A Noise-Robust Method for Crack Segmentation

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1 Introduction

- Why we need Crack Detection

  Crack detection is important for the inspection, diagnosis, and maintenance of concrete structures

- Challenge

  Images of the concrete surface contain various types of noise

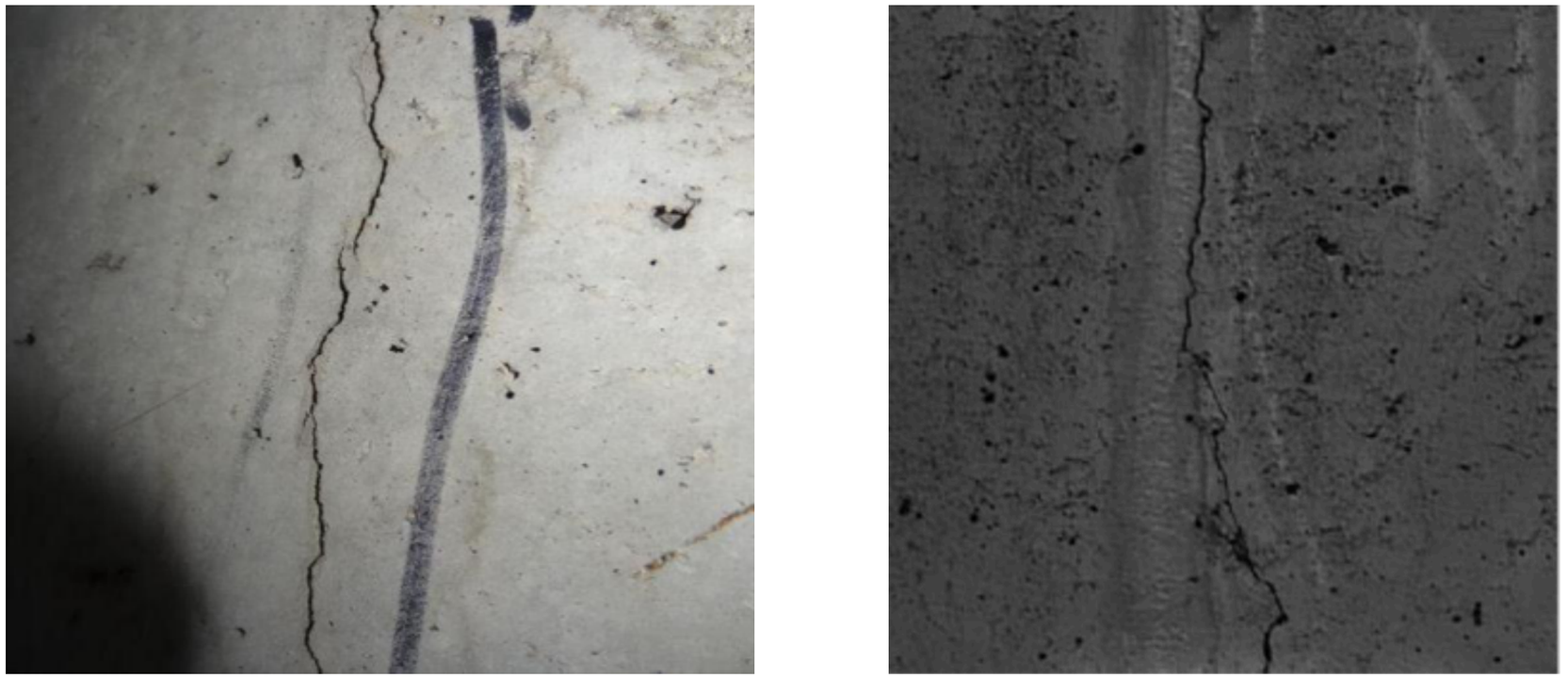


Fig.1 shading, stain and concrete blebs

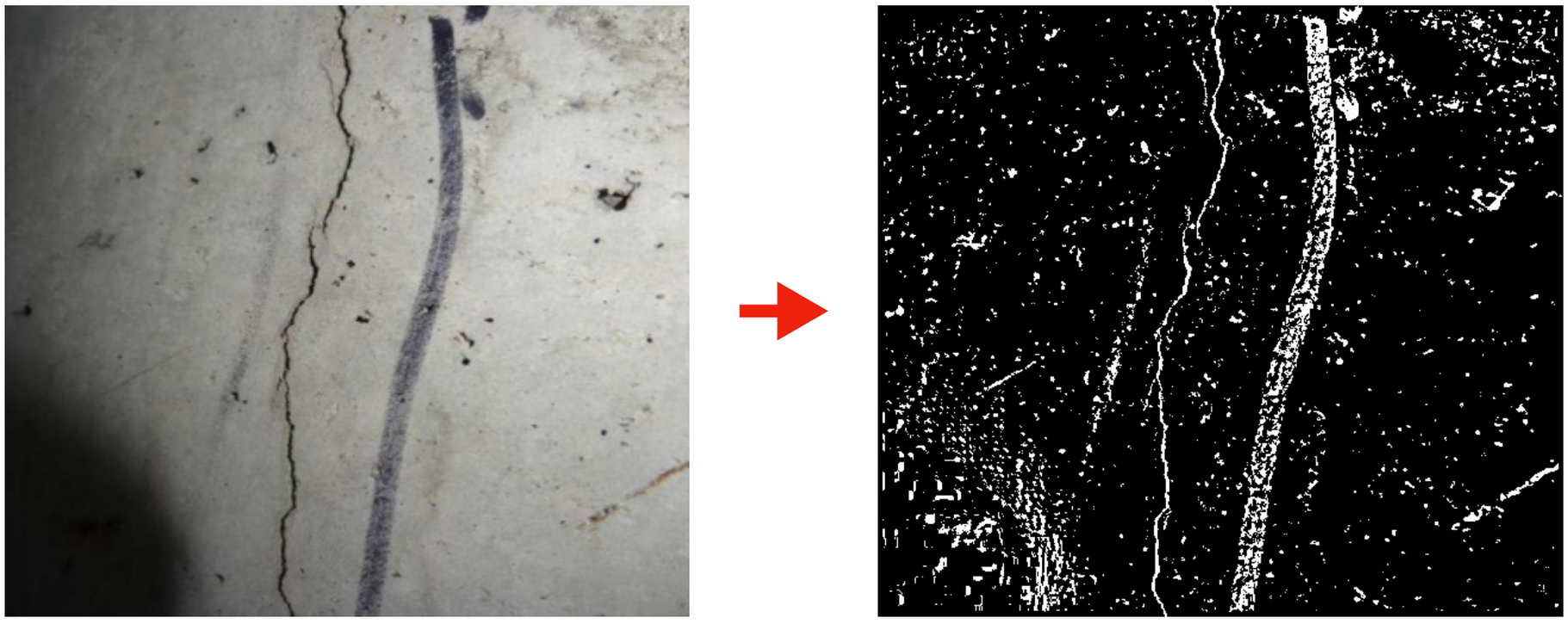
2 Proposed Method

2.1 Seeds Selection

- Binarize the image

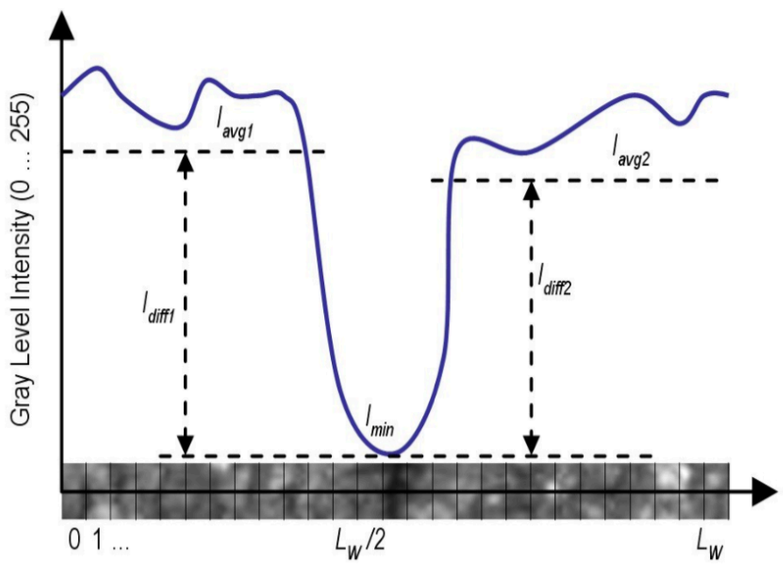
$$I_{avg} = \frac{1}{(2N+1)^2} \sum_{i=-N_{xy}}^{i=N_{xy}} \sum_{j=-N_{xy}}^{j=N_{xy}} I(x+i, y+j)$$

