TFB15103

TS Vision3D

Introduction to Robot Image Recognition Software

Robot Engineering Department, Control Division,

TOSHIBA MACHINE CO., LTD.

3D Image Recognition Software *TSVision3D*

TOSHIBA MACHINE
Best Partner of Leading Industries

Software package that facilitates use of high-end 3D image recognition technology.
Strong support of “automated bin picking” using robot and 3D image recognition

Easy setup

- Easy model registration:
  3D-CAD data not required!
- Easy calibration and box detection function
  (Box size and height are automatically detected.)

Error prevention

- “Box interference avoidance function” that prevents interference with box
- Arm motion reach check function

Improved recognition rate

- Multiple-model registration and detection function
- Mask function

TSVision3D

Robot Image Recognition Software

SYSTEM CONFIGURATION

System Configuration

TOSHIBA MACHINE
Best Partner of Leading Industries

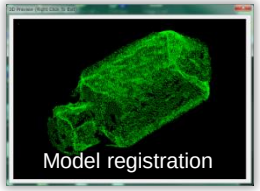
Stereo vision system

3D image acquisition → Lens distortion correction Calibrated camera → Disparity calculation (height information)

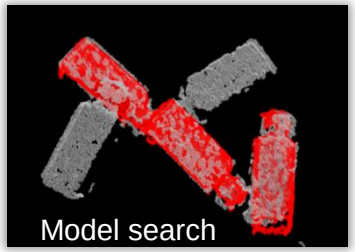
TSVision3D

Initial setting

Coordinate system calibration → Model registration

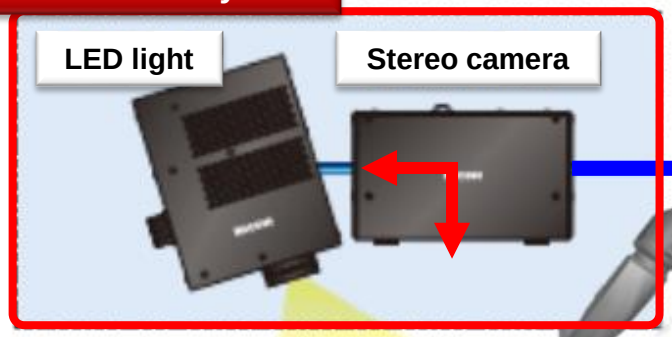


Model search → **Filtering** Box interference & motion reach check → Data transmission → Picking operation



Robot control

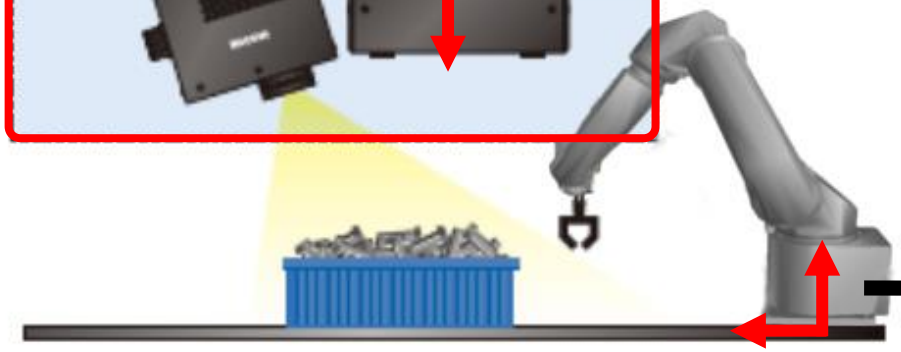
Stereovision system



Ethernet Hub

GigE

GigE



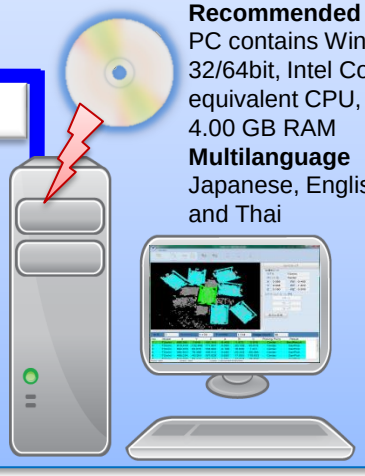
robot program for Picking

Robot controller

TSVision3D

Recommended PC spec
PC contains Windows7 32/64bit, Intel Corei5-equivalent CPU, and 4.00 GB RAM

Multilanguage
Japanese, English, Chinese and Thai

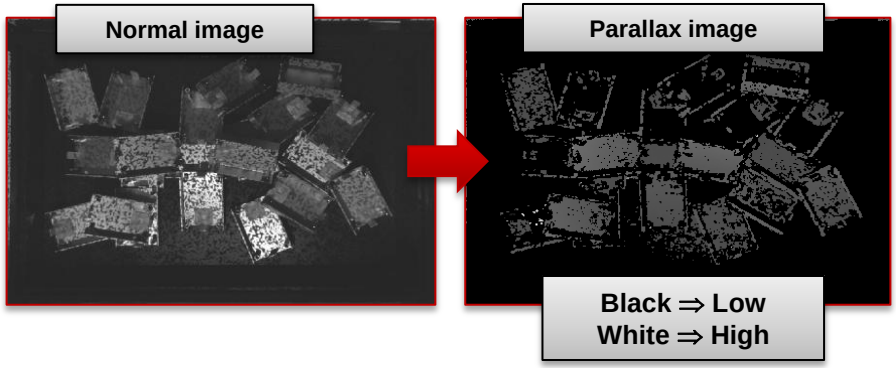


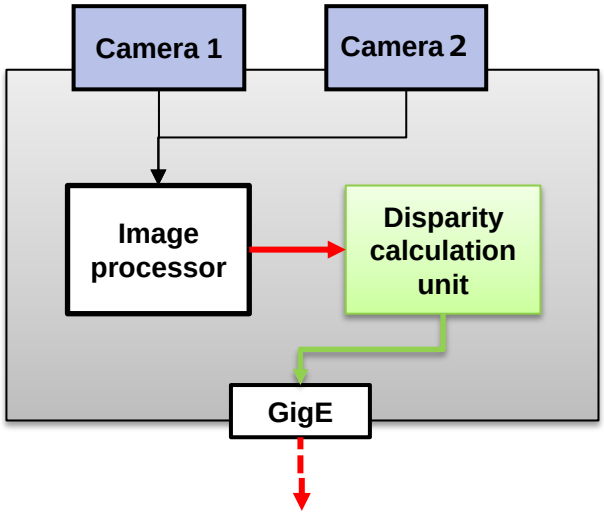
Industrial High-speed Stereo Camera

TOSHIBA MACHINE
Best Partner of Leading Industries

Stereo camera capable of high-speed 3D measurement

- **Stereo camera capable of that enables real-time 3D measurement**
  - **Capturing, image processing and parallax operation are performed inside the camera.**
    ⇒ Continuous high-speed 3D measurement is possible
    ⇒ 30 fps (30 times per second)



