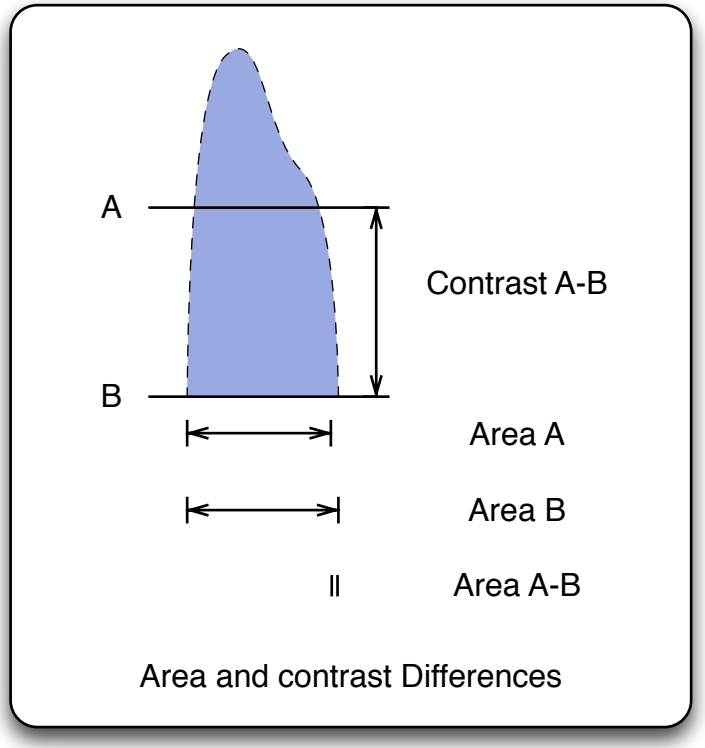
Connected Component Graph

X Set to be removed from output image

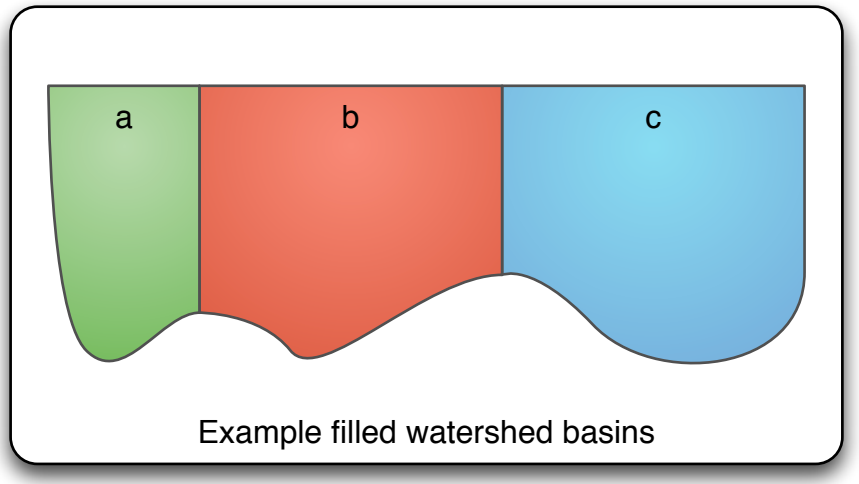
Transitive morphology is the removal of features in their entirety. In this case, the entire sub-tree on the left has been removed.



This diagram shows how a graph can be collapsed to simplify it.



This diagram shows how contrast and area differ when a section of image has a high gradient. In this case the difference in area between the levels A and B is very small, whilst the contrast difference is much larger. This property can be very useful.



Example filled watershed basins

This diagram shows how an image might be segmented using the watershed tansform. The bottom edge represents the umbra of an image, and the coloured areas represent basins (areas considered separate) by the watershed transform.