Vision App / Pro – User Manual

V 1.3 7.29.2026

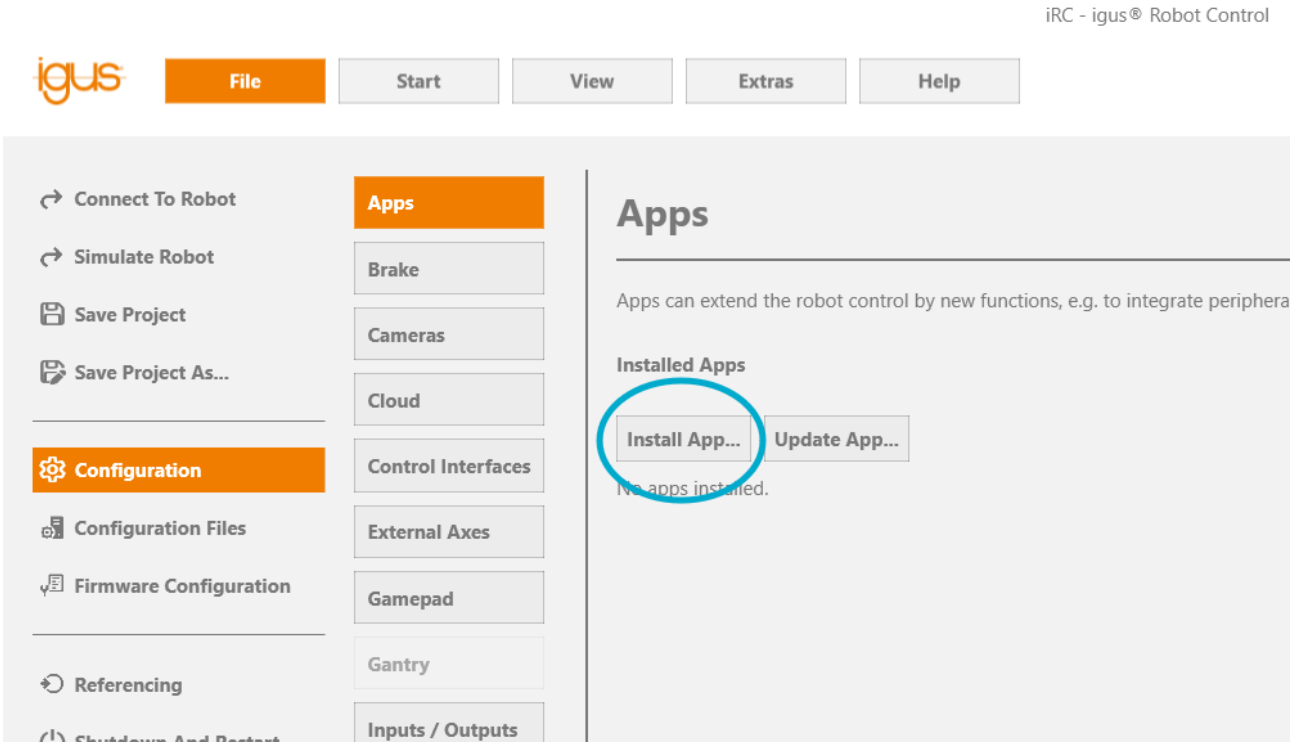
1. Requirements

- iRC Version 14-004-1 or newer installed on the robot.
- USB-Camera connected to the embedded controller of the robot.

2. Installation

Connect the iRC PC Software with your robot and go to "File -> Configuration -> Apps".

Click on "Install App…" and choose the .zip-file of the Vision App.



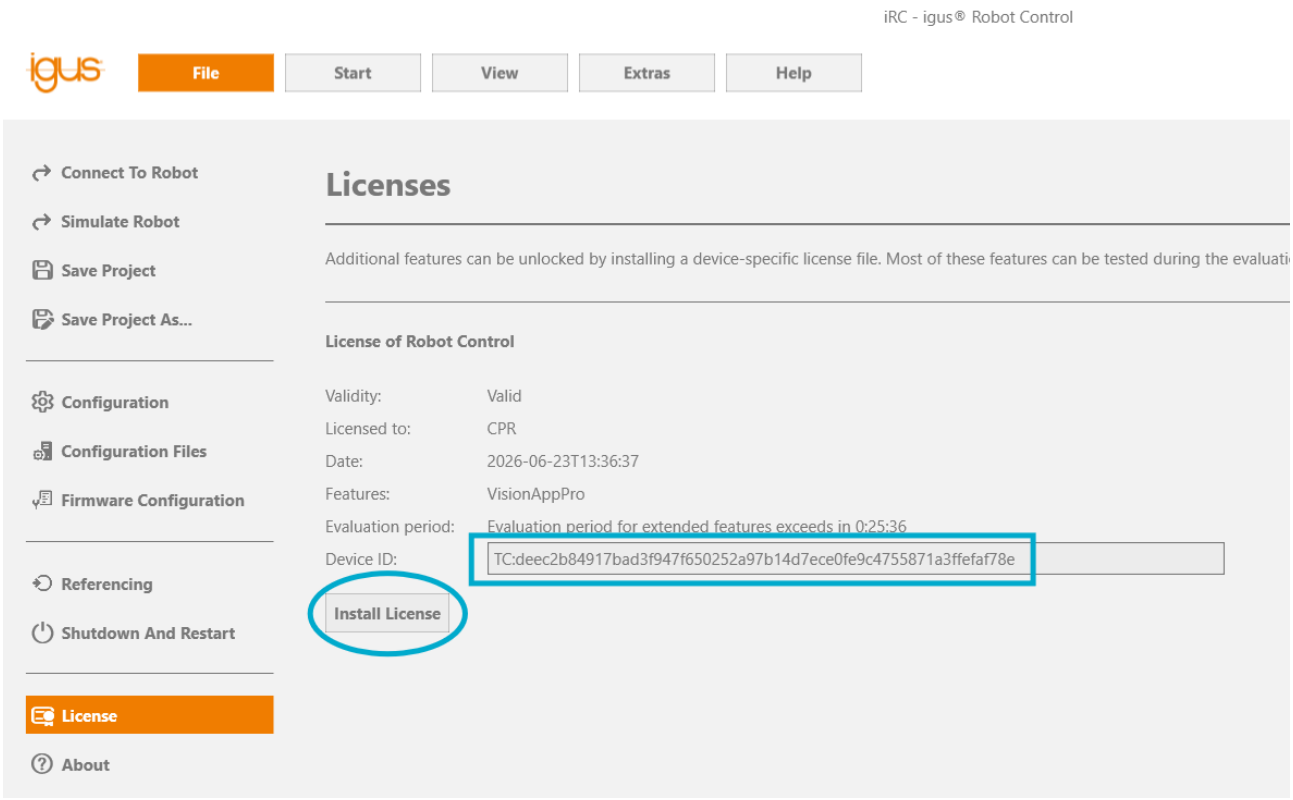
3. Licensing

This 'Pro'-version of this App needs a license for continuous operation. Without a valid license, you not be able to use the App.