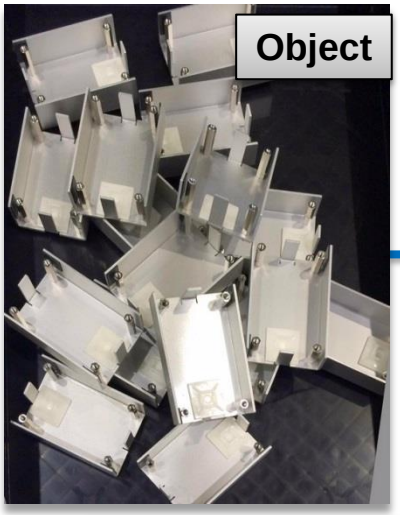


- **Stereo camera that is high-speed, highly accurate and easy to use**
  - **Accuracy (at measurement height of 1 m): ±1 mm**
  - **Measurement field: 500 mm × 400 mm**
  - **work pieces distance: 800 mm to 1200 mm**
  - **Calibrated camera**
  - **Lightweight, compact: 232 (W) × 40 (H) × 140 (D) mm, 1140 g**

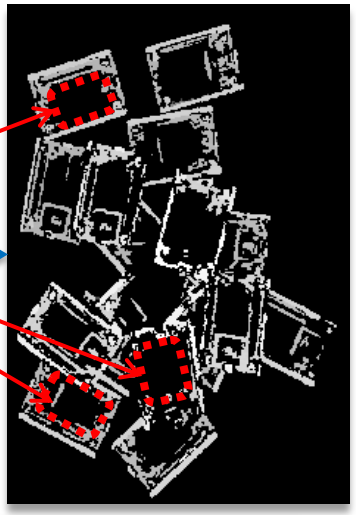
TS Vision3D

Improved object recognition accuracy based on random pattern projection system

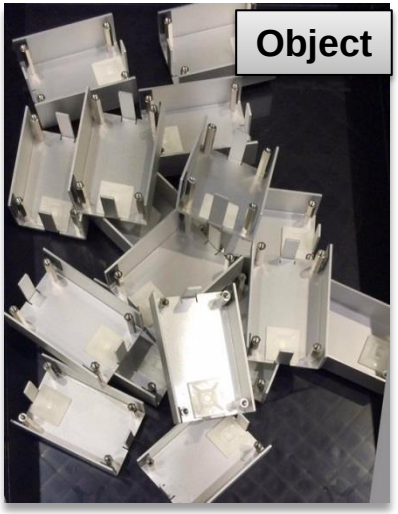
TOSHIBA MACHINE
Best Partner of Leading Industries



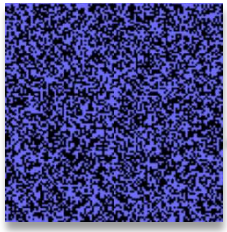
Under normal lighting, only outline shape can be acquired.
(Surface information cannot be acquired.)



An optimum random pattern is projected to acquire surface data of the object.



+



Blue random pattern radiation

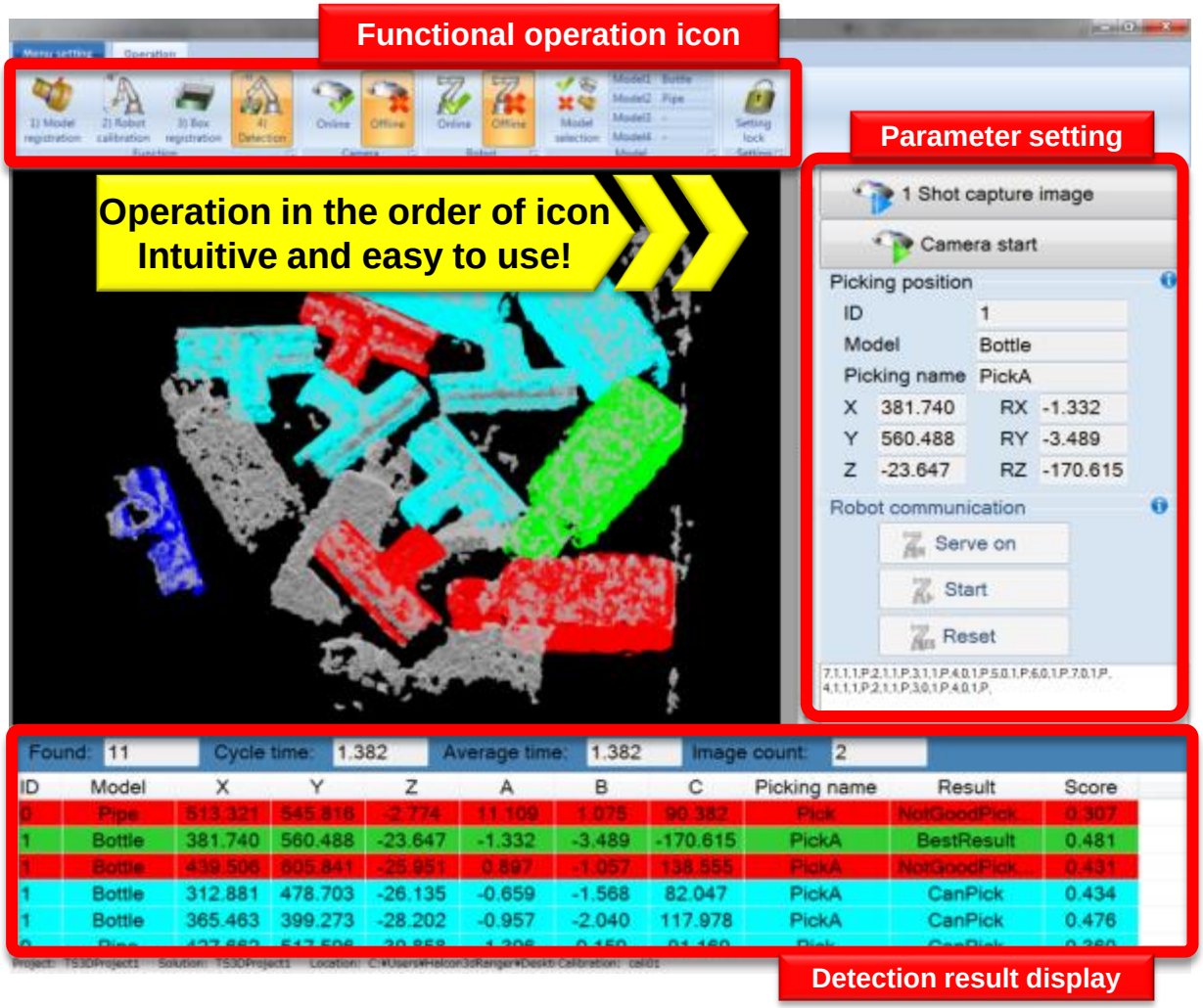
Improved object position and orientation detection accuracy

