Public Abstract

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Title:HIGH-THROUGHPUT ANALYSIS AND ADVANCED SEARCH FOR VISUALLY-OBSERVED PHENOTYPES

The trend in many scientific disciplines today, especially in biology and genetics, is towards larger scale experiments in which a tremendous amount of data is generated. As imaging of data becomes increasingly more popular in experiments related to phenotypes, the ability to perform high-throughput big data analyses and to efficiently locate specific information within these data based on increasingly complicated and varying search criteria is of great importance to researchers.

This research develops several methods for high-throughput phenotype analysis. This notably includes a registration algorithm called variable object pattern matching for mapping multiple indistinct and dynamic objects across images and detecting the presence of missing, extra, and merging objects. These methods aim to produce accurate and unique trait data that can help researchers gain further understanding and insight into the underlying biological and genetic mechanisms that mediate phenotypic expression.

Research accomplishments resulted in a number of unique advanced search mechanisms including a retrieval engine that integrates multiple phenotype text sources and domain ontologies and a search method that retrieves objects based on temporal semantics and behavior. These search mechanisms represent the first of their kind in the phenotype community. While this computational framework is developed primarily for the plant community, it has potential applications in other domains including the medical field.