In order to create a license, we need the device ID of your robot control. Connect to the robot via the iRC and go to "File -> License". Copy the string you find at "Device ID" and give it to us.

You can get the license via https://rbtx.com/

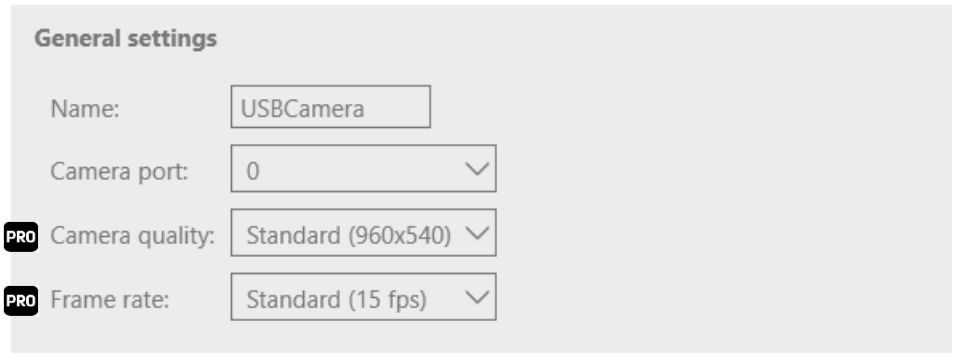
You will then get a license file that you can install via the "Install license" button.



4. General Settings

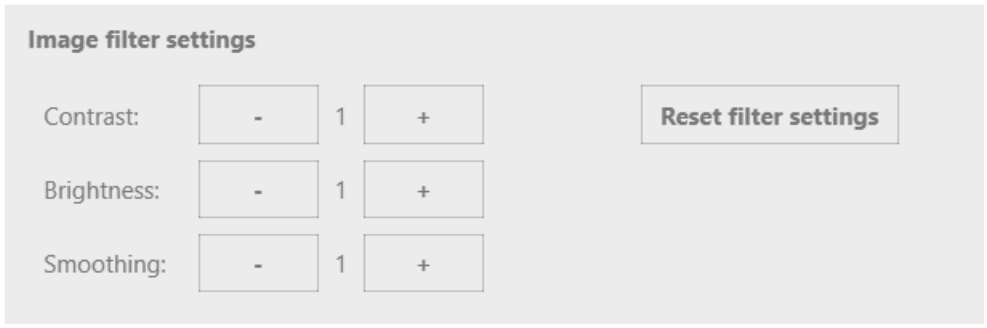
In the general Settings you add a name for the camera and choose the right USB Port ('0' if no other USB-device is connected to the embedded control). If you choose the right USB Port you should see the video of your camera on the bottom of the Vision app.

In the 'Pro'-version of the app, you can define quality and frame rate of the camera. This can be useful when encountering a delay in the video-preview in the iRC or camera-disconnects.



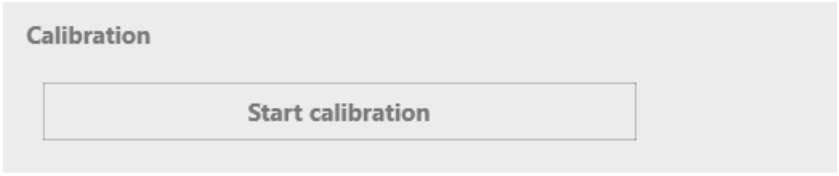
5. Image filter settings

Under the general settings you find the image filter settings. Here you can change contrast, brightness, and smoothness of the picture.



6. Calibration

You can start the calibration by clicking on the "Start Calibration" Button.

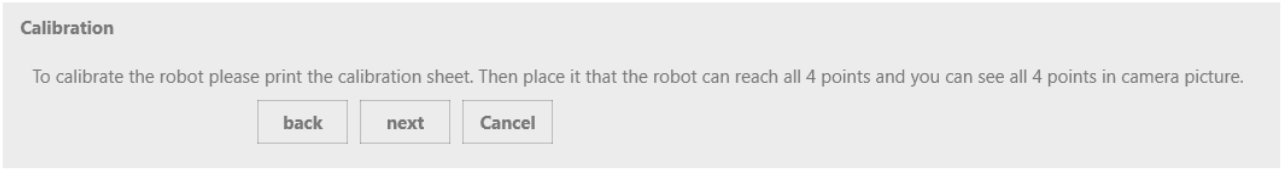


Now you can follow the instructions. The calibration sheet can be downloaded in the wiki:

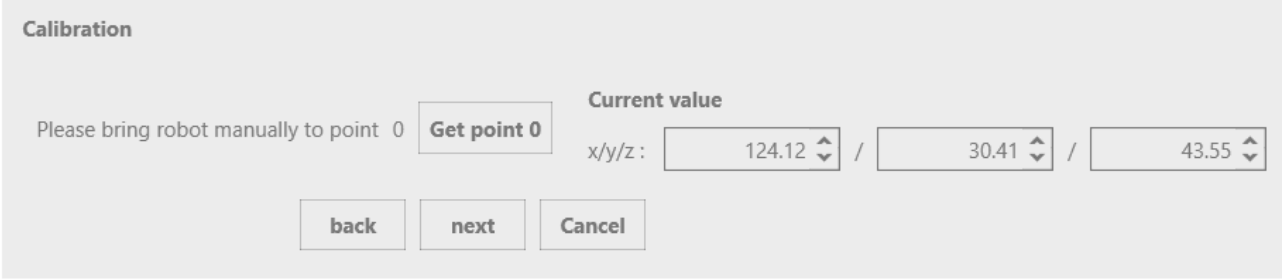
https://wiki.cpr-robots.com/index.php/Apps_for_the_Robot_Control. Place the sheet under the camera and check

- Do you see all 4 points in the camera picture?
- Can the robot reach all 4 points with the TCP?

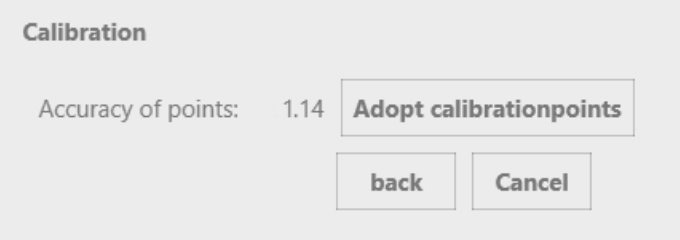
If you checked both, you can navigate to the next step.



Follow the instructions and bring the robot to point 0 on the calibration sheet. Click "Get point" if the TCP is on point 0. The coordinates will change and show the position.