$$K_{ROI} \times I_{avg} - I(x, y) > 0$$

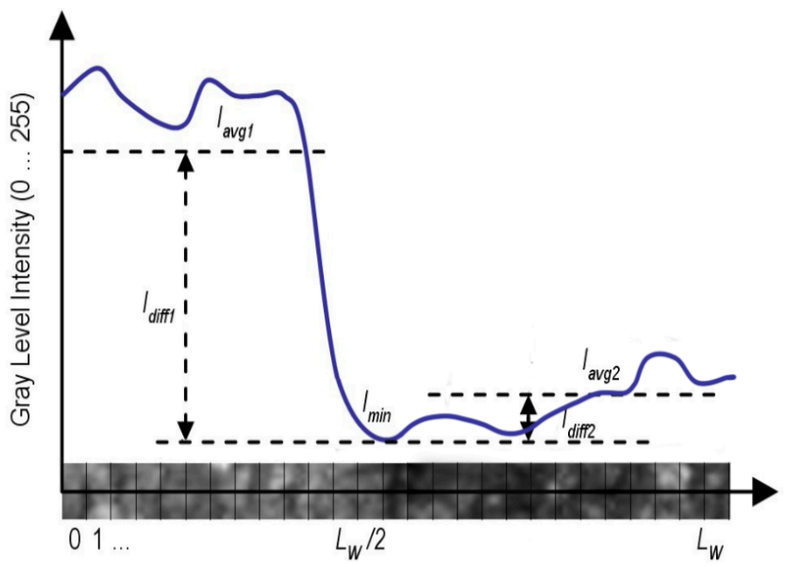


2.1 Seeds Selection

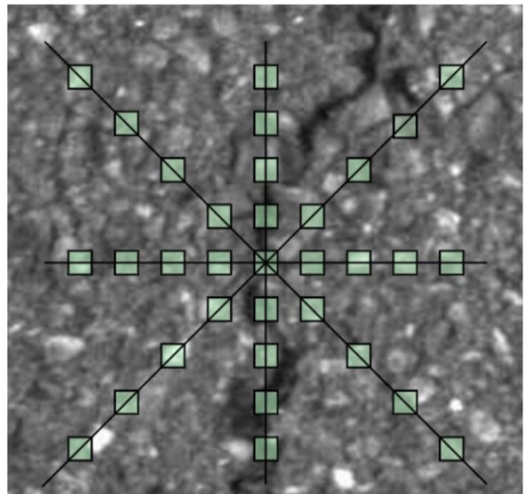
- Denoise——Multiple Directional Non-Minimum Suppression



