3D-EasyCalib v2.10.15

Objects

- › Cam0 🗑
- › Cam1 🗑

Add second object
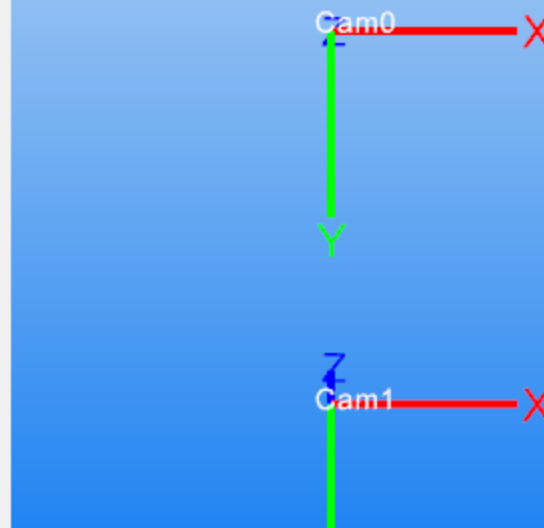
Add Object ①

Scene

Cam0 ——— X

Y

Z
Cam1 ——— X

Camera Calibration

Target-based

Intrinsic

Target Pose PnP

Extrinsic Stereo

Scene-based

Manhattan World

Projector Calibration

Camera-Projector

Robot-Camera Calibration

Hand-Eye

Robot-World

3D-EasyCalib v2.10.15

File   About

Objects

> IDSCam Left   🗑   ②   **Rename objects usefully**

> IDSCam Right   🗑

Add Object

Scene

IDSCam Left — X

IDSCam Right — X

Click on 'Extrinsic Stereo'   ③

zbs

Camera Calibration

Target-based

Intrinsic

Target Pose PnP

Extrinsic Stereo

Scene-based

Manhattan World

Projector Calibration

Camera-Projector

Robot-Camera Calibration

Hand-Eye

Robot-World

Stereo Checker Target Calibration

Select Cameras: Primary / Secondary

IDSCam Left ▾   IDSCam Right ▾

Image List

☐ Mirror x (Kinect)   ☐ Mirror x (Kinect)

Open Files ④   Open Files

2D Targets | 3D Targets | Rectification

Calibration Images

← → ∨ ↑ | 📁 « Tutorials › 2xIDSCam › Left ∨ ↻ | Search Left 🔍

Organize ▾   New folder

- › ⭐ Quick access
- › ☁ OneDrive - Personal
- › 🖥 This PC
- › 🌐 Network

11-49-03-616.png	11-54-49-759.png
11-49-28-887.png	11-54-55-967.png
11-50-15-376.png	11-55-07-071.png
11-50-25-672.png	11-55-11-307.png
11-50-49-319.png	11-55-15-367.png
11-51-17-271.png	11-55-19-712.png
11-51-39-863.png	11-55-23-751.png
11-52-34-775.png	11-55-38-791.png
11-52-44-800.png	11-55-48-583.png
11-52-55-747.png	11-55-55-967.png
11-54-41-753.png	11-55-58-616.png
11-54-46-455.png	11-56-02-775.png

File name: "11-56-02-775.png" "11-49-03-616.png" ∨ | Image Files (*.png *.jpg *.tif *.b ∨

Open   Cancel

Calibration | Rectification

Chessboard Detection

Inner corners   9 ↕   8 ↕

Square size [mm]   50   50

☐ Radon Chessboard Detection

Subpixel Corner Refinment

Win size   10 ↕ %

Zero zone [px]   1   1

Calibration Options

Primary intr. | Secondary intr.

☐ Use intrinsic guess
☐ Fix intrinsics
☐ Fix focal length fx,fy
☐ Fix principal point (cx,cy)
☑ Fix aspect ratio fx/fy
☑ Radial Distortion
  ☐ Fix k1   ☐ Fix k2   ☑ Fix k3
  ☐ Rational model
☐ Tangential distortion p1, p2

☐ Equal focal lengths f1=f2

Termination Criteria for Optimization

Max iterations   100

Epsilon [px]   0.001

Calibrate Stereo

☐ Remove Outliers

Reproj Err Primary >   5.00 px
Reproj Err Secondary >   5.00 px
Epipolar Err >   5.00 px

---

④ **Load first series of images from folder 'Tutorials/2xIDSCam/Left'**

Stereo Checker Target Calibration

Select Cameras: Primary / Secondary

IDSCam Left   IDSCam Right

Image List

- ☑ 11-49-03-616.png
- ☑ 11-49-28-887.png
- ☑ 11-50-15-376.png
- ☑ 11-50-25-672.png
- ☑ 11-50-49-319.png
- ☑ 11-51-17-271.png
- ☑ 11-51-39-863.png
- ☑ 11-52-34-775.png
- ☑ 11-52-44-800.png
- ☑ 11-52-55-747.png
- ☑ 11-54-41-753.png
- ☑ 11-54-46-455.png
- ☑ 11-54-49-759.png
- ☑ 11-54-55-967.png
- ☑ 11-55-07-071.png
- ☑ 11-55-11-307.png
- ☑ 11-55-15-367.png
- ☑ 11-55-19-712.png
- ☑ 11-55-23-751.png
- ☑ 11-55-38-791.png
- ☑ 11-55-48-583.png
- ☑ 11-55-55-967.png
- ☑ 11-55-58-646.png
- ☑ 11-56-02-775.png