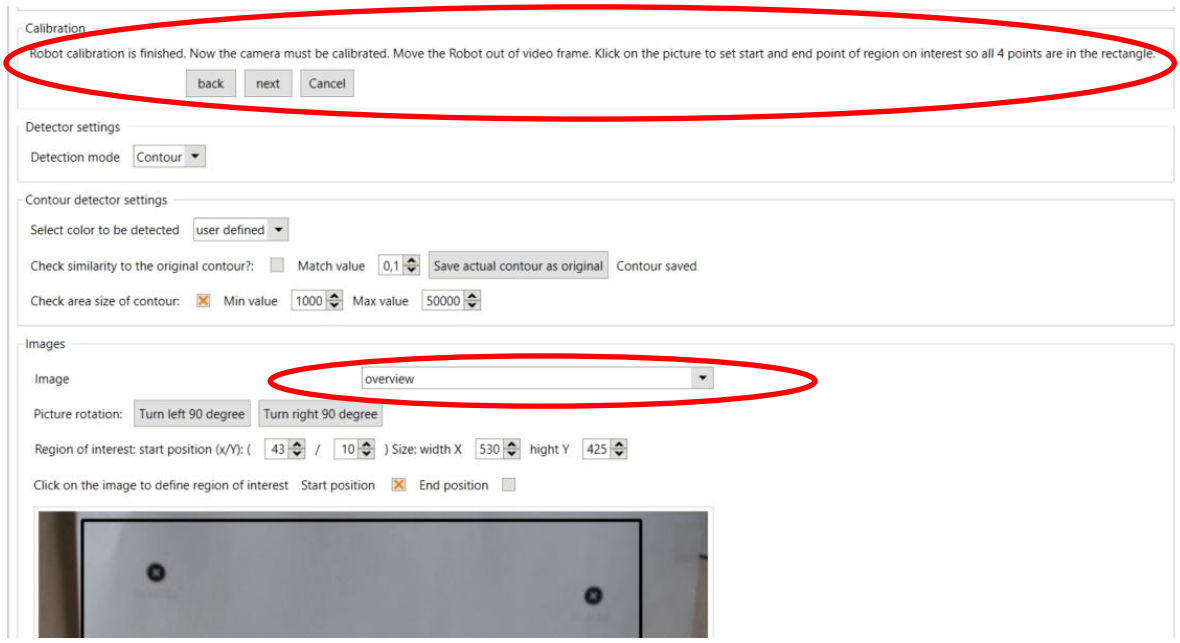


You can navigate to the next point by clicking on the Button “next”. To the same with the other 3 points.

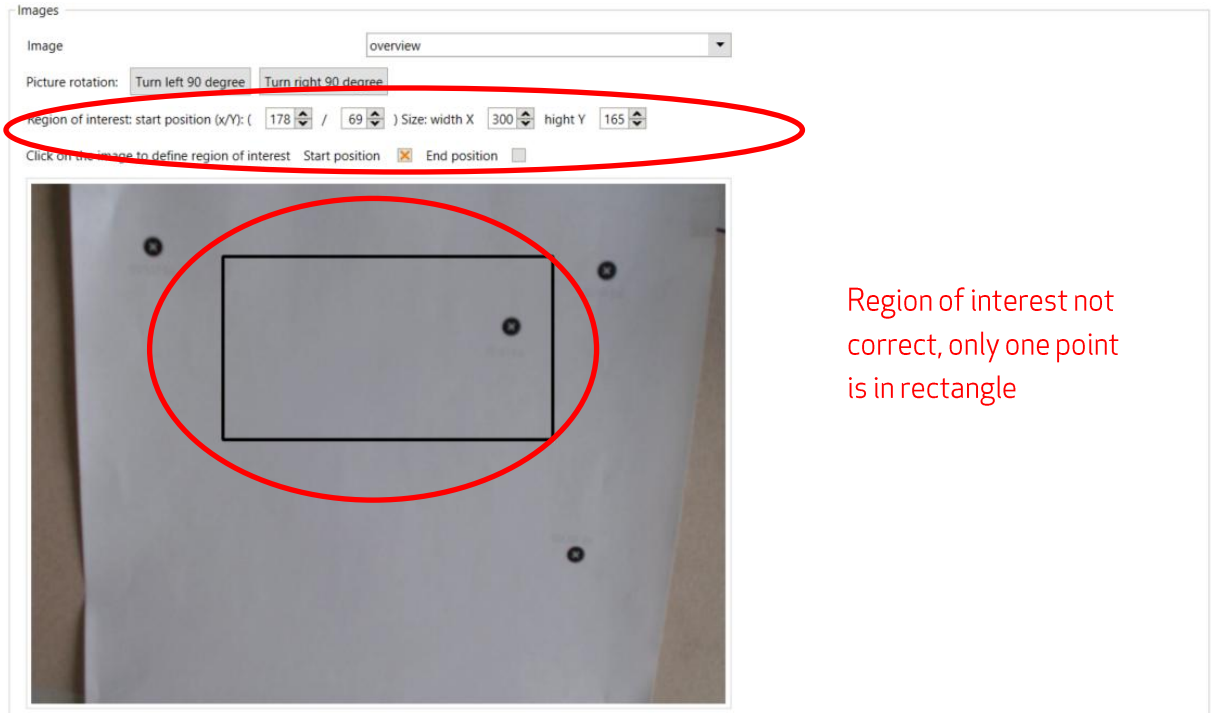


After all 4 points are stored you get an accuracy. This should be close to 1 (ca. 0,1 higher or lower is ok), otherwise you will get problems with positions later. You can navigate “back” if you want to correct some points to get a better accuracy. Click “Adopt calibration points” to save the points. The button “next” will appear. If the button next does not appear, your Accuracy is to bad. Please check your points again.

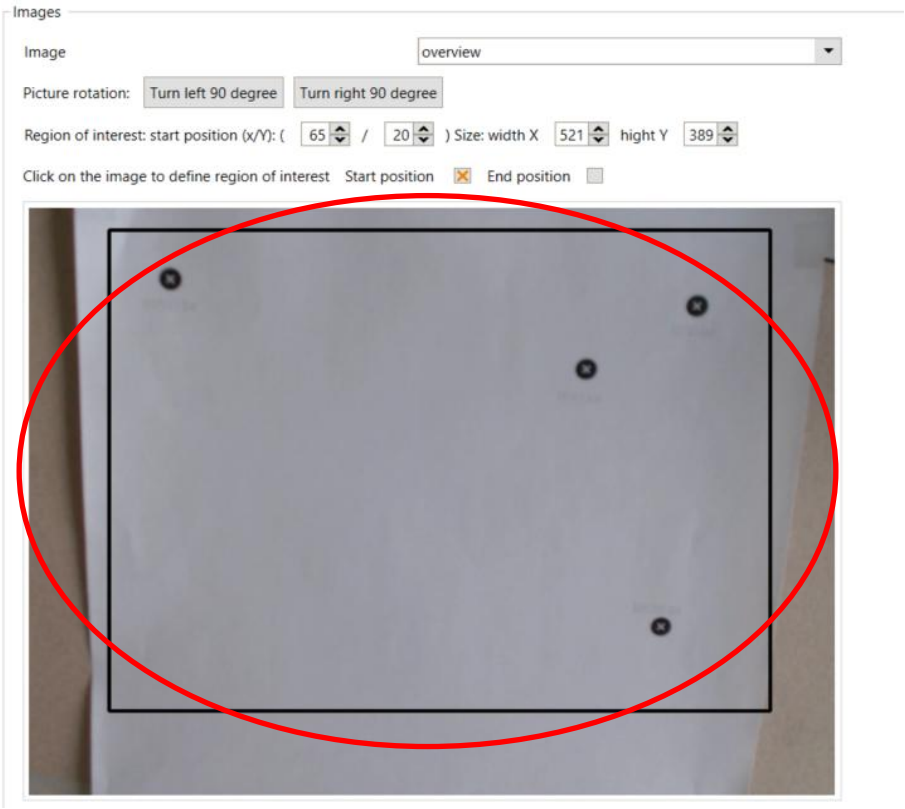
Now the calibration of the robot is finished, you need to calibrate the camera now. By clicking next, the image will change to “overview”.



