Active Contour Models - Snakes

Methodology

- Idea: minimise the *Energy Function*

$$E_{\text{snake}} = \sum_{x \in \mathscr{C}} E_{\text{int}}(\boldsymbol{x}) + E_{\text{image}}(\boldsymbol{x})$$

$$E_{\text{int}} = \frac{1}{2}\alpha\|\boldsymbol{x}_i - \boldsymbol{x}_{i-1}\|^2 + \frac{1}{2}\beta\|\boldsymbol{x}_{i-1} - 2\boldsymbol{x}_i + \boldsymbol{x}_{i+1}\|^2$$

$$E_{\text{image}} = -w_{\text{line}}\boldsymbol{I}(\boldsymbol{x}) - w_{\text{edge}}|\nabla\boldsymbol{I}(\boldsymbol{x})|^2$$

α : continuity, length, variable

β : curvature, smoothness, set to 0

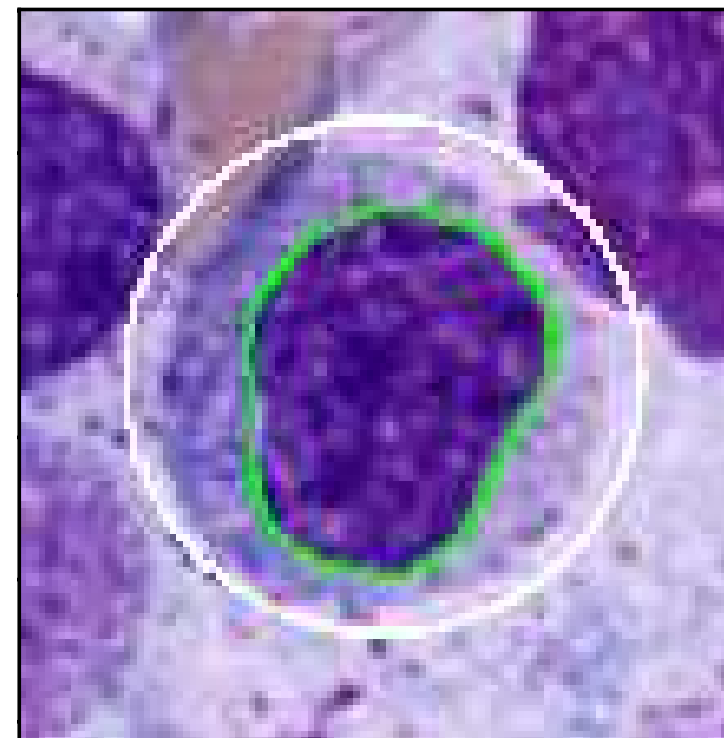w_{line} : attracted to lighter regions, set to 1

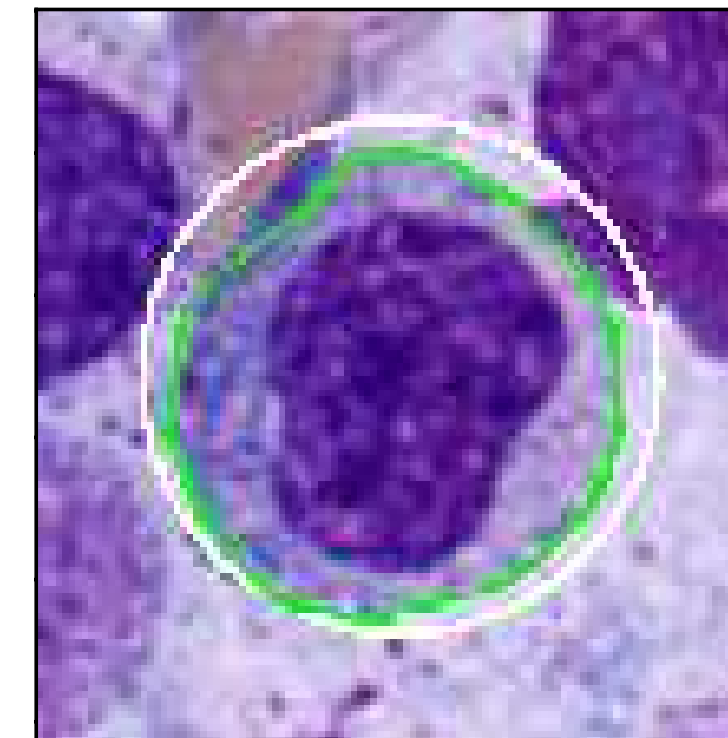w_{edge} : attracted to edges, more important than intensity, set to 3

Yuli Wu
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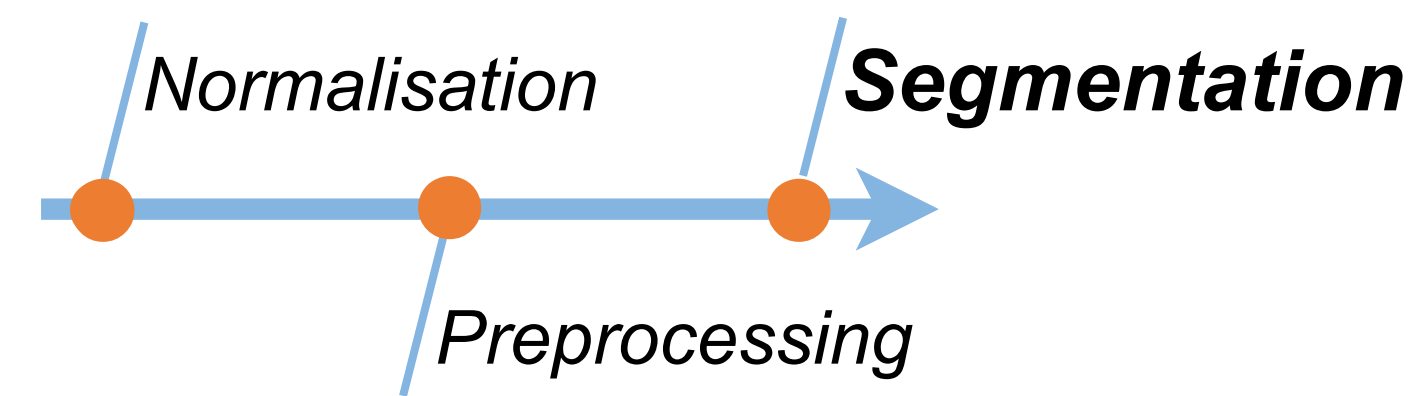
Example: controlling the contour with different parameters

Snakes

Snakes

$$\alpha = 5.0$$
$$\beta = 0.0$$
$$w_{\text{line}} = 1.0$$
$$w_{\text{edge}} = 1.0$$

$$\alpha = 0.3$$
$$\beta = 0.0$$
$$w_{\text{line}} = 1.0$$
$$w_{\text{edge}} = 1.0$$

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