TSVision3D

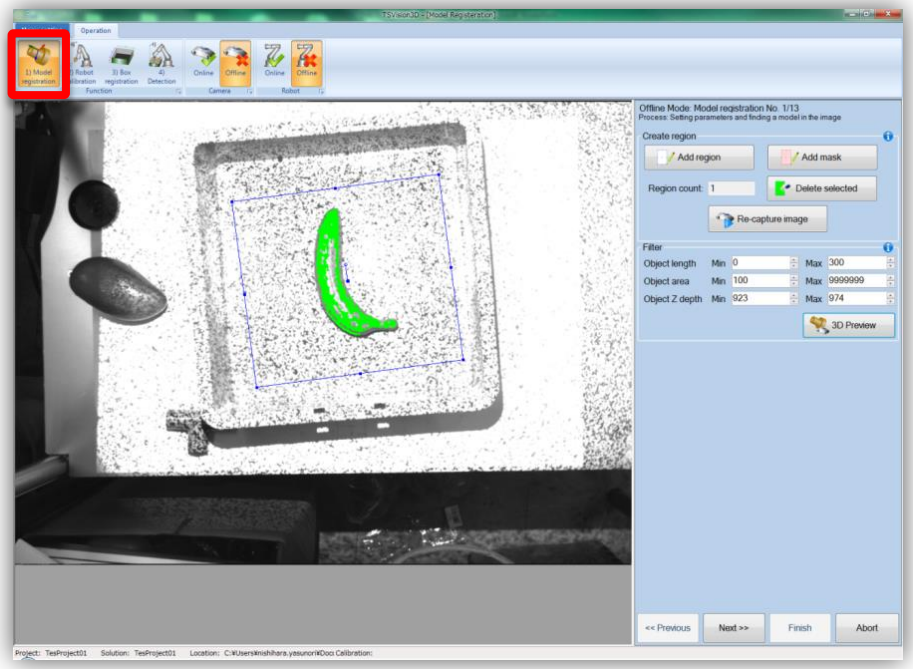
Robot Image Recognition Software

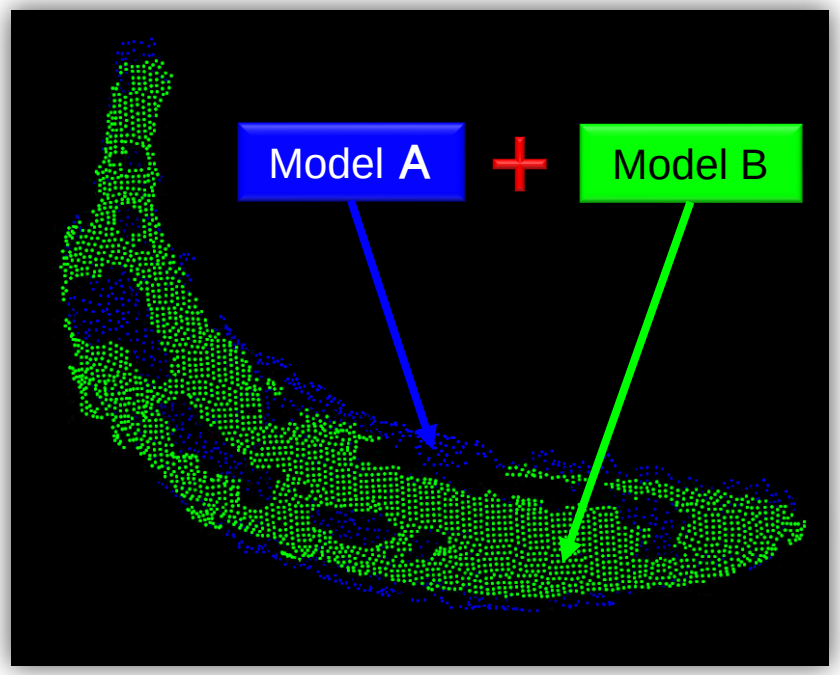
DESCRIPTION OF SOFTWARE FUNCTION

Intuitive operation. Support of bin picking by robot



No CAD data required. Easy model registration

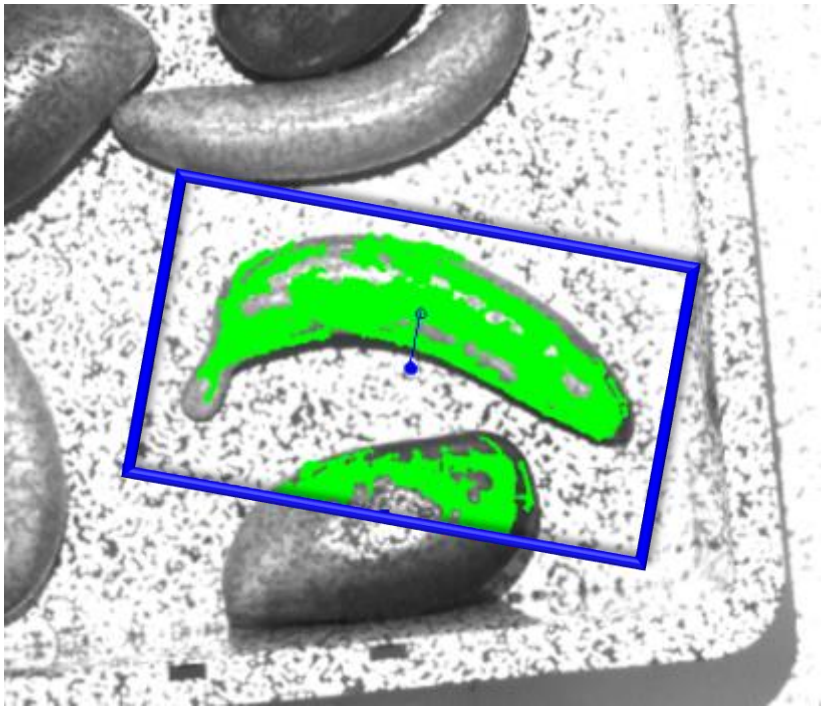


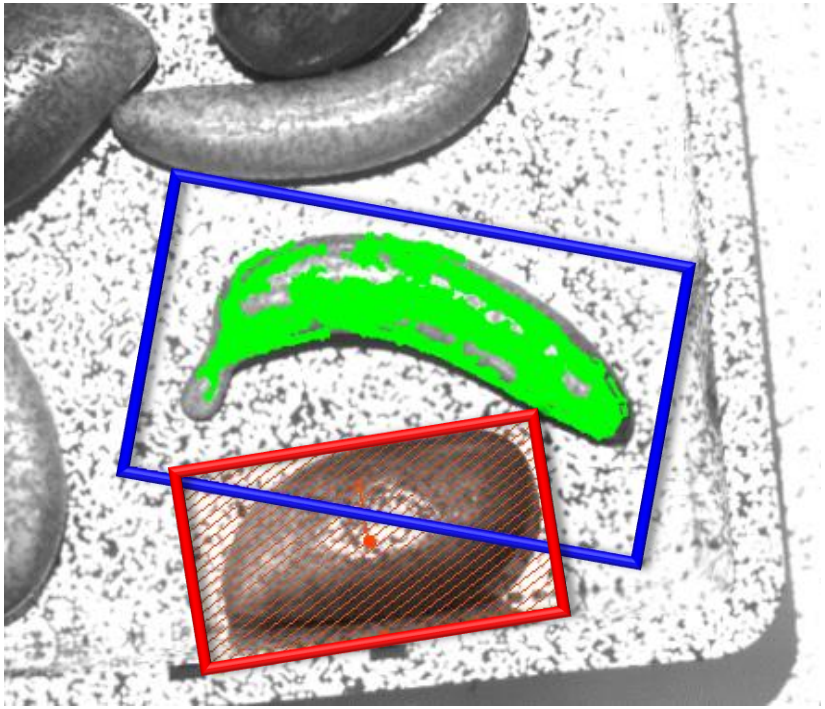


A model is registered by enclosing a sample work piece with mouse.

