Connected Component Analysis

Aims

- To identify groups of contiguous pixels (connected components)
- To label separate blobs, i.e. assign distinct labels to (those) connected components.

Definition of blob

A set of pixels that share some property and that are connected. We can trace a path from one pixel-member to all others.

Algorithm

First Pass

Work from left to right and top to bottom

if (zero neighbours have a label)
Pixel receives the next free label

else if (one or more neighbours have the same label)
Pixel receives that same label

else if (two or more neighbours have different labels)
Pixel receives (any) one of the labels,
equivalence of these labels is recorded

Second Pass

Work from left to right and top to bottom

Relabel all equivalent labels.

4- vs 8-connectivity

Choose whichever connectivity model is most appropriate for the current situation

- 4-connectivity: A central pixel is only connected to its four nearest neighbours (north, east, south and west)
- 8-connectivity: A central pixel may be connected to the four nearest neighbours and the four next-nearest neighbours (mostly NE, SE, SW, NW but not always)