(a) The profile of crack region



(b) The profile of non-crack region



(c) The four linear windows at 0°, 45°, 90° and 135°

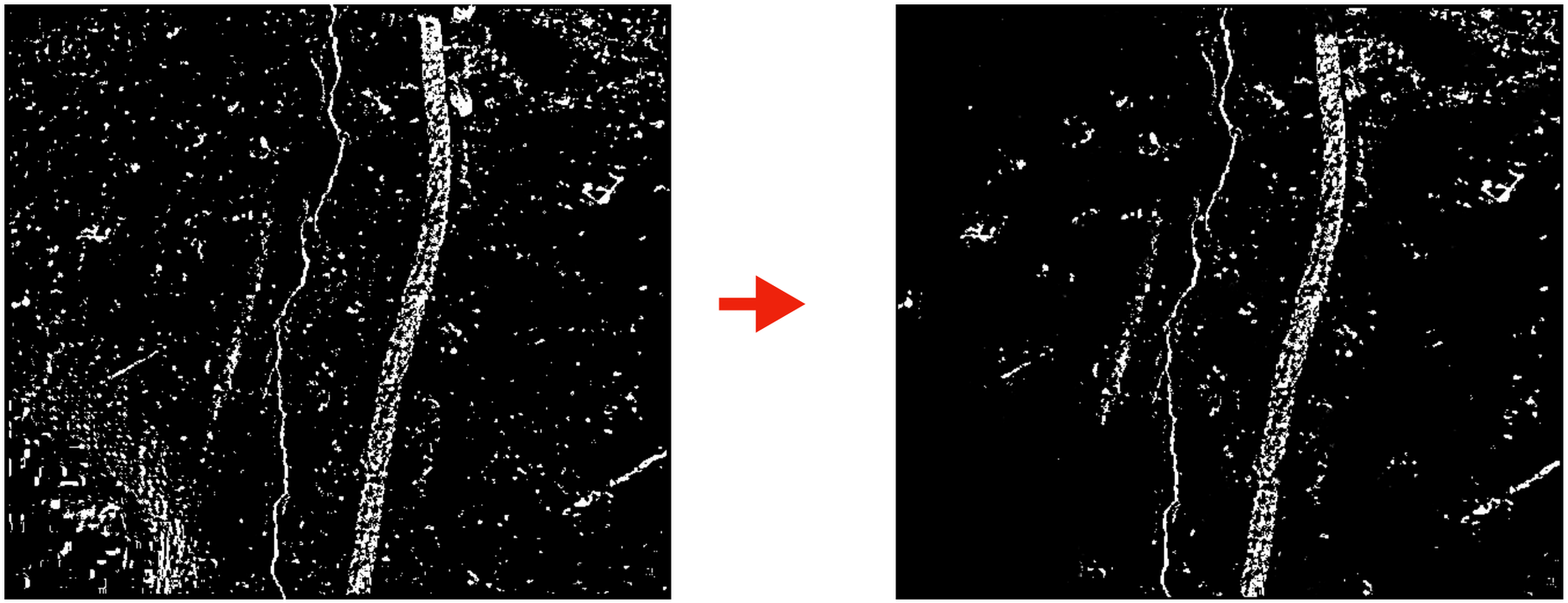
$$I_{avg1} = \frac{1}{L_w}\sum_{i=0}^{L_{min}} I(i); I_{avg2} = \frac{1}{L_w}\sum_{i=L_{min}}^{L_w} I(i)$$

$$I_{diff1} = I_{avg1} - I_{min}; I_{diff2} = I_{avg2} - I_{min}$$

Sun.Changming and Vallotton.Pascal. Fast linear feature detection using multiple directional non- maximum suppression. In International Conference on Pattern Recognition, 2006.