After capturing the sample work pieces multiple times in different positions and orientations, smooth composite model data is generated automatically.

Model mask function

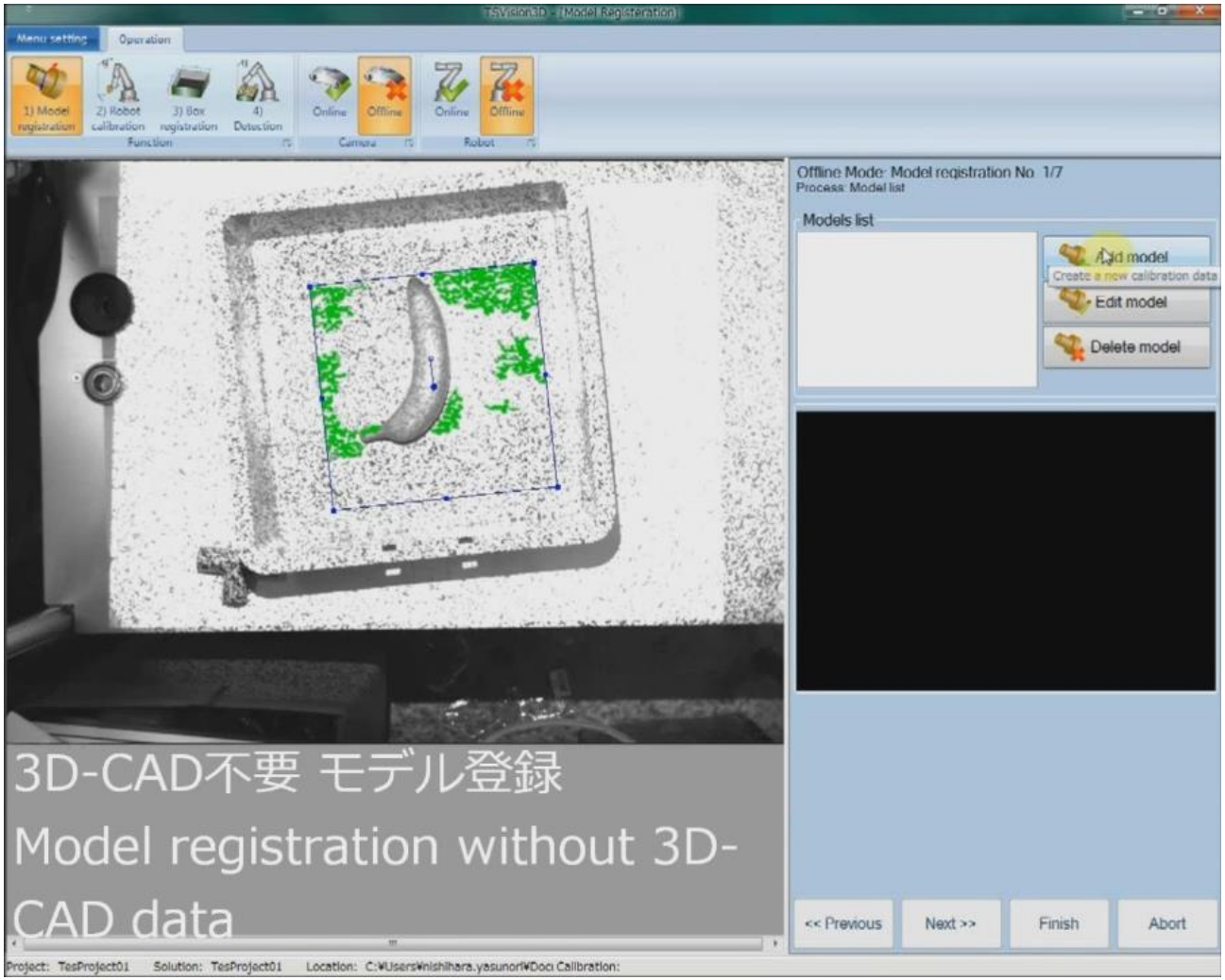




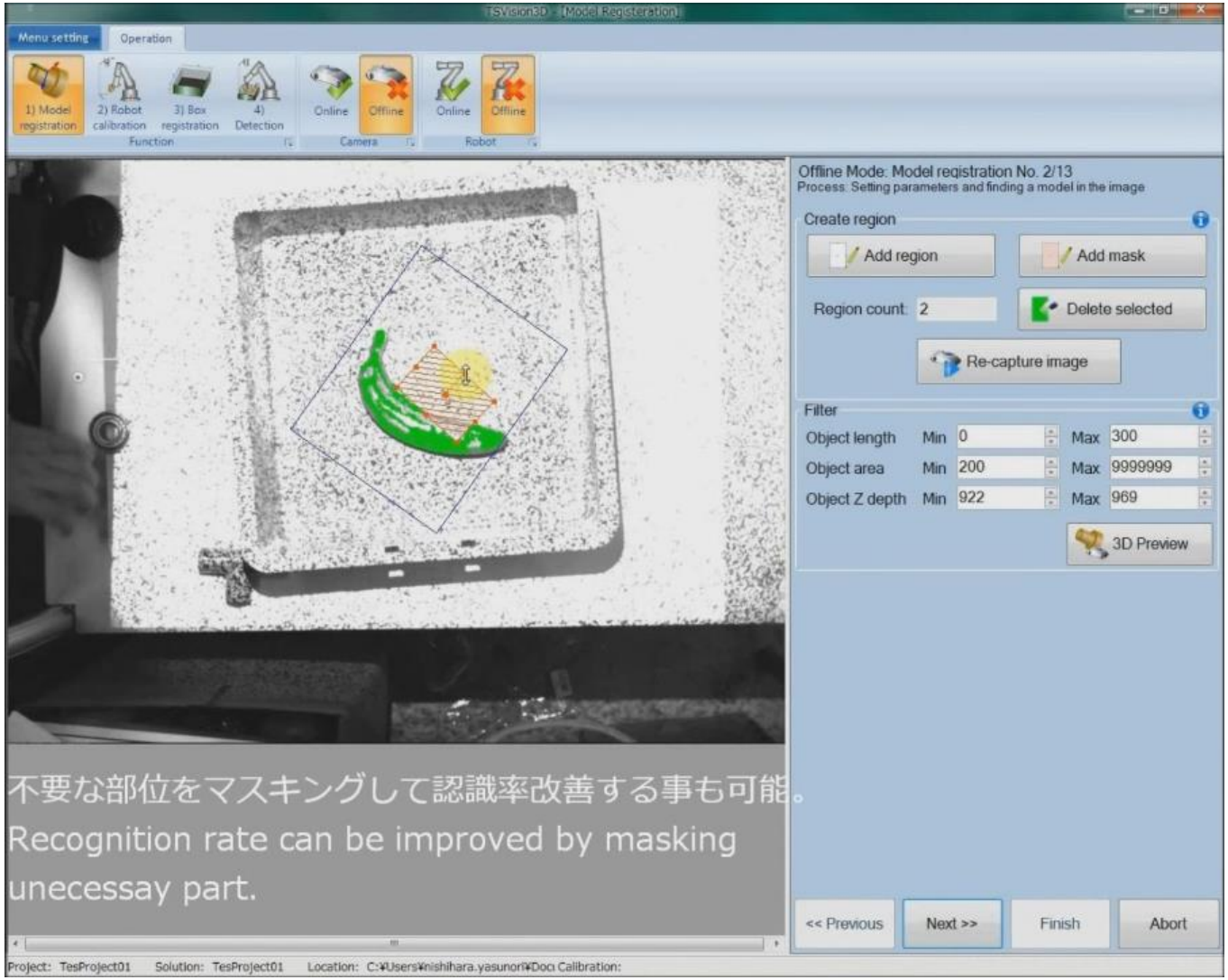
An unnecessary part is excluded from the model.
The area to be inspected can be narrowed down to improve the recognition rate.
(Same usability as 2D vision sensor)