Follow the instructions and resize and shift the region of interest until all 4 points are into it. You can do this by clicking on the picture. First the start position will be set, then the end point will be set. You can change which point will be set by checking the checkbox. It is also possible to change the size and position of the region of interest if you change values “start position” and “size”.



Region of interest not correct, only one point is in rectangle



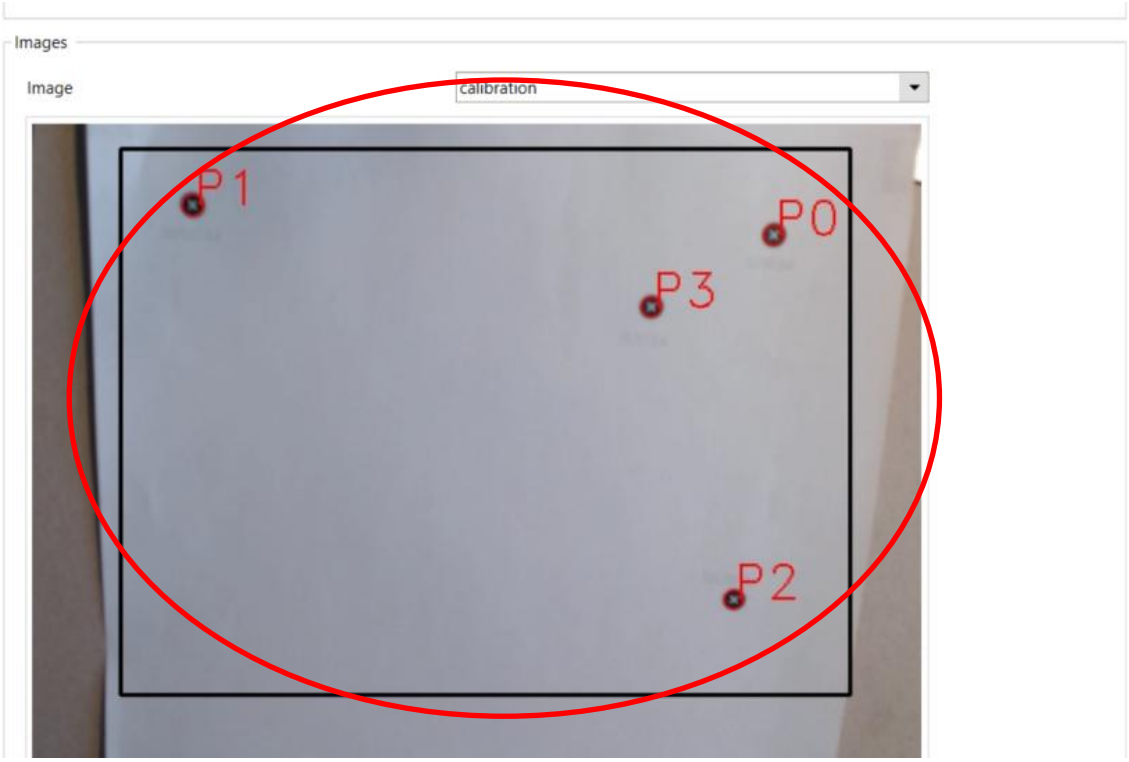
Region of interest is correct, all point is in rectangle

If all 4 points are in region of interest, click next. The image automatically changes to calibration.

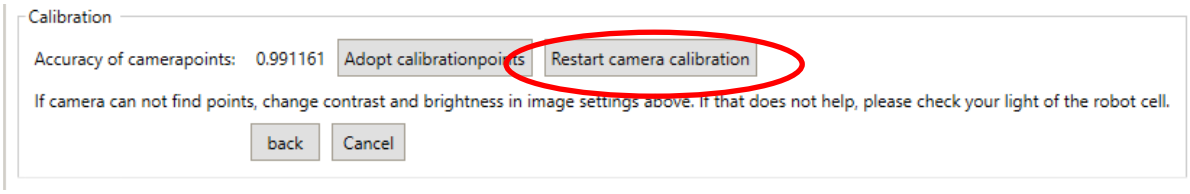
The camera will search for the 4 black points. All found points will be marked with a red circle. If the camera cannot find all 4 Points, like in the picture below, change the settings of brightness and contrast until all 4 points are detected. and the accuracy is -1 until 4 points are found.

If you still get problems, you can check you light and background. Do not move the positon of the calibration sheet, otherwise you need to restart the whole calibration and save the 4 points with the robot again.

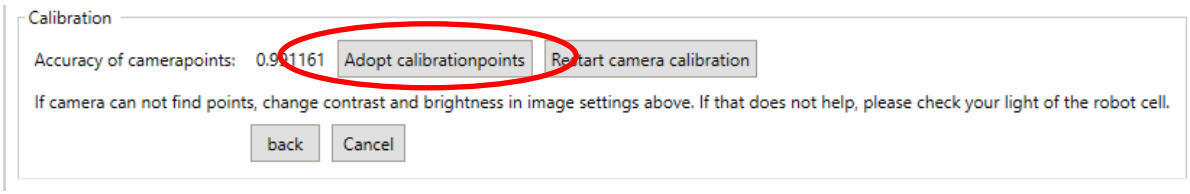
If the camera detected 4 Points, they get a number and you should check, if the points are marked correctly.

