A* Path Planning for Line Segmentation of Handwritten Documents

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Abstract

> The novelty of the proposed approach lies in the use of a smart combination of simple soft cost function that allows an artificial agent to compute paths separating the upper and lower text fields.

> The use of soft cost functions enables the agent to **compute** near-optimal separating paths even if the upper and lower text parts are overlapping in particular places.







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the **IAM-HistDB**

Pre-processing



a) The original handwritten document image **b)** Background noise is removed by Otsu's algorithm **c)** The result of Sauvola's algorithm (a window size of 20x20 pixels) **d)** Smooth ink density histogram and local maxima represent the text lines.

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The A* Algorithm with simple cost function

Qui nna reliquinus > The agent ann lequeremur

correctly separates two character lines



> Some lines are not segmented correctly, the agent cannot divide the two touching text lines

 $1 + \min(d(n, n_{v_{n}}), d(n, n_{v_{d}}))$

 $D(n)^{2} = \frac{1}{1 + \min(d(n, n_{y_{u}}), d(n, n_{y_{d}}))^{2}}$

Proposed Cost Functions for line segmentation with A* Path-Planning Algorithm

The Ink Distance D(n) = -**Cost Functions**

The A* Path-Planning Algorithm for Text Line Segmentation



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- 2. The Map-Obstacle Cost Function M(n)
- 3. The Vertical Cost Function $V(n) = abs(n_v - n_v^{start})$ 4. The Neighbor Cost Function
 - $N(s_i, s_i)$

> The proposed A* pathplanning algorithm uses

Hit rate and line accuracy of line segmentation

Dataset	Hit rate	Line Accuracy
MLS (our method)	0.9280	0.9000
Saint Gall (our method)	0.9980	0.9999
(Baechler <i>et al</i> .)	0.9600	0.9540
(Garz <i>et al</i> .)	0.9865	0.9797



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for infinity

The **MLS** dataset is available at

http://www.ai.rug.nl/ ~mrolarik/MLS/