Easy Model Registration

No CAD data required. Easy model registration



Model mask function

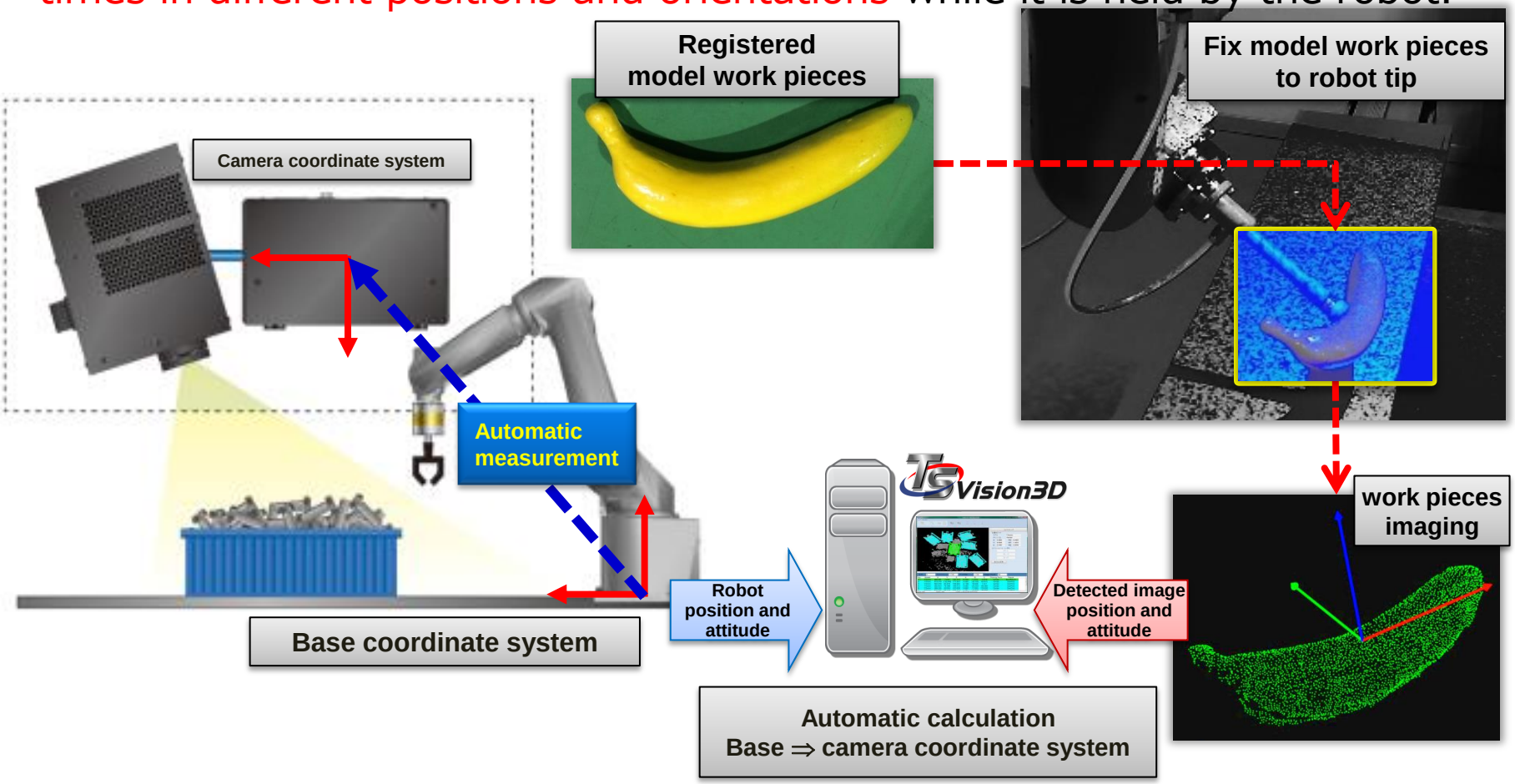


Easy calibration

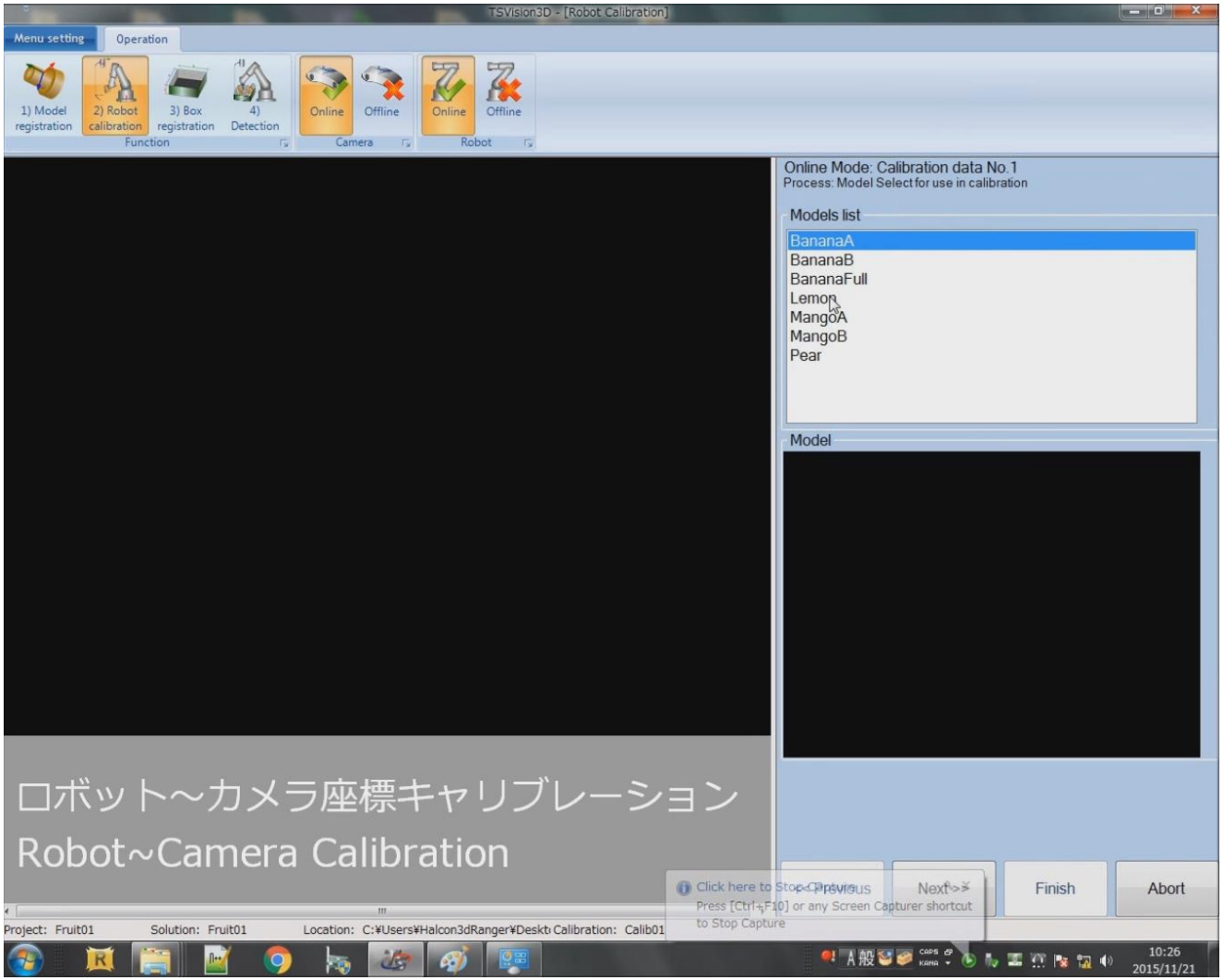
TOSHIBA MACHINE
Best Partner of Leading Industries

