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Using a depth camera to measure canopy height

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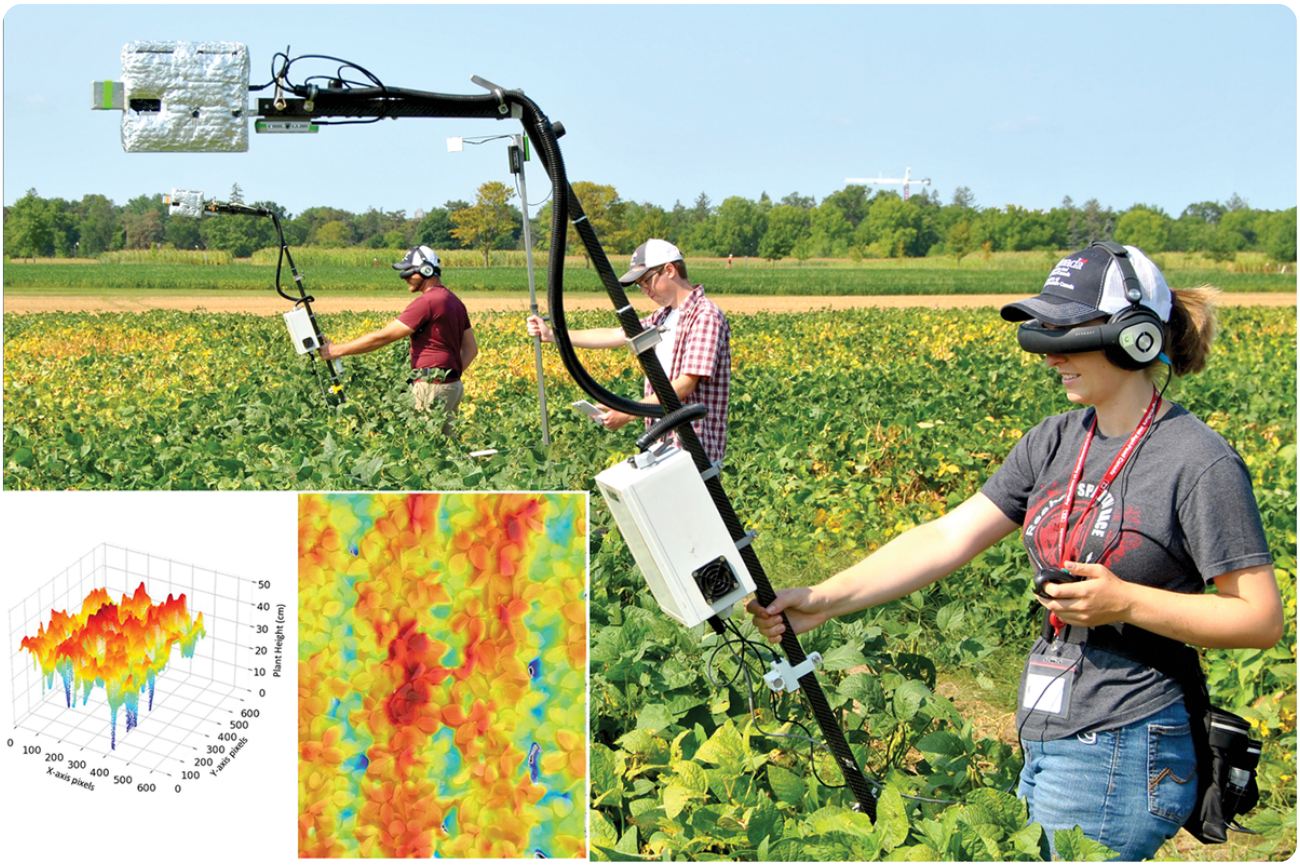

The D415 camera is mounted anterior to the heat reflective wrapped RGB and infrared camera housing on the PlotCam. The HeightStick is a single-point LIDAR aimed down to a vertically movable paddle set at the top of the canopy; data are stored on a tablet via Bluetooth. Inset: A 3D plot of 480- x 640-pixel soybean canopy heights and a 2D overlay of the heights over a nadir RGB image at the beginning of flowering. Courtesy of Soybean

Canopy height is an important crop trait that is largely manually characterized in plant breeding and phenomics. But in a new study in *The Plant Phenome Journal*, researchers used the Intel RealSense D415 depth camera to measure wheat and soybean canopy heights from a portable, ground-based phenomics platform, the PlotCam. The D415 camera uses dual infrared cameras and depth-and vision-processing modules to measure distance. It is a relatively inexpensive instrument that is small and lightweight, consumes minimal power, and is easily incorporated into a ground-based systems.

Researchers collected distance arrays weekly over the course of a growing season in soybean and wheat. Using the known height of the camera, distances were converted into heights, and the top 1 and 5% of heights were compared to ones from a manual single-point LIDAR system. The D415 heights were significantly correlated with the manual heights in both wheat and soybean. The increased dimensionality of depth camera data could increase the accuracy of plot-scale height measurements and has the potential to be used to study canopy structure and changes in greater detail.

This study demonstrates a way to shift canopy height phenotyping from a time-intensive manual effort to a quicker, more detailed method.

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Morrison, M., Gahagan, A.C., & Lefebvre, M.B. (2021). Measuring canopy height in soybean and wheat using a low-cost depth camera. *The Plant Phenome Journal, 4,* e20019. **https://doi.org/10.1002/ppj2.20019**

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