2D Targets   3D Targets   Rectification

Calibration Images

« Tutorials > 2xIDSCam > Right

Search Right

Organize ▼   New folder

- Quick access
- OneDrive - Personal
- This PC
- Network

📄 11-49-03-616.png	📄 11-54-49-759.png
📄 11-49-28-887.png	📄 11-54-55-967.png
📄 11-50-15-376.png	📄 11-55-07-071.png
📄 11-50-25-672.png	📄 11-55-11-307.png
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📄 11-51-39-863.png	📄 11-55-23-751.png
📄 11-52-34-775.png	📄 11-55-38-791.png
📄 11-52-44-800.png	📄 11-55-48-583.png
📄 11-52-55-747.png	📄 11-55-55-967.png
📄 11-54-41-753.png	📄 11-55-58-646.png
📄 11-54-46-455.png	📄 11-56-02-775.png

File name: "11-56-02-775.png" "11-49-03-616.png"   Image Files (*.png *.jpg *.tif *.b

[Open]   [Cancel]

☐ Mirror x (Kinect)   ☐ Mirror x (Kinect)

[Open Files]   [Open Files]
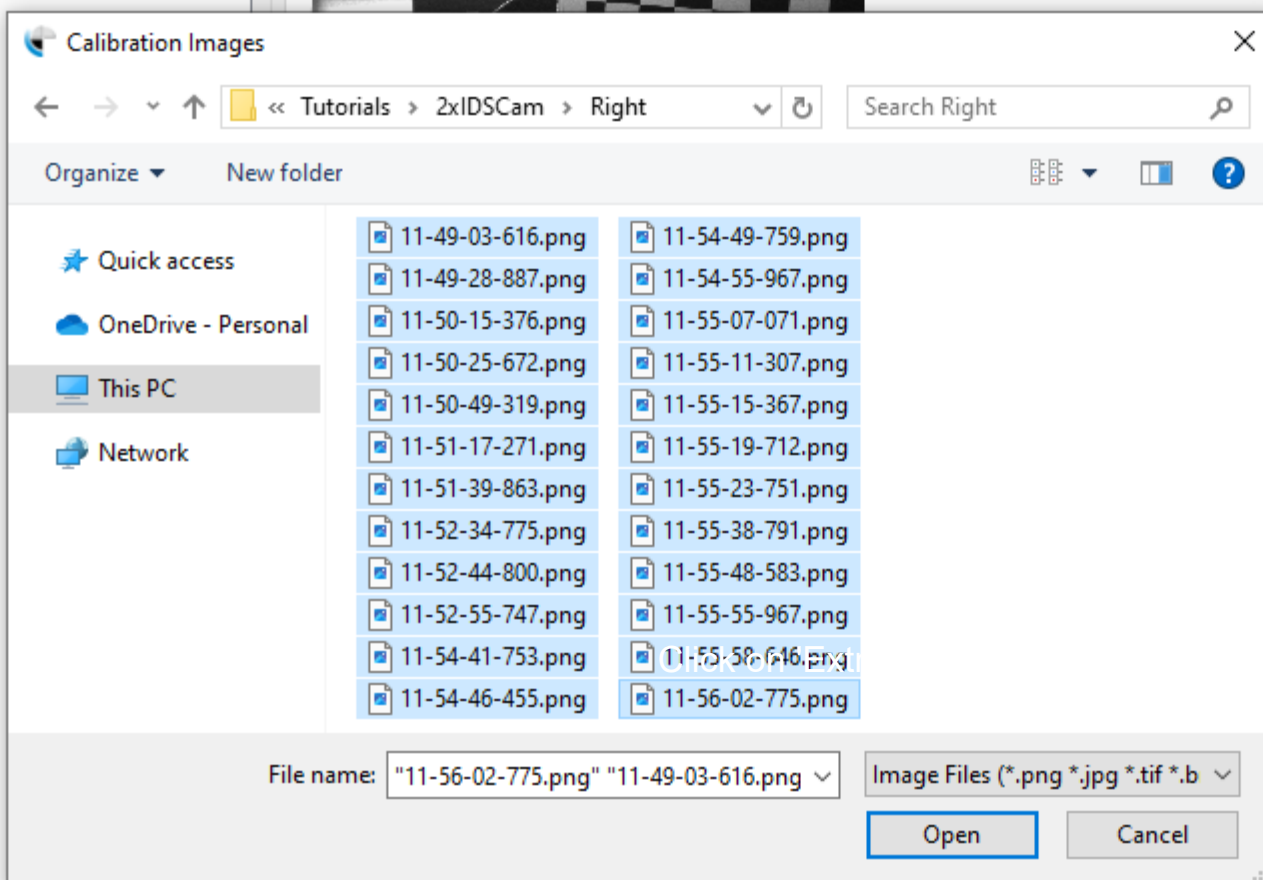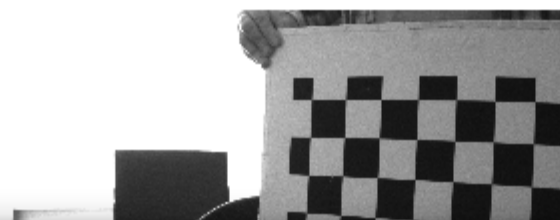
(5) Load second series of images from folder 'Tutorials/2xIDSCam/Right'

Calibration | Rectification

Chessboard Detection

Inner corners   9   8

Square size [mm]   50   50

☐ Radon Chessboard Detection

Subpixel Corner Refinement

Win size   10   %

Zero zone [px]   1   1

Calibration Options

Primary intr.   Secondary intr.