Camera and robot coordinate system calibration

The position and orientation of the camera coordinate system in relation to the robot base coordinate system is automatically calculated just by capturing a sample work piece of previously-registered model multiple times in different positions and orientations while it is held by the robot.



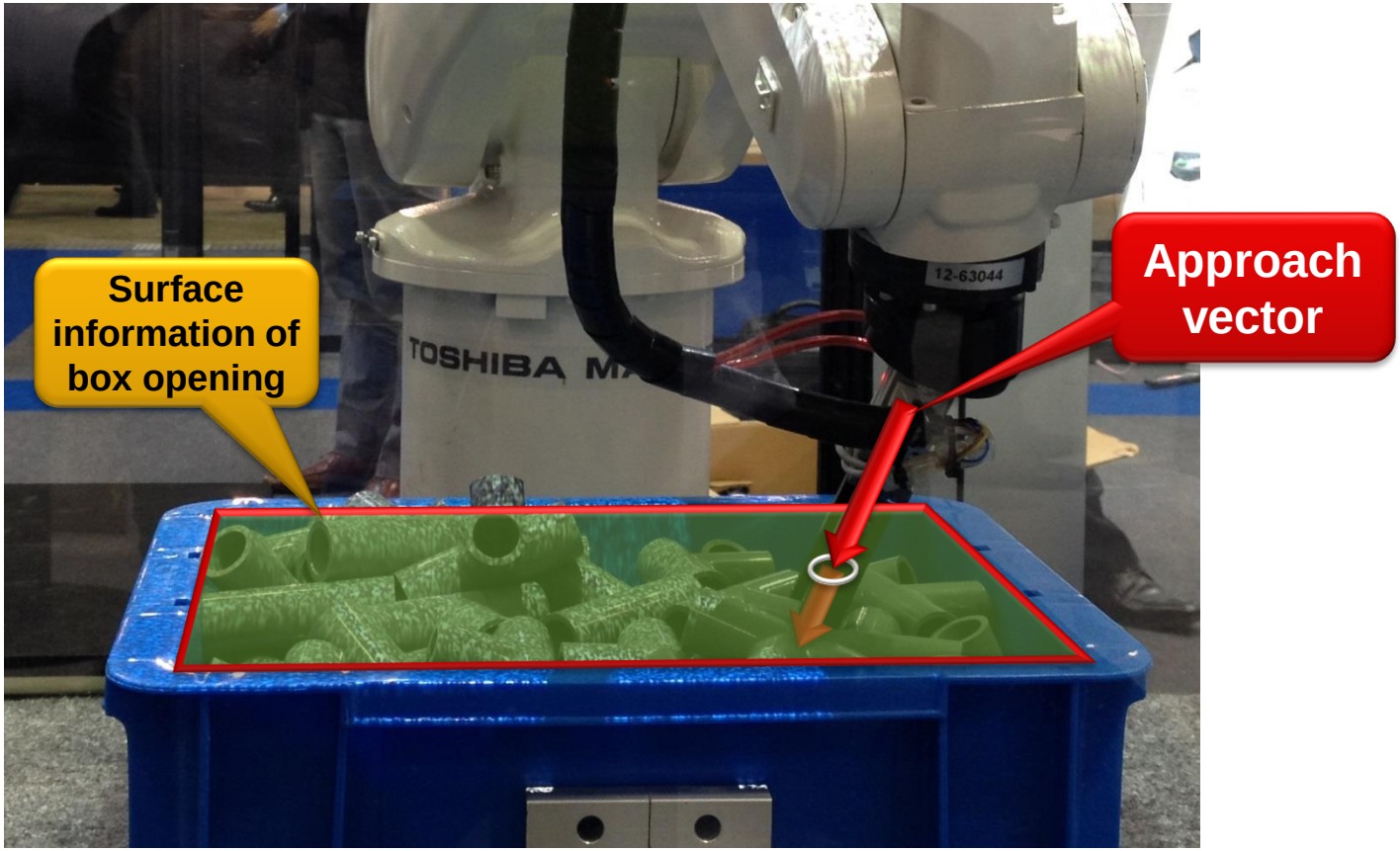
Camera and robot coordinate system calibration



Box Interference Avoidance Function

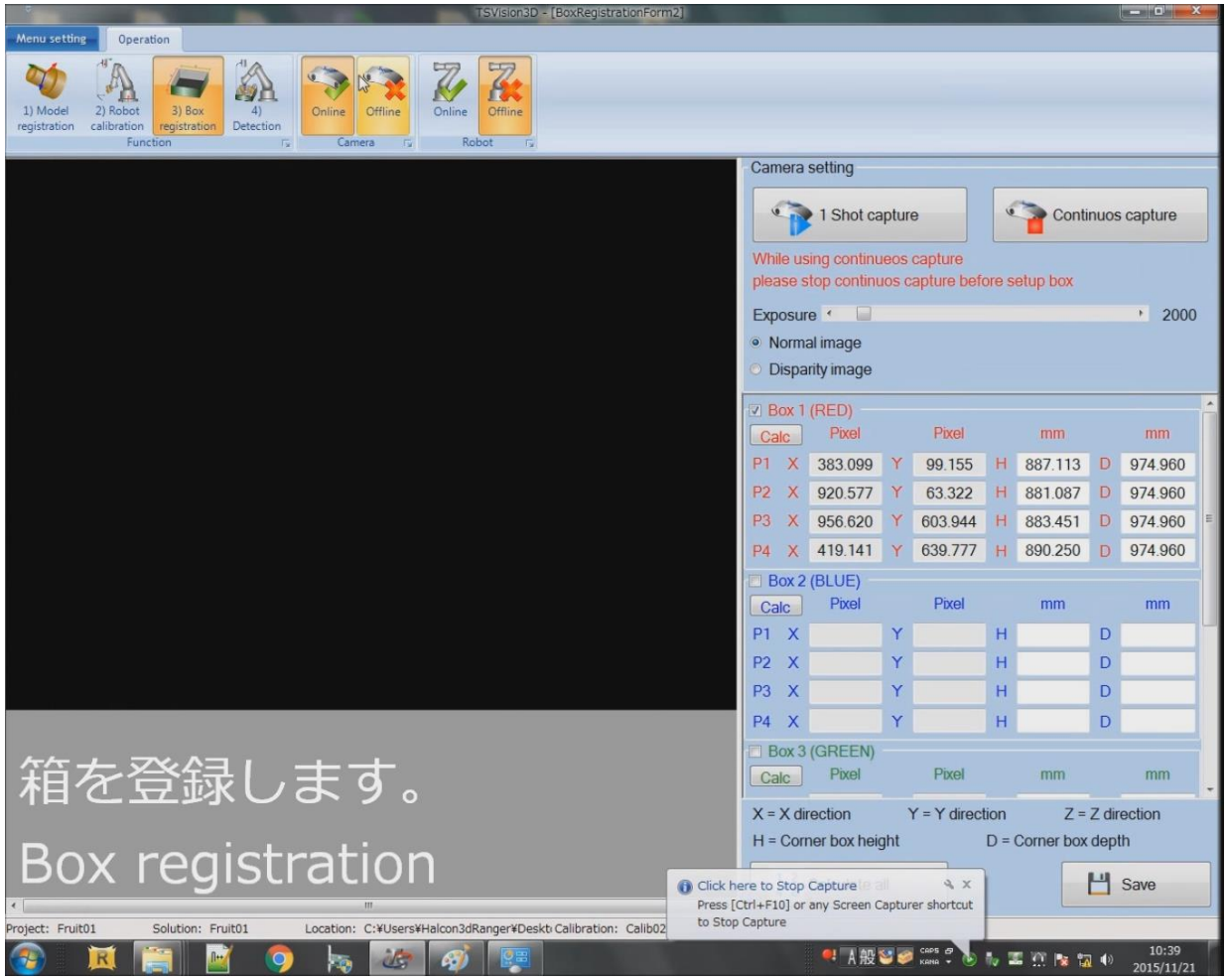
The positional relationship between the box opening and gripper during approach is calculated.

Only work pieces that does not interfere with the box is picked.



Box Interference Avoidance Function

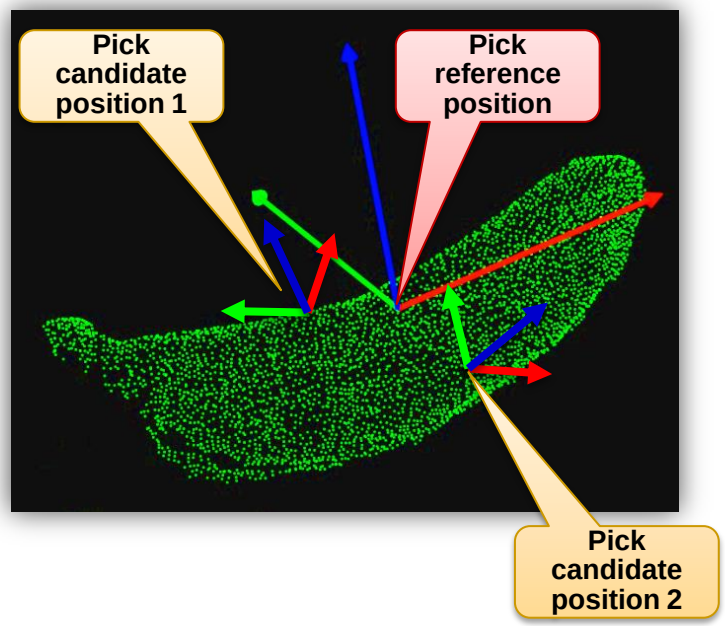
Box position and height ⇒ Measured automatically with box enclosed by the mouse.

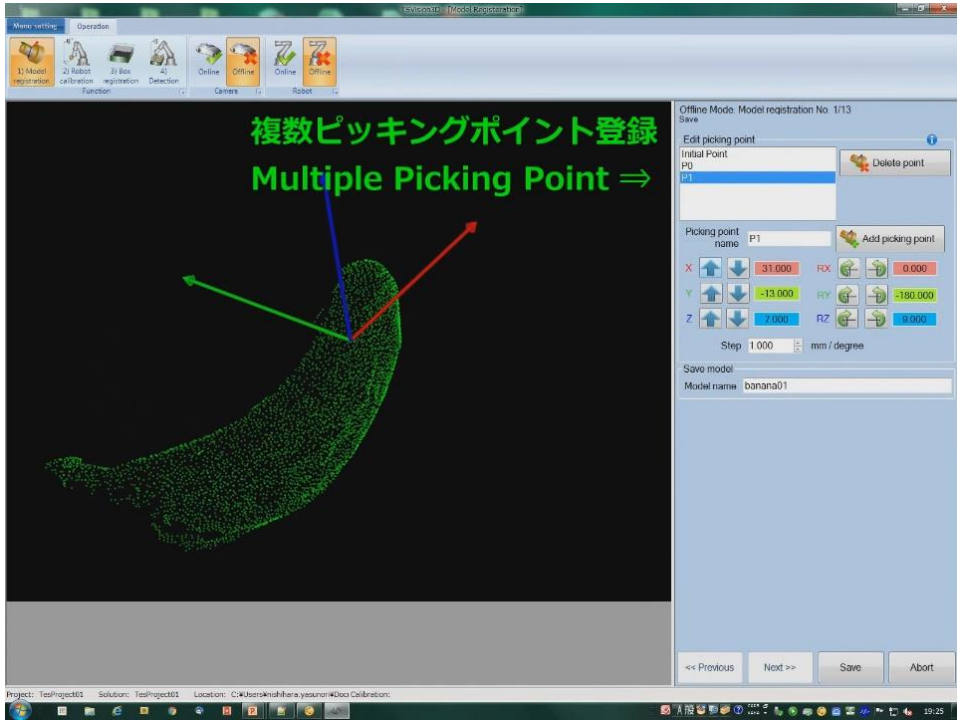


An optimum picking point is selected.

① Arm reach check
② Box interference check

If the above conditions are not satisfied,
other candidate pick position is
Automatically selected.

