

CONTENT EXTRACTION, ANALYSIS, AND RETRIEVAL

FOR PLANT VISUAL TRAITS STUDIES

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ABSTRACT

IN recent years, automatic content extraction, analysis and retrieval for plant visual trait studies play a more important role than ever before, because traditional manual processing suffers two major issues: excessive processing time and subjectiveness rising from different individuals. Therefore, to conduct high throughput experiments, plant biologists are in urgent need for, 1) efficient computer software to automatically extract and analyze significant contents, 2) scoring functions to mimic human scoring, etc.

In order to meet these needs, a series of customized computer vision and image processing algorithms is developed in our research. These algorithms are particularly customized for two model plants: Maize lesion extraction and Arabidopsis insect damage calculation. For Maize, a mixture of edge-based and region-based segmentation algorithm is developed to extract lesions caused by fungus; for Arabidopsis, a top-down segmentation process is employed to measure leaf area differences resulting from insect damage. Our informatics tools can be generalized to accommodate a broad range of plant species for visual trait studies. Moreover, they will potentially provide a framework for cross-institutional and collaborative studies.