- ☐ Use intrinsic guess
- ☐ Fix intrinsics
- ☐ Fix focal length fx,fy
- ☐ Fix principal point (cx,cy)
- ☑ Fix aspect ratio fx/fy
- ☑ Radial Distortion
  - ☐ Fix k1   ☐ Fix k2   ☑ Fix k3
  - ☐ Rational model
- ☐ Tangential distortion p1, p2

☐ Equal focal lengths f1=f2

Termination Criteria for Optimization

Max iterations   100

Epsilon [px]   0.001

[Calibrate Stereo]

☐ Remove Outliers

Reproj Err Primary >   5.00   px

Reproj Err Secondary >   5.00   px

Epipolar Err >   5.00   px

Stereo Checker Target Calibration — □ ✕

Select Cameras: Primary / Secondary

| IDSCam Left ▼ | IDSCam Right ▼ |

Image List

☑ 11-49-03-616.png	☑ 11-49-03-616.png
☑ 11-49-28-887.png	☑ 11-49-28-887.png
☑ 11-50-15-376.png	☑ 11-50-15-376.png
☑ 11-50-25-672.png	☑ 11-50-25-672.png
☑ 11-50-49-319.png	☑ 11-50-49-319.png
☑ 11-51-17-271.png	☑ 11-51-17-271.png
☑ 11-51-39-863.png	☑ 11-51-39-863.png
☑ 11-52-34-775.png	☑ 11-52-34-775.png
☑ 11-52-44-800.png	☑ 11-52-44-800.png
☑ 11-52-55-747.png	☑ 11-52-55-747.png
☑ 11-54-41-753.png	☑ 11-54-41-753.png
☑ 11-54-46-455.png	☑ 11-54-46-455.png
☑ 11-54-49-759.png	☑ 11-54-49-759.png
☑ 11-54-55-967.png	☑ 11-54-55-967.png
☑ 11-55-07-071.png	☑ 11-55-07-071.png
☑ 11-55-11-307.png	☑ 11-55-11-307.png
☑ 11-55-15-367.png	☑ 11-55-15-367.png
☑ 11-55-19-712.png	☑ 11-55-19-712.png
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☑ 11-55-48-583.png	☑ 11-55-48-583.png
☑ 11-55-55-967.png	☑ 11-55-55-967.png
☑ 11-55-58-646.png	☑ 11-55-58-646.png
☑ 11-56-02-775.png	☑ 11-56-02-775.png

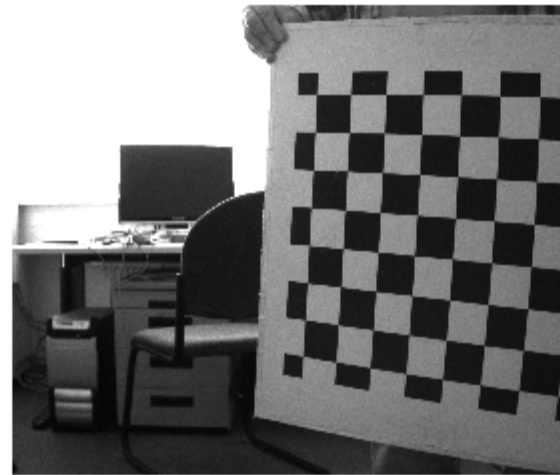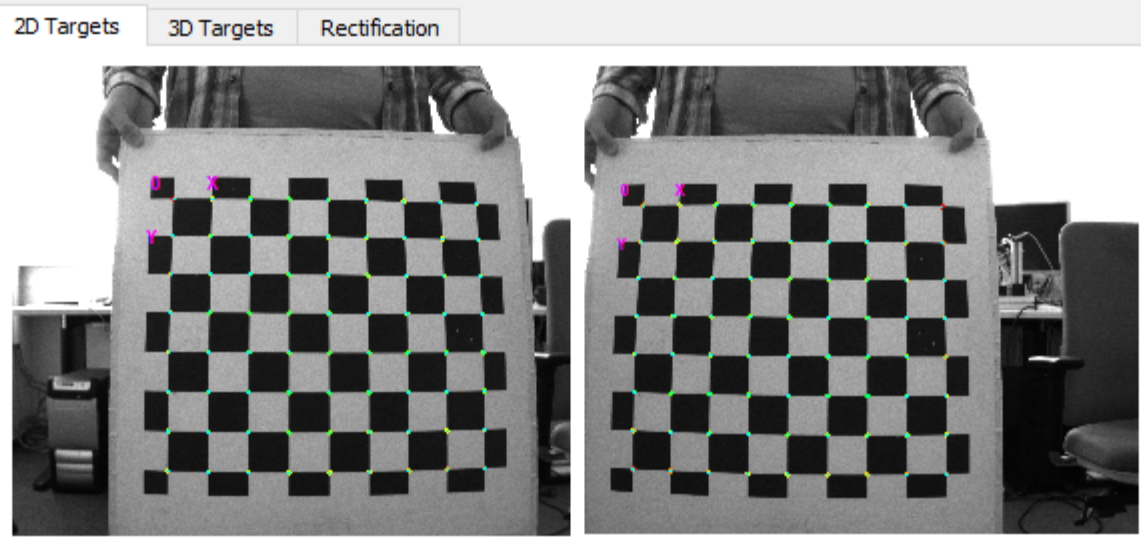☐ Mirror x (Kinect)   ☐ Mirror x (Kinect)