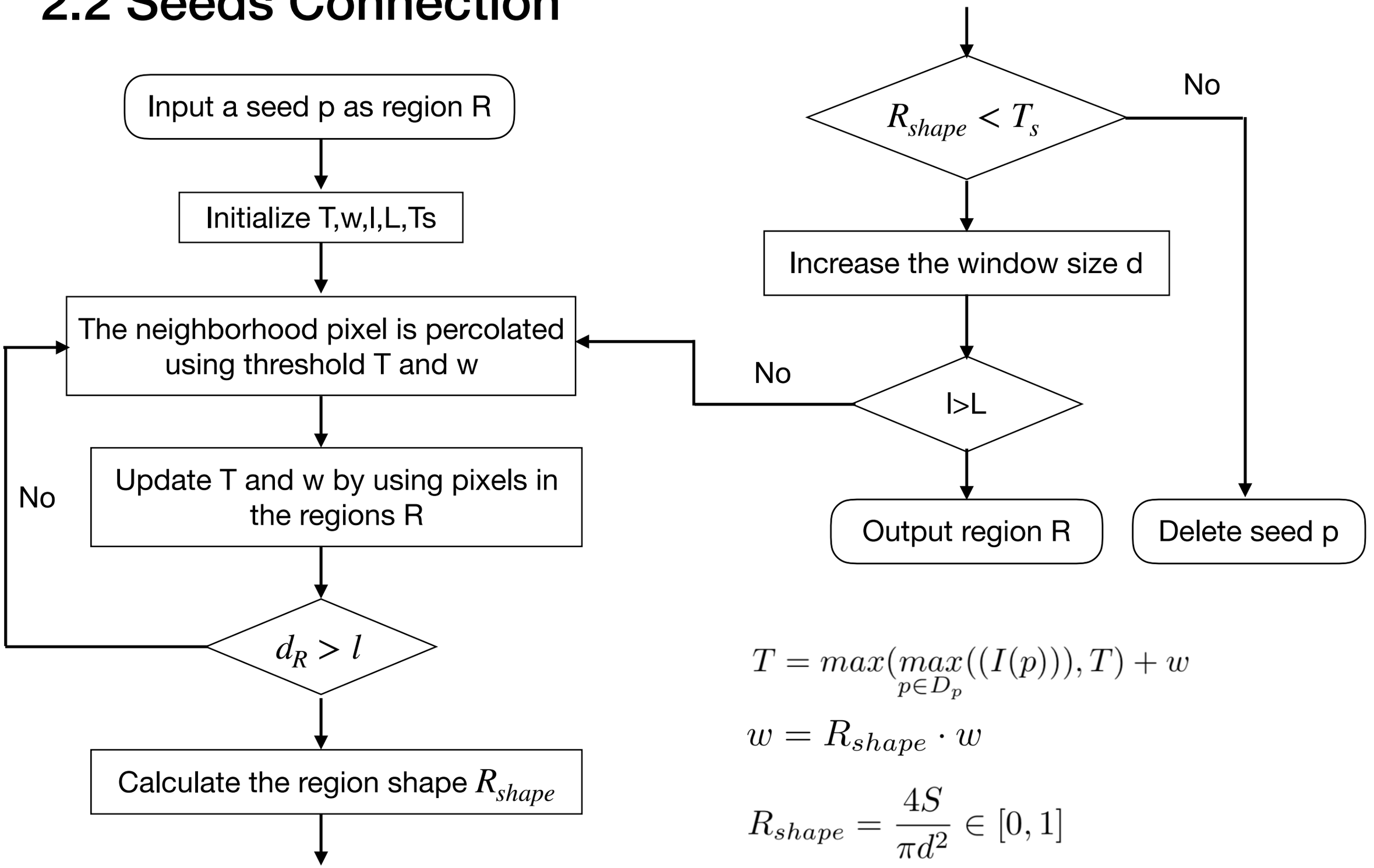
2.1 Seeds Selection

- Denoise——Multiple Directional Non-Minimum Suppression



Sun.Changming and Vallotton.Pascal. Fast linear feature detection using multiple directional non- maximum suppression. In International Conference on Pattern Recognition, 2006.

