Searching the Shadows: Using s Shadows in Aerial Imagery to Classify Trees by Genus for Urban Tree Management, Year II

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A thriving tree canopy is an essential aspect of a healthy and sustainable city. However, to best manage urban trees, city planners must have access to crucial information about the location of individual tree types. This can allow them to make informed decisions to protect trees from genus-related diseases (e.g., emerald ash borer). Current manual tree type identification methods are time-consuming and labor-intensive. We worked to identify tree type (genus) from shadows in aerial imagery so trees can be identified more efficiently. Our three goals were to expand a tree shadow dataset created in our previous work, identify and validate characteristics that can be used to determine tree type, and quantify these characteristics. We identified 35 distinct tree characteristics, including branch structure, fine branch distribution, and canopy shape, to determine tree type. Characteristics were validated through repeated tests and could be used to distinguish ten tree types with an average accuracy between raters of 62.5% in a single identification (Random guess: 10%) and 80% in two identifications (Random guess: 20%). Python was then used to quantify characteristics like branch density, canopy texture, color distribution, and canopy shape. Results were analyzed for ability to distinguish among tree types. Our method was five times faster at identifying tree types than traditional manual field surveys. The quantified characteristics also lay foundation for the development of accurate machine learning methods to further improve tree identification efficiency. Ultimately, our work could provide a cost-effective and efficient alternative to traditional manual field surveys.

Awards Won: