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Ridge Network Detection in Crumpled Paper via Graph Density Maximization.

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ABSTRACT

Crumpled sheets of paper tend to exhibit specific and complex structure, which is described as ridge networks by physicists. Existing literature showed that automation of ridge network detection in crumpled paper is very challenging because of its complex structure and the measuring distortion. In this paper, we propose to model the ridge network as a weighted graph and formulate the ridge network detection as an optimization problem in terms of the graph density. We first detect a set of graph nodes and then determine the edge weight between each pair of nodes to construct a complete graph. Next, we define a graph density criterion and formulate the detection problem as to determine a subgraph with maximal graph density. In addition, we also propose to refine the graph density by including pairwise connectivity into the criterion to improve the connectivity of the detected ridge network. Our experimental results show that, with the density criterion, our proposed method effectively automates the ridge network detection.

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