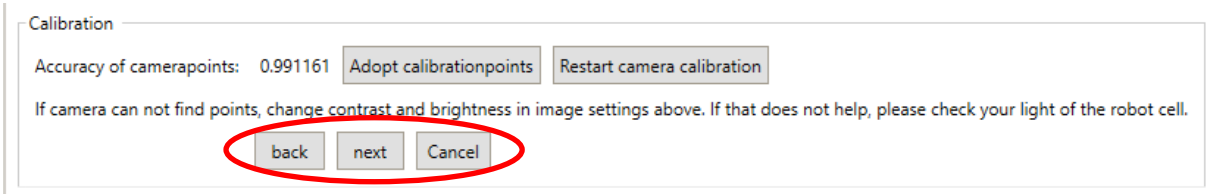


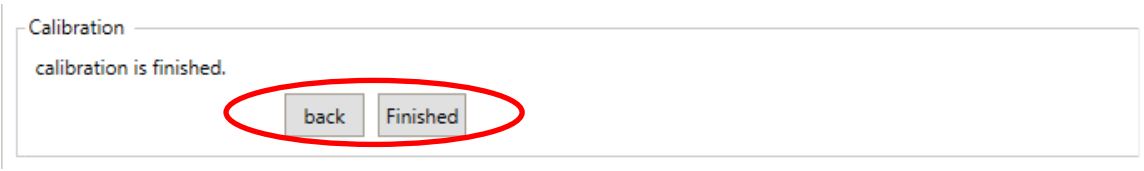
Like the robot configuration, you get an accuracy of the points. This should be close to 1 as well. If the points are not marked correctly or the accuracy is not good, you can click “restart camera calibration”. If you get wrong points, e.g. because of dark background, please light up your background or put some white sheets of paper to it.



Save the calibration points by clicking “Adopt calibration”. The Button next will appear.





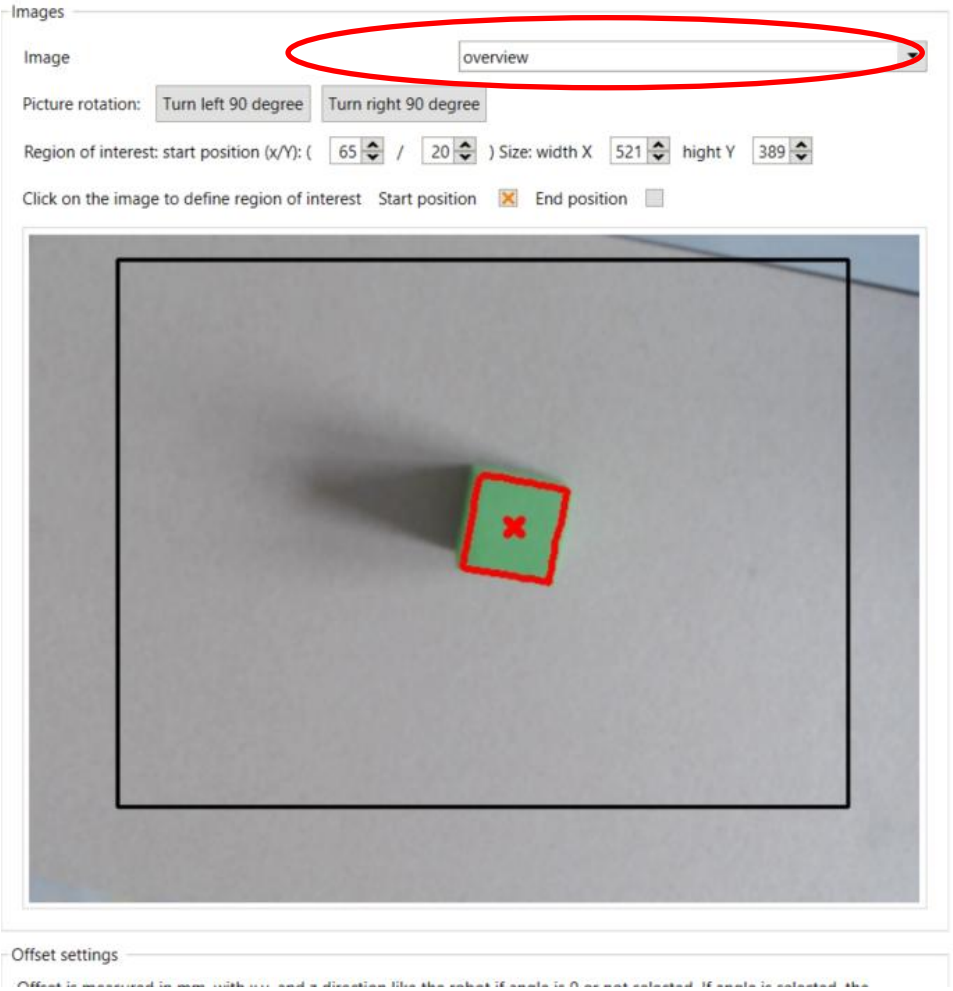


You can end the calibration by clicking "finished". Now you can store your object to be found in the next step.

7. Images

7.1 Overview

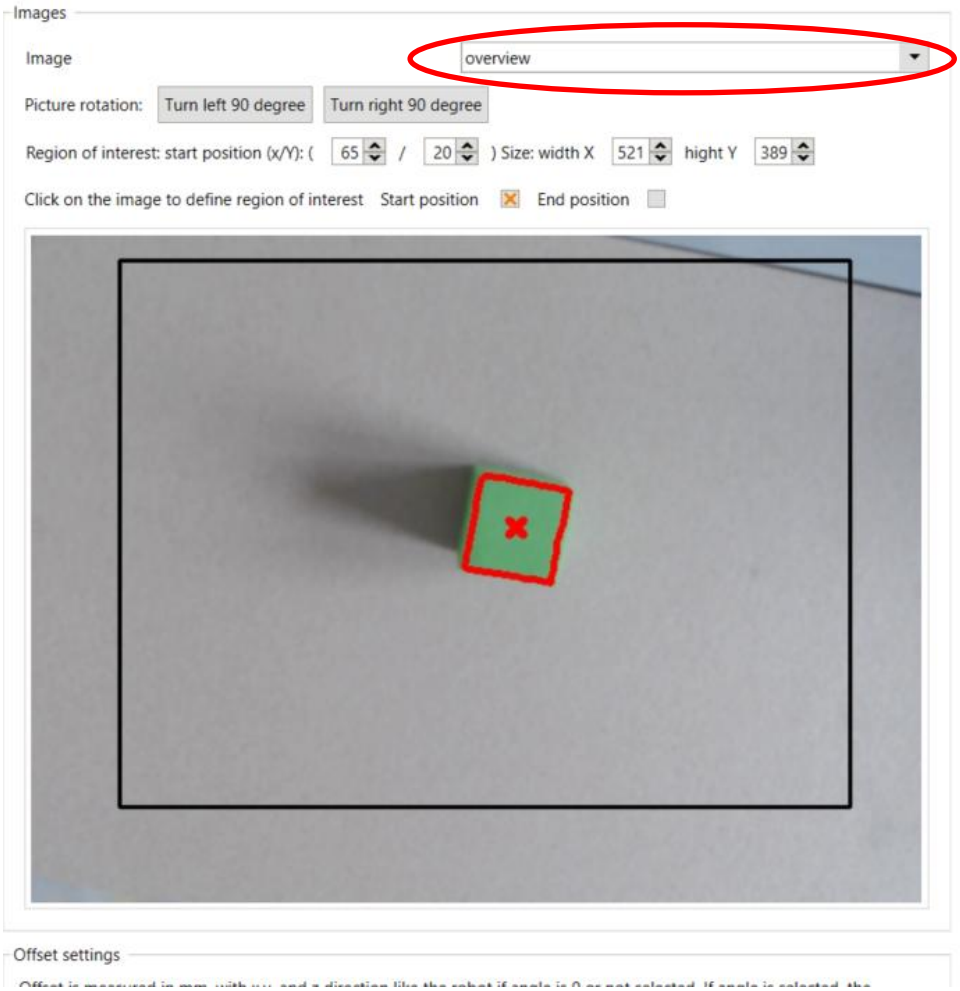
In the image overview you get the whole camera frame. Marked is the region of interest. The selected settings like brightness and contrast are shown. If there is an object detected it is marked with a red x on the grip point and a red colored contour.