Open Files   Open Files

2D Targets   3D Targets   Rectification

(x=714.28, y=966.85)   (x=447.27, y=113.28)

Set target parameters

Calibration   Rectification

Chessboard Detection

Inner corners   9 ⬍   8 ⬍

Square size [mm]   50   50

☐ Radon Chessboard Detection

Subpixel Corner Refinment

Win size   10 ⬍ %

Zero zone [px]   1   1

Calibration Options

Primary intr.   Secondary intr.

☐ Use intrinsic guess
☐ Fix intrinsics
☐ Fix focal length fx,fy
☐ Fix principal point (cx,cy)
☑ Fix aspect ratio fx/fy
  ☑ Radial Distortion
    ☐ Fix k1   ☐ Fix k2   ☑ Fix k3
    ☐ Rational model
☐ Tangential distortion p1, p2

☐ Equal focal lengths f1=f2

Termination Criteria for Optimization

Max iterations   100

Epsilon [px]   0.001

⑥

Press 'Calibrate Stereo'   ⑦

Calibrate Stereo

☐ Remove Outliers

Reproj Err Primary >   5.00   px
Reproj Err Secondary >   5.00   px
Epipolar Err >   5.00   px

Stereo Checker Target Calibration

Select Cameras: Primary / Secondary

IDSCam Left | IDSCam Right

Image List

☐ 11-49-03-616.png	☐ 11-49-03-616.png
☑ 11-49-28-887.png	☑ 11-49-28-887.png
☑ 11-50-15-376.png	☑ 11-50-15-376.png
☑ 11-50-25-672.png	☑ 11-50-25-672.png
☑ 11-50-49-319.png	☑ 11-50-49-319.png
☑ 11-51-17-271.png	☑ 11-51-17-271.png
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☑ 11-52-34-775.png	☑ 11-52-34-775.png
☑ 11-52-44-800.png	☑ 11-52-44-800.png
☑ 11-52-55-747.png	☑ 11-52-55-747.png
☑ 11-54-41-753.png	☑ 11-54-41-753.png
☑ 11-54-46-455.png	☑ 11-54-46-455.png
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☑ 11-54-55-967.png	☑ 11-54-55-967.png
☑ 11-55-07-071.png	☑ 11-55-07-071.png
☑ 11-55-11-307.png	☑ 11-55-11-307.png
☑ 11-55-15-367.png	☑ 11-55-15-367.png
☑ 11-55-19-712.png	☑ 11-55-19-712.png
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☑ 11-55-55-967.png	☑ 11-55-55-967.png
☑ 11-55-58-646.png	☑ 11-55-58-646.png
☑ 11-56-02-775.png	☑ 11-56-02-775.png

☐ Mirror x (Kinect) | ☐ Mirror x (Kinect)

Open Files | Open Files

2D Targets | 3D Targets | Rectification

(9) Select a dark red image with outliers

Reprojection Error
RMS: 1.3366 px   Min: 0.0903 px   Max: 3.2122 px

Reprojection Error
RMS: 1.2637 px   Min: 0.1192 px   Max: 2.5002 px

Epipolar Error
RMS: 0.3923 px   Min: 0.0009 px   Max: 1.2440 px

Calibration | Rectification

Chessboard Detection
Inner corners 9   8
Square size [mm] 50   50

☐ Radon Chessboard Detection

Subpixel Corner Refinment
Win size 10 %
Zero zone [px] 1   1

Calibration Options

Primary intr. | Secondary intr.

☐ Use intrinsic guess
☐ Fix intrinsics
☐ Fix focal length fx,fy
☐ Fix principal point (cx,cy)
☑ Fix aspect ratio fx/fy
☑ Radial Distortion
  ☐ Fix k1 ☐ Fix k2 ☑ Fix k3
☐ Rational model

☐ Tangential distortion p1, p2

☐ Equal focal lengths f1=f2

Termination Criteria for Optimization

Max iterations 100
Epsilon [px] 0.001

Calibrate

☐ Remove Outliers

Reproj Err Primary > 5.00 px
Reproj Err Secondary > 5.00 px
Epipolar Err > 5.00 px

Detecting chessboards:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Calibration in progress ...
Calibration completed with rms reprojection error: 0.922631
Extrinsics: IDSCam Left wrt IDSCam Right
tx -139.0784
ty -0.3685
tz 5.4576
R
0.9998 -0.0004 0.0203
0.0003 1.0000 0.0070
-0.0203 -0.0070 0.9998
Stereo parameters saved to C:/Sonst/EasyCalib/Tutorials/2xIDSCam/Left/IDSCam Left_IDSCam Right_stereo.yml