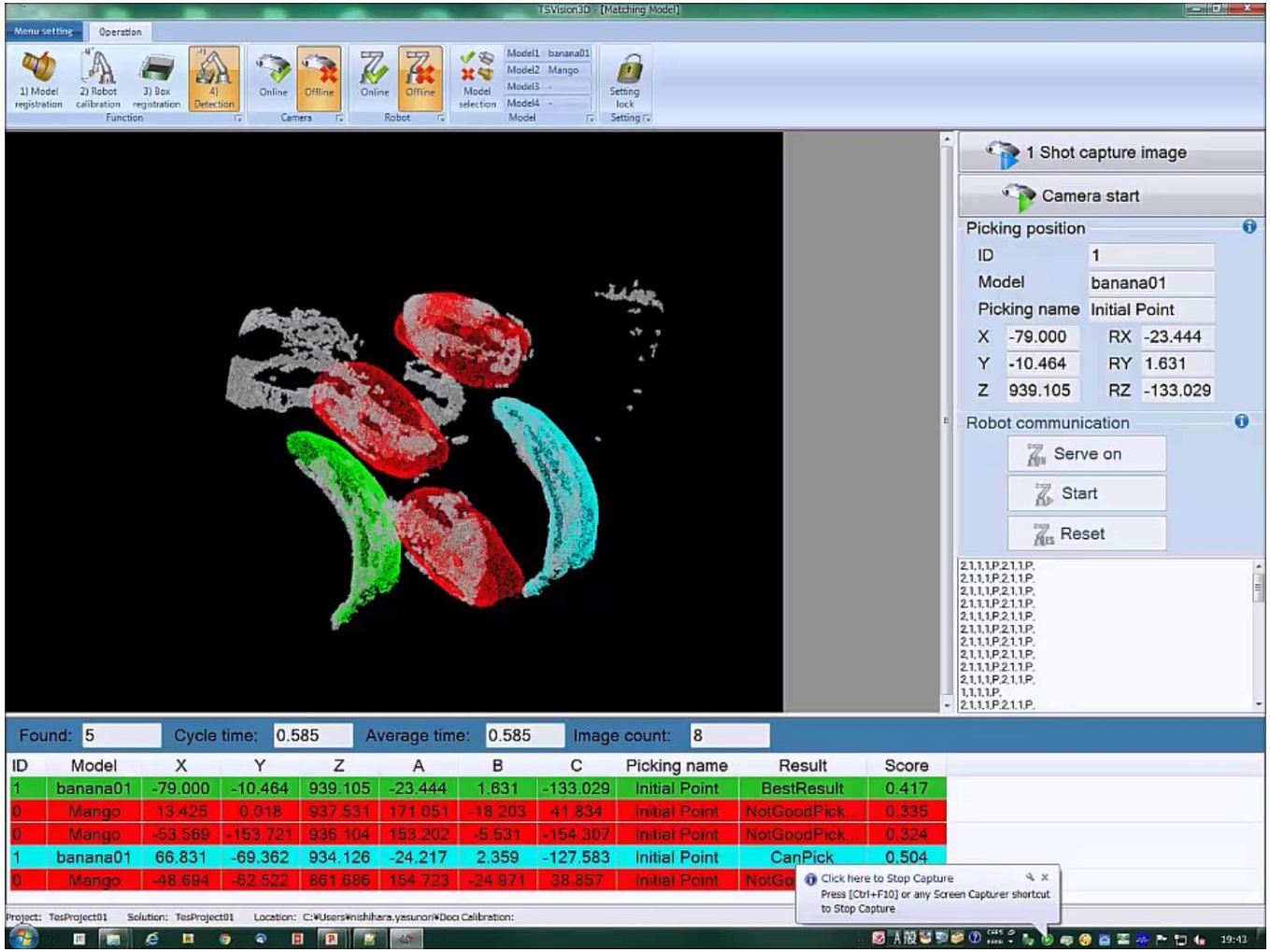




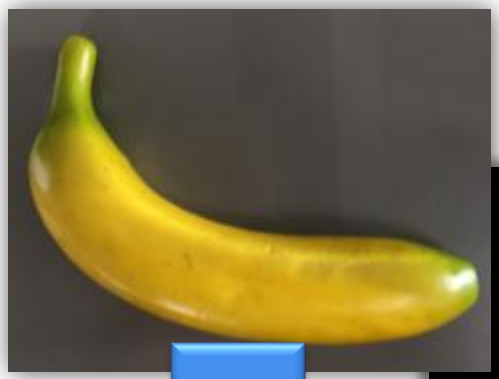
Easy Model Registration

Multiple models can be registered and detected.

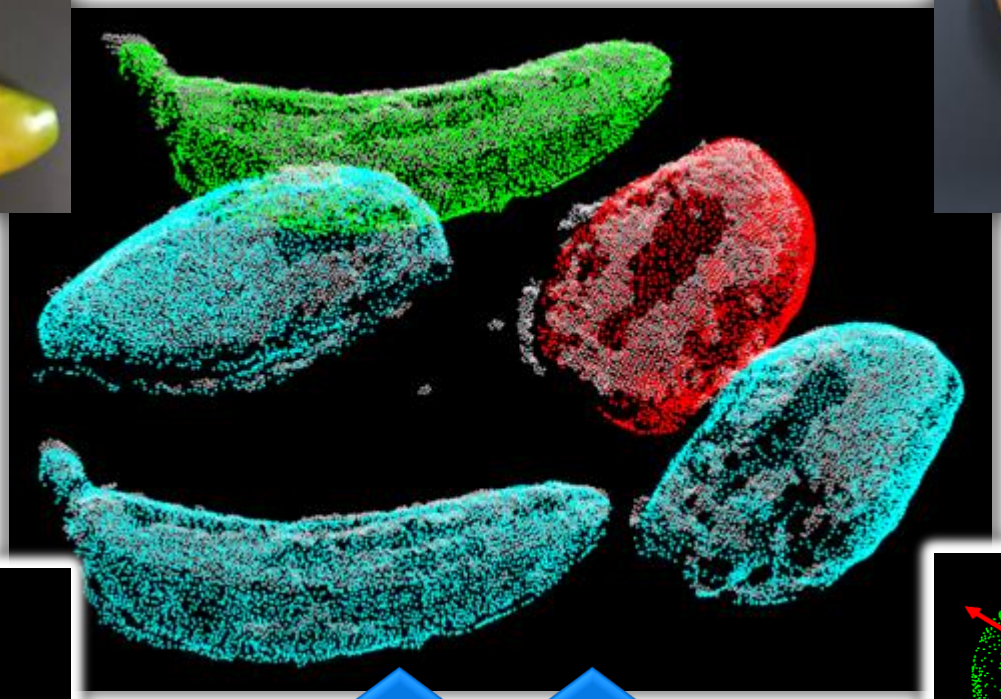
Parameters are also easily adjusted!



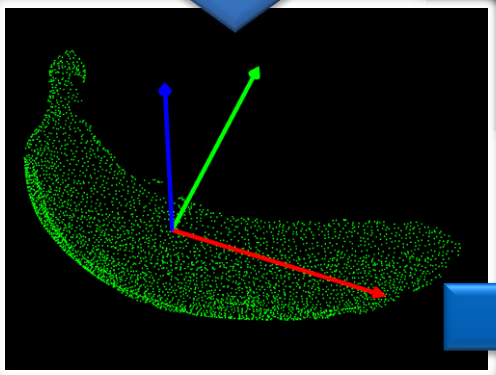
Multiple models can be registered and concurrently detected

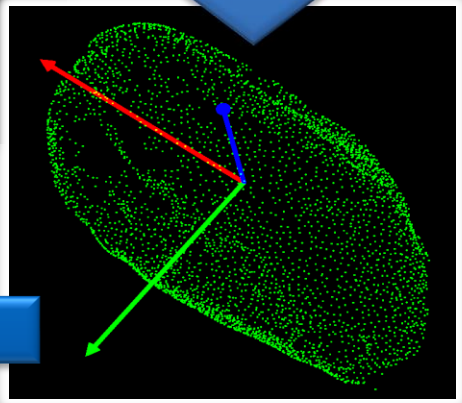


Model ① registration



Model ② registration





Multiple models can be concurrently detected

Future Efforts

Easy to use software

- Easier to use
- Easy to use by any beginners

TSVision3D

Extended Scope of Application

- Accommodation of irregular-size work pieces
- Improvement of reflective work pieces recognition rate
- Interface to connect with other maker's robot

Thank you

In closing,
I thank you very much for your attention.