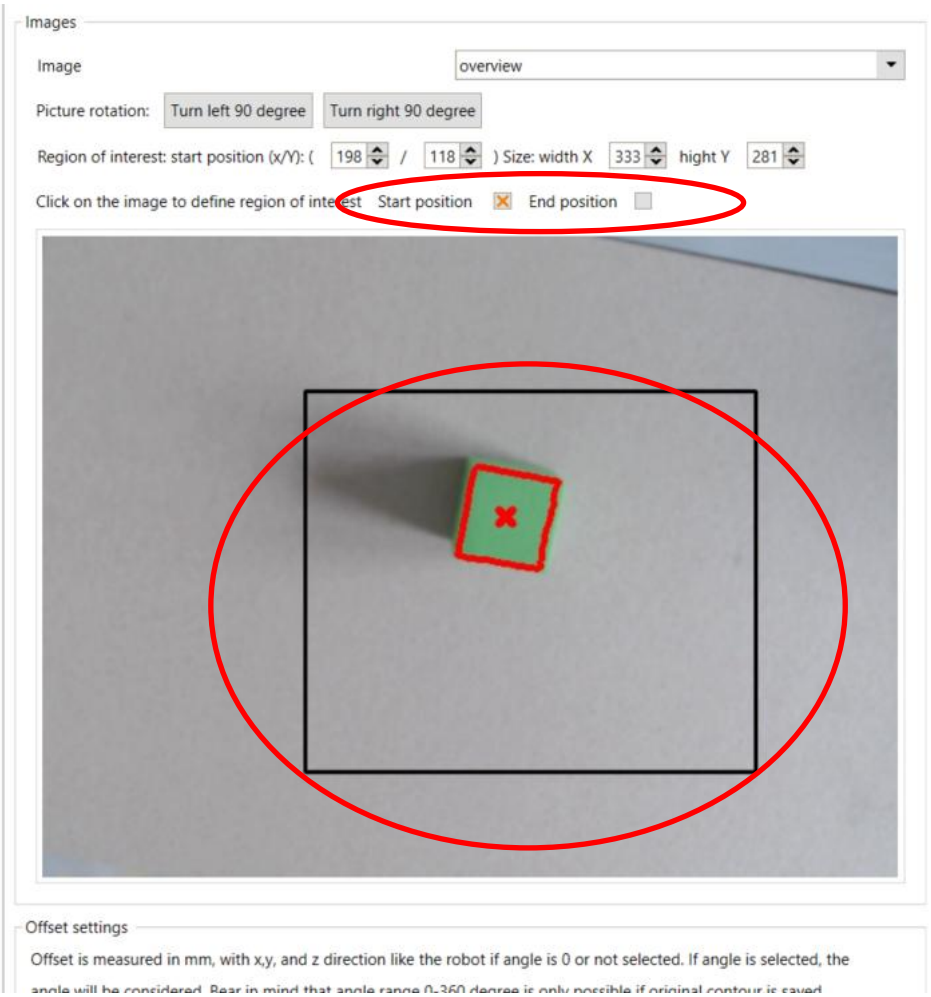
You can rotate the image if you have a different orientation of the camera.

7.1.1 Set region of interest

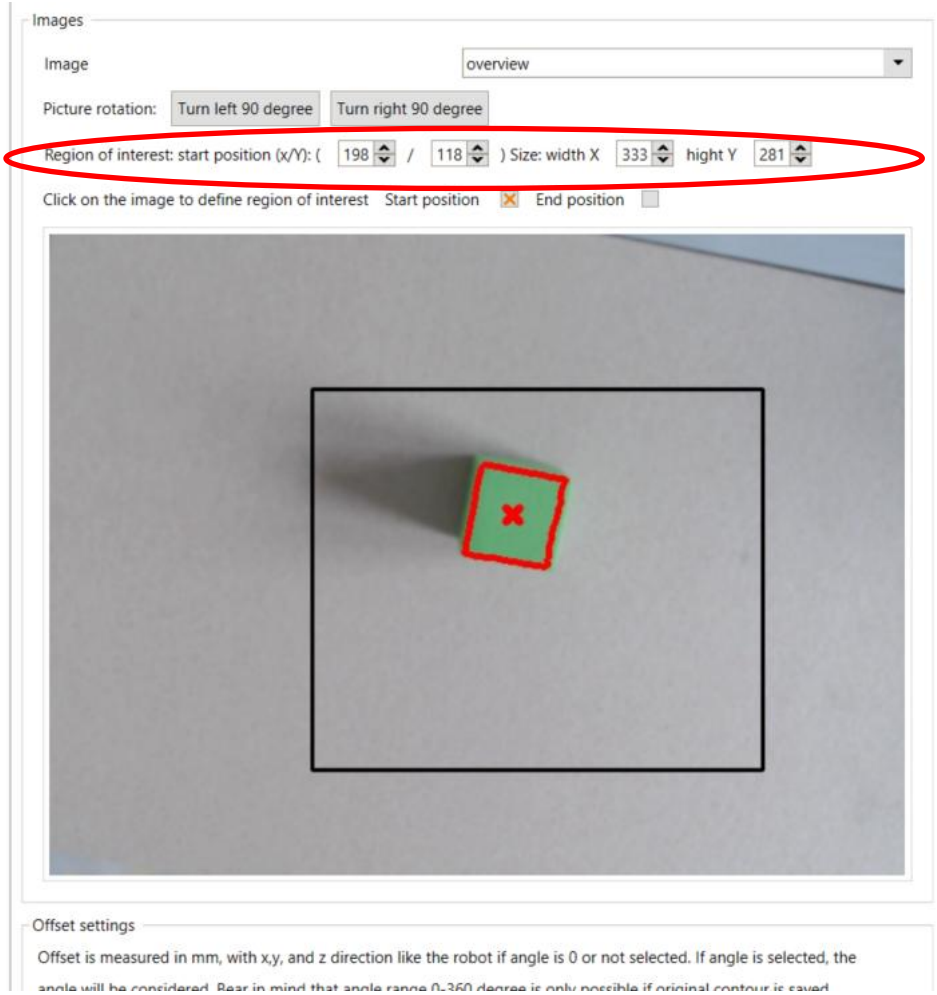
The object will only get detected if it is in the region of interest. This is marked with the black rectangle. You can change the region of interest in the image "overview".