(8) Calibration is complete

Stereo Checker Target Calibration

Select Cameras: Primary / Secondary

IDSCam Left   IDSCam Right

Image List

11-49-03-616.png	11-49-03-616.png
11-49-28-887.png	11-49-28-887.png
11-50-15-376.png	11-50-15-376.png
11-50-25-672.png	11-50-25-672.png
11-50-49-319.png	11-50-49-319.png
11-51-17-271.png	11-51-17-271.png
11-51-39-863.png	11-51-39-863.png
11-52-34-775.png	11-52-34-775.png
11-52-44-800.png	11-52-44-800.png
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11-54-46-455.png	11-54-46-455.png
11-54-49-759.png	11-54-49-759.png
11-54-55-967.png	11-54-55-967.png
11-55-07-071.png	11-55-07-071.png
11-55-11-307.png	11-55-11-307.png
11-55-15-367.png	11-55-15-367.png
11-55-19-712.png	11-55-19-712.png
11-55-23-751.png	11-55-23-751.png
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11-55-48-583.png	11-55-48-583.png
11-55-55-967.png	11-55-55-967.png
11-55-58-646.png	11-55-58-646.png
11-56-02-775.png	11-56-02-775.png

☐ Mirror x (Kinect)   ☐ Mirror x (Kinect)

Open Files   Open Files

2D Targets | 3D Targets | Rectification

(10) Zoom at the lower right corner with mouse wheel

(11) Zoom at the lower right corner with mouse wheel

(12) Note the difference between the modelled (cross) and measured points (circle)

(x=2120.12, y=1636.02)   (x=1433.72, y=1938.49)

Reprojection Error
RMS: 1.3366 px   Min: 0.0903 px   Max: 3.2122 px

Reprojection Error
RMS: 1.2637 px   Min: 0.1192 px   Max: 2.5002 px

Epipolar Error
RMS: 0.3923 px   Min: 0.0009 px   Max: 1.2440 px

Calibration | Rectification

Chessboard Detection
Inner corners   9   8
Square size [mm]   50   50

☐ Radon Chessboard Detection

Subpixel Corner Refinment
Win size   10   %
Zero zone [px]   1   1

Options
... intr.   Secondary intr.

☐ Use intrinsic guess
☐ Fix intrinsics
☐ Fix focal length fx,fy
☐ Fix principal point (cx,cy)
☑ Fix aspect ratio fx/fy
  ☑ Radial Distortion
    ☐ Fix k1   ☐ Fix k2   ☑ Fix k3
    ☐ Rational model

☐ Tangential distortion p1, p2

☐ Equal focal lengths f1=f2

Termination Criteria for Optimization
Max iterations   100
Epsilon [px]   0.001

Calibrate

☐ Remove Outliers
Reproj Err Primary >   5.00   px
Reproj Err Secondary >   5.00   px
Epipolar Err >   5.00   px

Detecting chessboards:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Calibration in progress ...
Calibration completed with rms reprojection error: 0.922631
Extrinsics: IDSCam Left wrt IDSCam Right
tx -139.0784
ty -0.3685
tz 5.4576
R
0.9998 -0.0004 0.0203
0.0003 1.0000 0.0070
-0.0203 -0.0070 0.9998
Stereo parameters saved to C:/Sonst/EasyCalib/Tutorials/2xIDSCam/Left/IDSCam Left_IDSCam Right_stereo.yml

Stereo Checker Target Calibration

Select Cameras: Primary / Secondary

IDSCam Left ▾   IDSCam Right ▾

Image List

|	
☐ 11-49-03-616.png	☐ 11-49-03-616.png
☑ 11-49-28-887.png	☑ 11-49-28-887.png
☑ 11-50-15-376.png	☑ 11-50-15-376.png
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☑ 11-52-34-775.png	☑ 11-52-34-775.png
☑ 11-52-44-800.png	☑ 11-52-44-800.png
☑ 11-52-55-747.png	☑ 11-52-55-747.png
☑ 11-54-41-753.png	☑ 11-54-41-753.png
☑ 11-54-46-455.png	☑ 11-54-46-455.png
☑ 11-54-49-759.png	☑ 11-54-49-759.png
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☑ 11-55-48-583.png	☑ 11-55-48-583.png
☑ 11-55-55-967.png	☑ 11-55-55-967.png
☑ 11-55-58-646.png	☑ 11-55-58-646.png
☑ 11-56-02-775.png	☑ 11-56-02-775.png

(13) Uncheck the outlier

☐ Mirror x (Kinect)   ☐ Mirror x (Kinect)
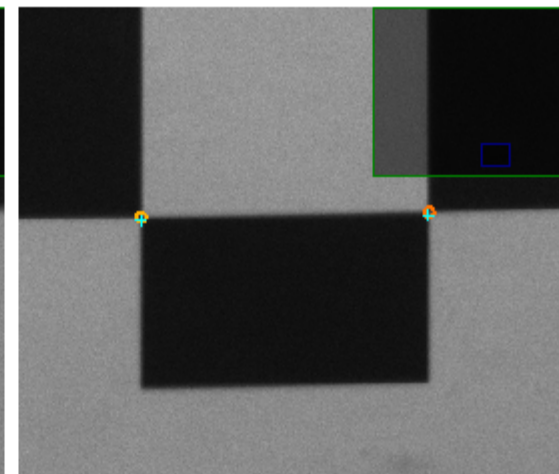
Open Files   Open Files