2.2 Seeds Connection



$$T = max(\underset{p \in D_p}{max}((I(p))), T) + w$$

$$w = R_{shape} \cdot w$$

$$R_{shape} = \frac{4S}{\pi d^2} \in [0, 1]$$

2.2 Seeds Connection

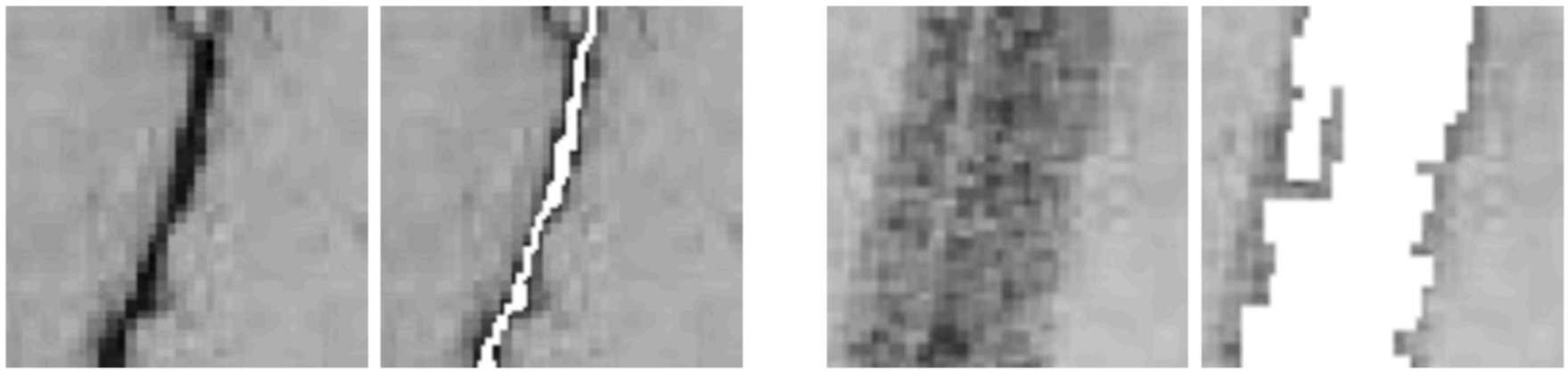
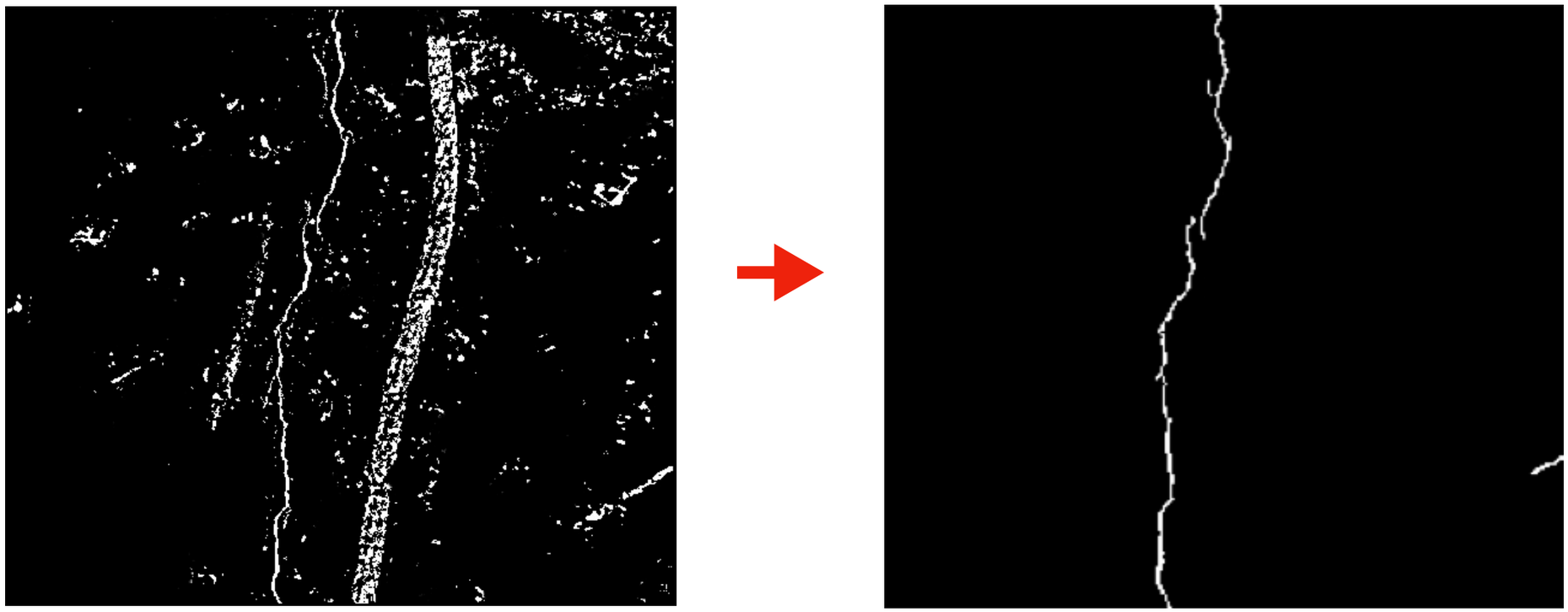