If you want to change the region of interest, you can click in the image. Depending on the selection "Start position" or "End position" the start or end position will be set. After setting the start position, automatically end position will be set.

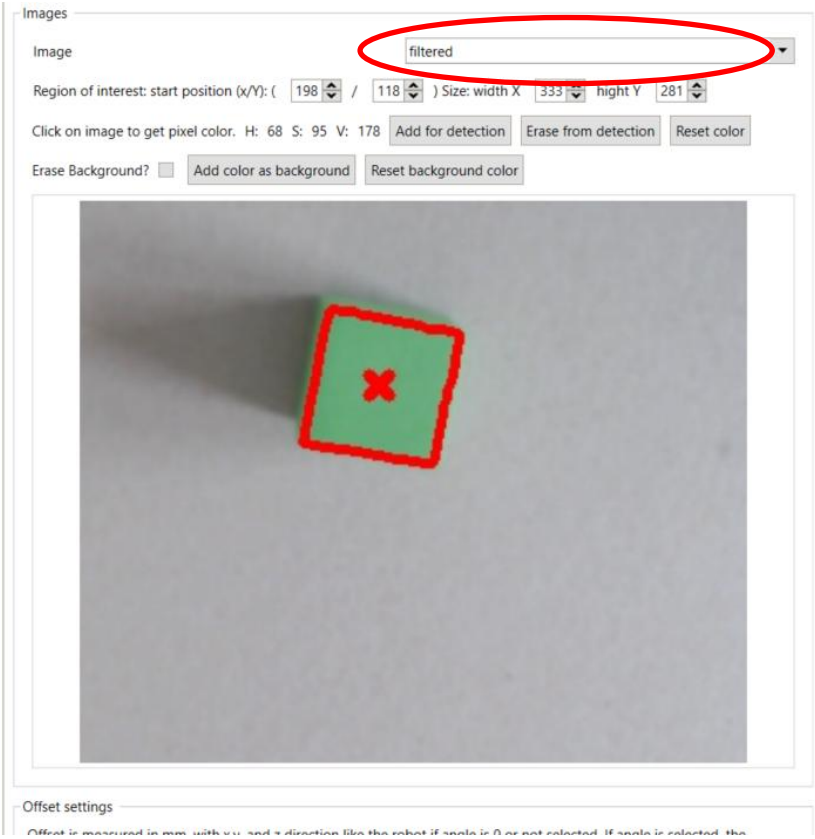


Another possibility is to change the region of interest by changing the values “start position” and “width”/”hight”.

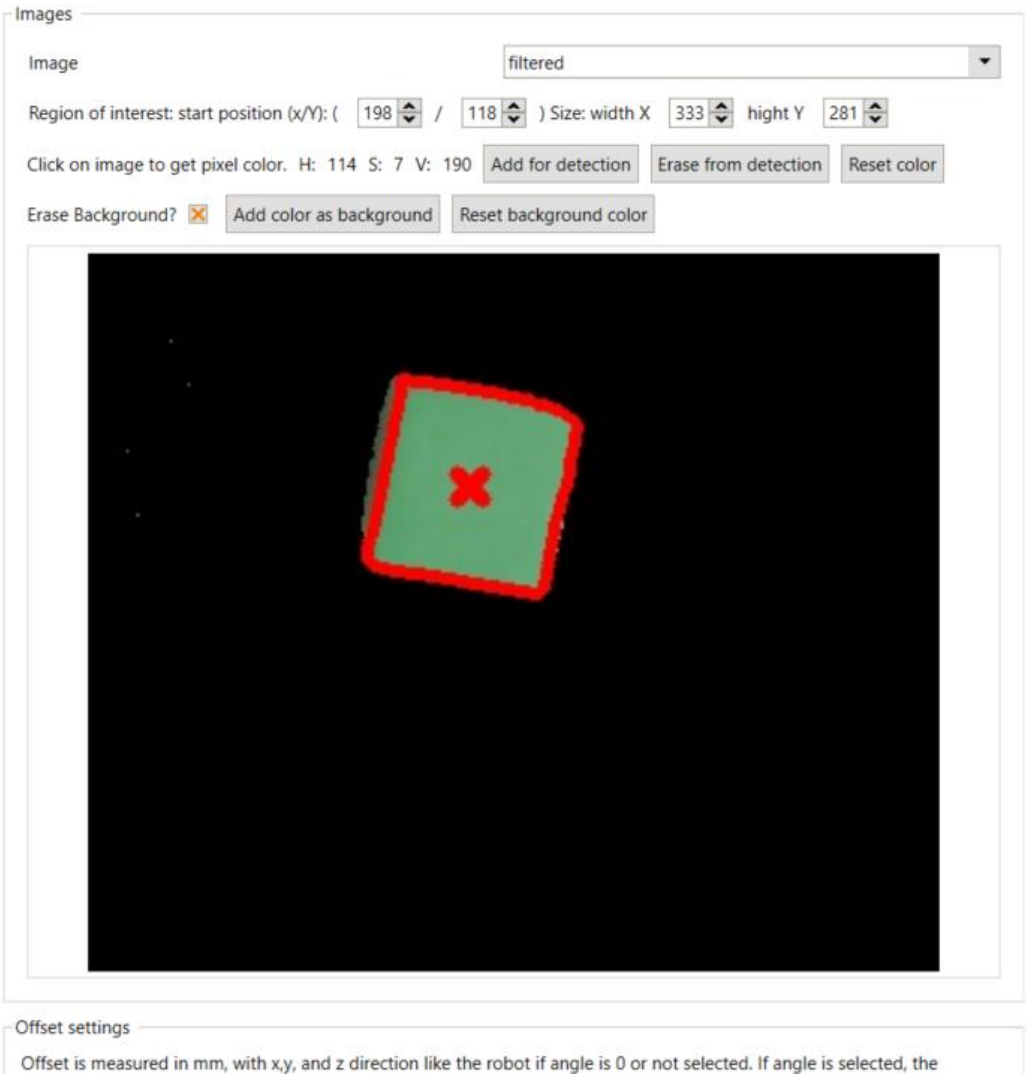


7.2 Filtered

The image filtered shows the region of interest.



If a contour/ Blob is found, it will be marked. If you click on the image, you will get the pixel color and can add or remove it to the color to be detected or the background(only in Contour detection). A detailed explanation for setting detection color you will find in 8.1.1. In 8.2 you will find an explanation how to set the background color. If you selected a background color, all areas with this color will be marked black. Note that this is only possible if you chose contour detection.