2D Targets | 3D Targets | Rectification
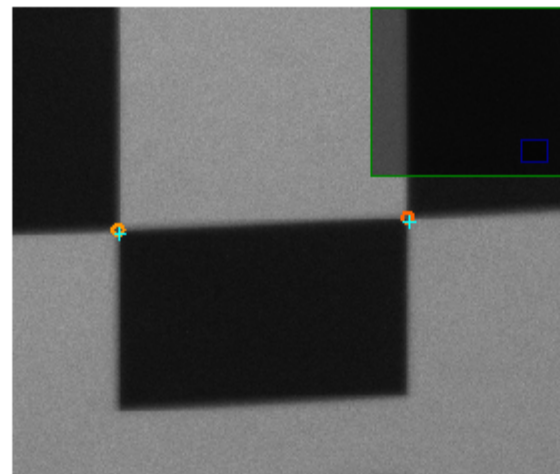
(x=1881.40, y=1674.29)   (x=1341.44, y=1666.12)

Reprojection Error
RMS: 1.3366 px   Min: 0.0903 px   Max: 3.2122 px

Reprojection Error
RMS: 1.2637 px   Min: 0.1192 px   Max: 2.5002 px

Epipolar Error
RMS: 0.3923 px   Min: 0.0009 px   Max: 1.2440 px

Calibration | Rectification

Chessboard Detection
Inner corners   9 ⬍   8 ⬍
Square size [mm]   50   50

☐ Radon Chessboard Detection

Subpixel Corner Refinment
Win size   10 ⬍ %
Zero zone [px]   1   1

Calibration Options

Primary intr. | Secondary intr.

☐ Use intrinsic guess
☐ Fix intrinsics
☐ Fix focal length fx,fy
☐ Fix principal point (cx,cy)
☑ Fix aspect ratio fx/fy
　☑ Radial Distortion
　　☐ Fix k1   ☐ Fix k2   ☑ Fix k3
　　☐ Rational model
☐ Tangential distortion p1, p2

☐ Equal focal lengths f1=f2

Termination Criteria for Optimization
Max iterations   100
Epsilon [px]   0.001

Calibrate again

(14) Calibrate

☐ Remove Outliers
Reproj Err Primary >   5.00   px
Reproj Err Secondary >   5.00   px
Epipolar Err >   5.00   px

Detecting chessboards:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Calibration in progress ...
Calibration completed with rms reprojection error: 0.922631
Extrinsics: IDSCam Left wrt IDSCam Right
tx -139.0784
ty -0.3685
tz 5.4576
R
0.9998 -0.0004 0.0203
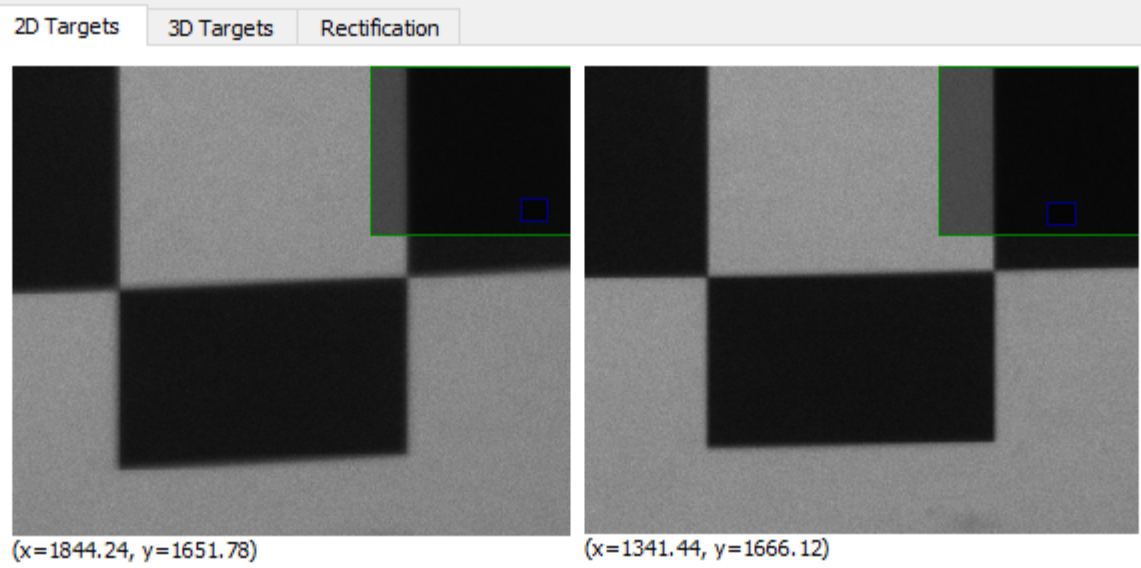0.0003 1.0000 0.0070
-0.0203 -0.0070 0.9998
Stereo parameters saved to C:/Sonst/EasyCalib/Tutorials/2xIDSCam/Left/IDSCam Left_IDSCam Right_stereo.yml

