

NAPPN Annual Conference Abstract: Volume Estimation of Sweetpotatoes using LiDAR

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Abstract

Volume is an important phenotype and quality attribute of sweetpotato storage roots. Conventionally the volume of most agricultural products is measured by water displacement. This method, which requires submerging the products in a container of water and measuring the displacement of water in the container, is time-consuming and tedious. It would be beneficial for sweetpotato breeding programs and quality inspection if a rapid method is developed for measuring the volume of sweetpotatoes. This study is therefore to evaluate the feasibility of LiDAR (light detection and ranging) technology as a novel high-throughput approach to phenotyping and measurement of the volume of sweetpotatoes. LiDAR data will be acquired from sweetpotato storage roots using a consumer-grade sensor, Intel® RealSense L515, which is an RGB-D (red-green-blue-depth) camera. Ground-truth volume values will be obtained using the reference water displacement method. RGB images will be used to segment sweetpotatoes from background, and extract meaningful features (e.g., the major axis length and the center of mass), complement the point cloud data from depth images for volume estimation. The shape of the sweetpotatoes will be constructed by a series of three-dimensional coordinate points, the alpha shape method is to be used to envelop the boundary points of sweetpotatoes to obtain a non-convex body, and thereby the volume of the sweet potato will be calculated. The efficacy of the proposed method will be evaluated in terms of volume estimation accuracy.