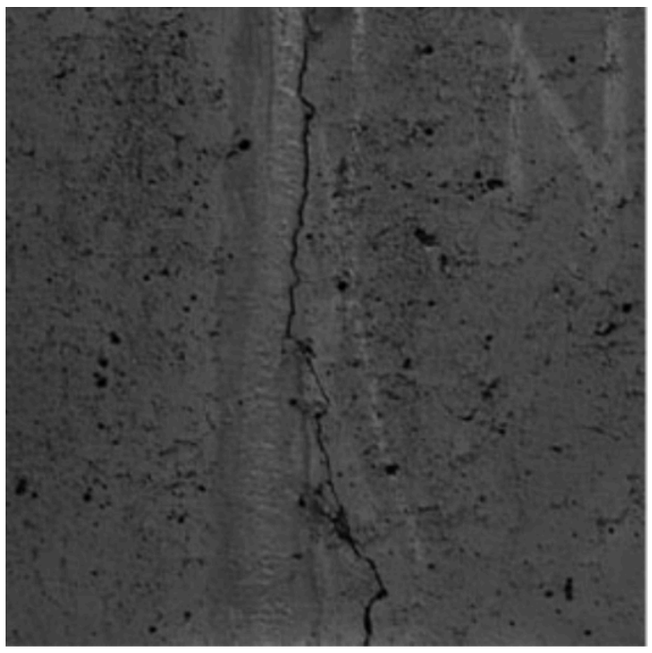
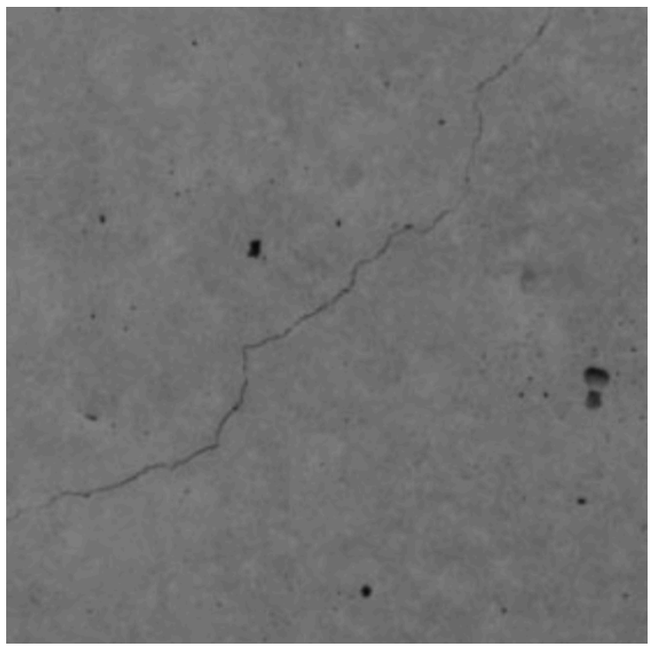
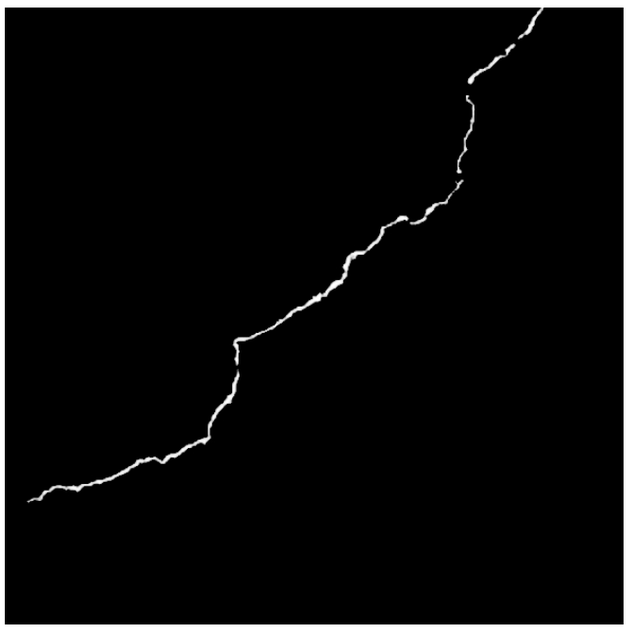


Fig.1 The shape parameter R_{shape} of (b) is 0.04, and R_{shape} of (d) is 0.58,



2.3 Results

Thank you!