Stereo Checker Target Calibration — □ ✕

Select Cameras: Primary / Secondary

IDSCam Left ▾   IDSCam Right ▾

Image List

☐ 11-49-03-616.png	☐ 11-49-03-616.png
☑ 11-49-28-887.png	☑ 11-49-28-887.png
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☑ 11-51-39-863.png	☑ 11-51-39-863.png
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☑ 11-52-55-747.png	☑ 11-52-55-747.png
☑ 11-54-41-753.png	☑ 11-54-41-753.png
☑ 11-54-46-455.png	☑ 11-54-46-455.png
☑ 11-54-49-759.png	☑ 11-54-49-759.png
☑ 11-54-55-967.png	☑ 11-54-55-967.png
☑ 11-55-07-071.png	☑ 11-55-07-071.png
☑ 11-55-11-307.png	☑ 11-55-11-307.png
☑ 11-55-15-367.png	☑ 11-55-15-367.png
☑ 11-55-19-712.png	☑ 11-55-19-712.png
☑ 11-55-23-751.png	☑ 11-55-23-751.png
☐ 11-55-38-791.png	☐ 11-55-38-791.png
☑ 11-55-48-583.png	☑ 11-55-48-583.png
☑ 11-55-55-967.png	☑ 11-55-55-967.png
☑ 11-55-58-646.png	☑ 11-55-58-646.png
☑ 11-56-02-775.png	☑ 11-56-02-775.png

(15) Note: The selected image and its couterpart are excluded from calibration

☐ Mirror x (Kinect)   ☐ Mirror x (Kinect)

Open Files   Open Files

2D Targets | 3D Targets | Rectification

(x=1844.24, y=1651.78)   (x=1341.44, y=1666.12)

Calibration | Rectification

Chessboard Detection
Inner corners 9   8
Square size [mm] 50   50

☐ Radon Chessboard Detection

Subpixel Corner Refinment
Win size 10 %
Zero zone [px] 1   1

Calibration Options

Primary intr. | Secondary intr.

☐ Use intrinsic guess
☐ Fix intrinsics
☐ Fix focal length fx,fy
☐ Fix principal point (cx,cy)
☑ Fix aspect ratio fx/fy
  ☑ Radial Distortion
    ☐ Fix k1 ☐ Fix k2 ☑ Fix k3
  ☐ Rational model
☐ Tangential distortion p1, p2

☐ Equal focal lengths f1=f2

Termination Criteria for Optimization
Max iterations 100
Epsilon [px] 0.001

Calibrate

☐ Remove Outliers
Reproj Err Primary > 5.00 px
Reproj Err Secondary > 5.00 px
Epipolar Err > 5.00 px

Stereo parameters saved to C:/Sonst/EasyCalib/Tutorials/2xIDSCam/Left/IDSCam Left_IDSCam Right_stereo.yml
Detecting chessboards:
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Calibration in progress ...
Calibration completed with rms reprojection error: 0.898682
Extrinsics: IDSCam Left wrt IDSCam Right
tx -139.2788
ty -0.3058
tz 4.9944
R
0.9998 -0.0006 0.0195
0.0004 1.0000 0.0068
-0.0195 -0.0067 0.9998
Stereo parameters saved to C:/Sonst/EasyCalib/Tutorials/2xIDSCam/Left/IDSCam Left_IDSCam Right_stereo.yml

(16) Note the decreased reprojection error

3D-EasyCalib v2.10.15

File   About

Objects

cx [px]	1207.614796	
cy [px]	1042.073581	
k1	-0.395581	
k2	0.060677	
Extrinsics wrt	IDSCam Left ▼	
tx [mm]	0.000000	
ty [mm]	0.000000	
tz [mm]	0.000000	
yaw [°]	0.000000	
pitch [°]	0.000000	
roll [°]	0.000000	
∨ IDSCam Right	🗑	
Intrinsics	📁	
fx [px]	3489.000080	
fy [px]	3489.000080	
cx [px]	1137.813626	
cy [px]	1040.731830	
k1	-0.396562	
k2	0.160553	
Extrinsics wrt	IDSCam Left ▼	
tx [mm]	139.349772	
ty [mm]	0.261615	
tz [mm]	-2.278026	
yaw [°]	0.024500	
pitch [°]	1.116437	
roll [°]	-0.386438	

Add Object

Scene
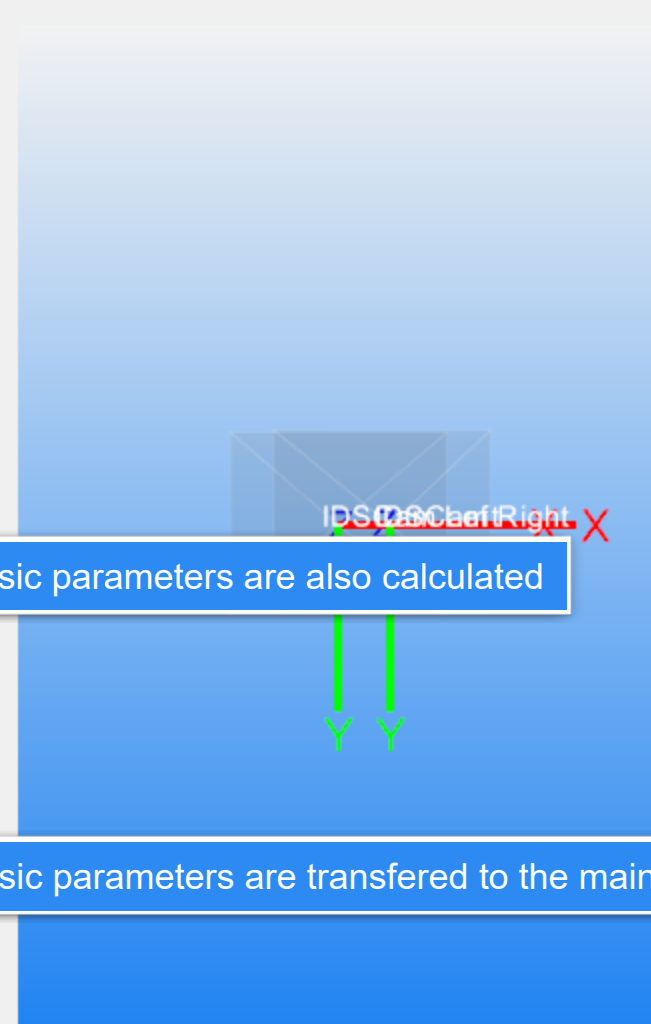
(18) Intrinsic parameters are also calculated

(17) Extrinsic parameters are transfered to the main window

IDS Cam Left Right X

zbs

Camera Calibration

Target-based

Intrinsic

Target Pose PnP

Extrinsic Stereo

Scene-based

Manhattan World

Projector Calibration

Camera-Projector

Robot-Camera Calibration

Hand-Eye

Robot-World

3D-EasyCalib v2.10.15

File   About

Objects

IDSCam Left	🗑
Intrinsics	📁
fx [px]	3496.580799
fy [px]	3496.580799
cx [px]	1207.609969
cy [px]	1042.078080
k1	-0.395598
k2	0.060787
Extrinsics wrt	IDSCam Left ▼
tx [mm]	0.000000
ty [mm]	0.000000
tz [mm]	0.000000
yaw [°]	0.000000
pitch [°]	0.000000
roll [°]	0.000000
IDSCam Right	🗑
Intrinsics	📁
fx [px]	3489.000807
fy [px]	3489.000807
cx [px]	1137.813677
cy [px]	1040.731476
k1	-0.396563
k2	0.160558
Extrinsics wrt	IDSCam Left ▼
tx [mm]	139.349675
ty [mm]	0.261710

Add Object

Scene
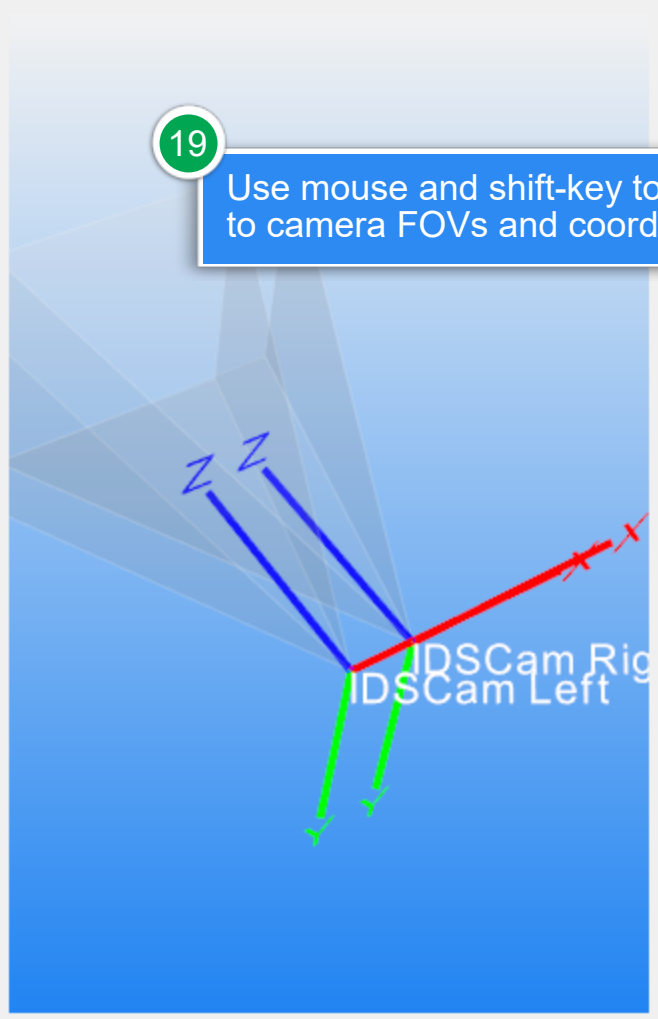
19 Use mouse and shift-key to change the view to camera FOVs and coordinate systems

IDSCam Right
IDSCam Left

zbs

Camera Calibration

Target Pose PnP

Extrinsic Stereo

Scene-based

Manhattan World

Projector Calibration

Camera-Projector

Robot-Camera Calibration

Hand-Eye

Robot-World