

Figure 2 Flow chart for calculating the azimuth and spacing of maize plants

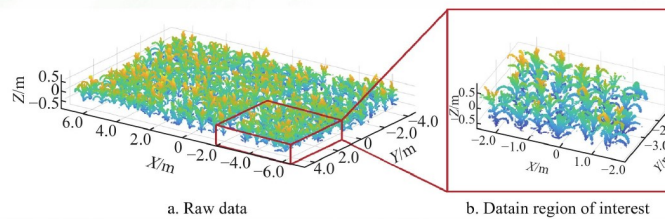


Figure 3 Point cloud data clipped in region of interest from the raw data

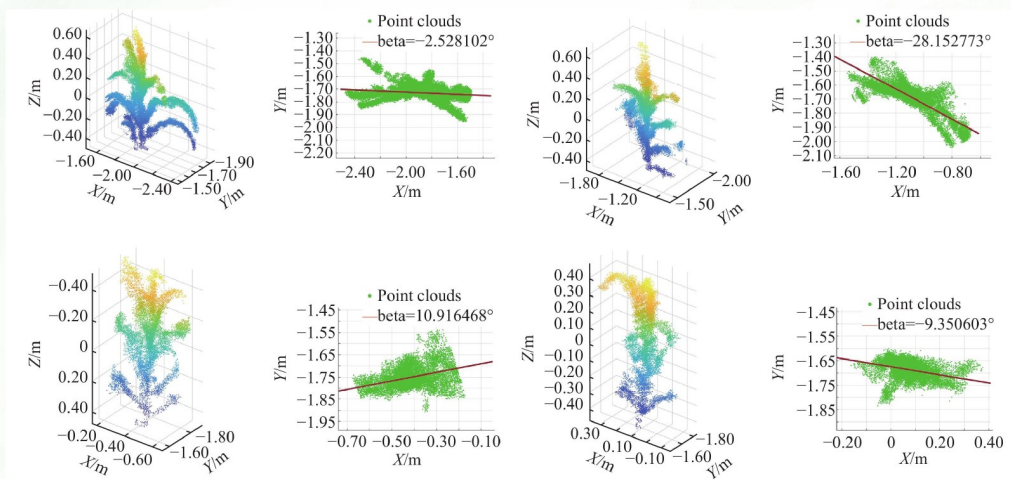


Figure 7 Calculation of maize growth direction angle by PCA

Wang J P, Xu L, Mei S, Hu H R, Zhou J L, Chen Q. Fast and accurate detection of kiwifruits in the natural environment using improved YOLOv4. *Int J Agric & Biol Eng*, 2024; 17(5): 222–230.

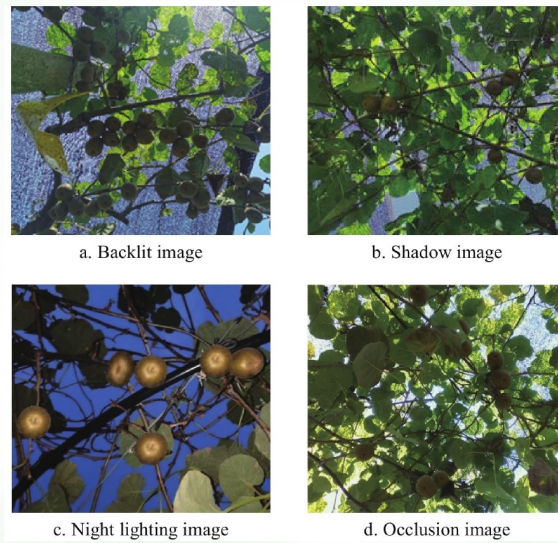
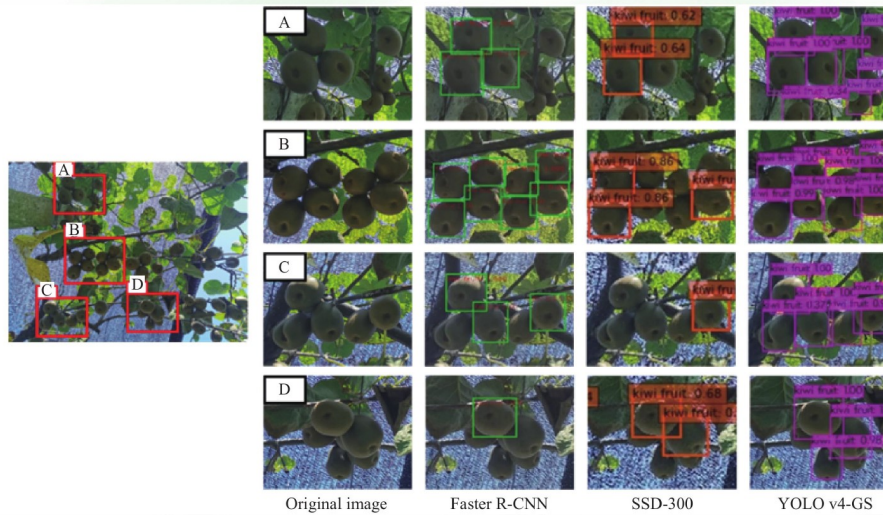
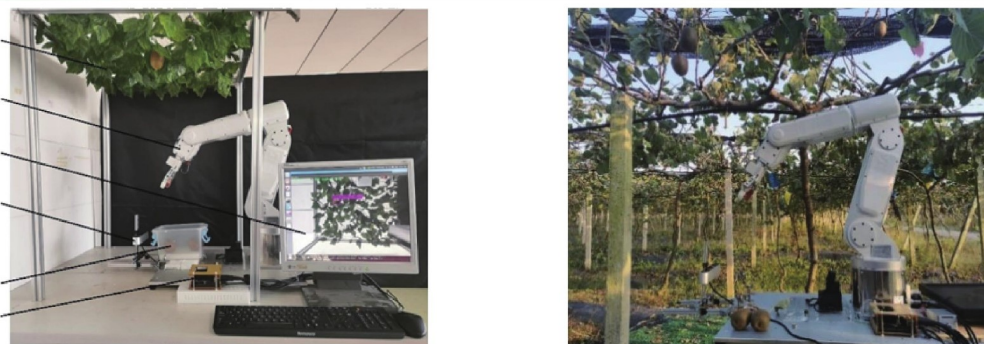


Figure 1 Kiwifruit image examples in natural environments



Note: Label “A” represents the detection of small target kiwifruits. Labels “B” and “C” represent the detection of dense clusters of kiwifruits. Label “D” represents the detection of obscured kiwifruits.

Figure 8 Detection results of the three models



Note: 1. Indoor kiwifruits scaffolding;
 2. S6H4D_Plus six-axis manipulator;
 3. Identification interface;
 4. ZED binocular stereo camera;
 5. Collection box; 6. Jetson Xavier NX system
 a. Indoor picking experiment

b. Orchard picking experiment

Figure 9 Experiments of picking kiwifruits