7.3 Calibration

If you select „calibration“, the image of calibration will be shown, if you already calibrated your robot. Otherwise, the picture will be white. How to calibrate your robot is explained in 5.

7.4 Original contour

The „original contour“ shows the saved original contour. If you don't have an original contour, the picture will be white. In chapter 8.4 you find a detailed explanation how to save contours.

7.5 Binary Detection Frame

If you chose the image “binary detection frame” you will get a binary picture, which is used to define the contour. The white pixels are the object to be detected, the black pixels are the background. If you have

problems with detection, check which area of your object is white and which is still black. Check the background as well.

8. Contour Detection

For contour detection select "contour" as detection mode.

In the following the different settings for contour detection are explained.

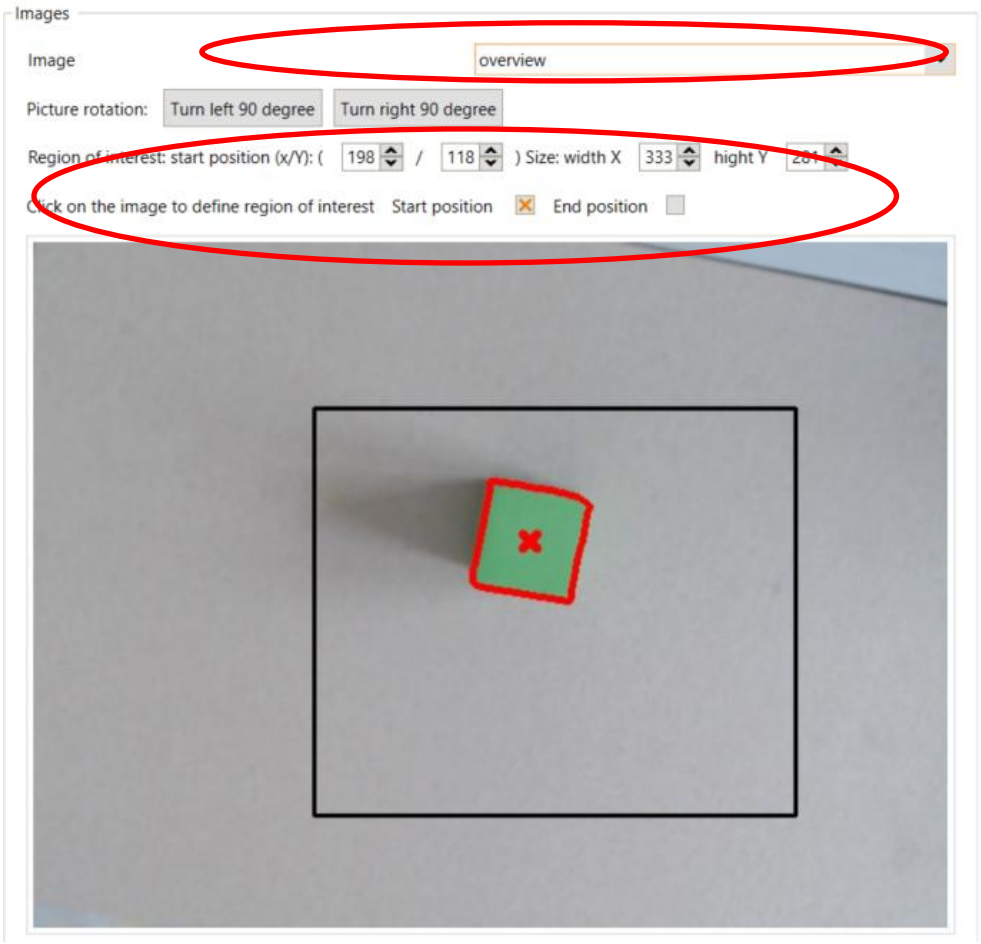
8.1 Set color of object

There are three different opportunities to set color of the object which should be detected.

1. Pic color form image
2. Select predefined value
3. Define HSV values

8.1.1 Pic color from image

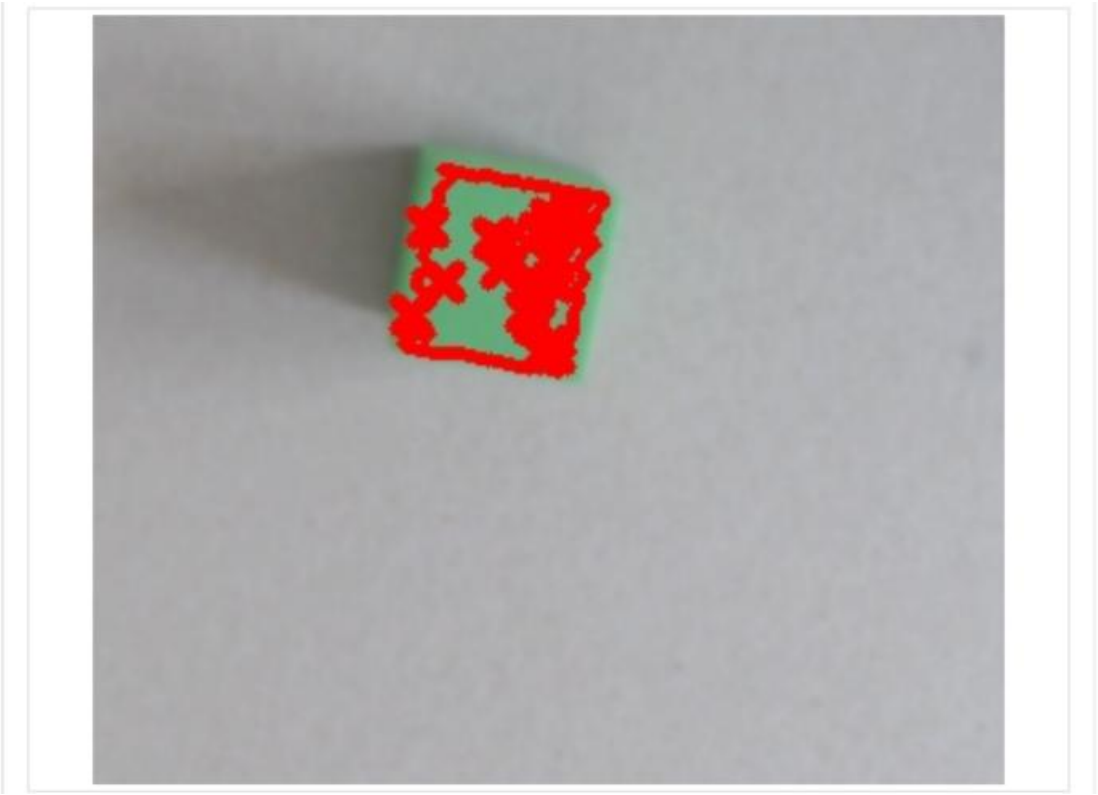
First the Region of interest must be set. This is possible in the image "overview" by clicking on the image.



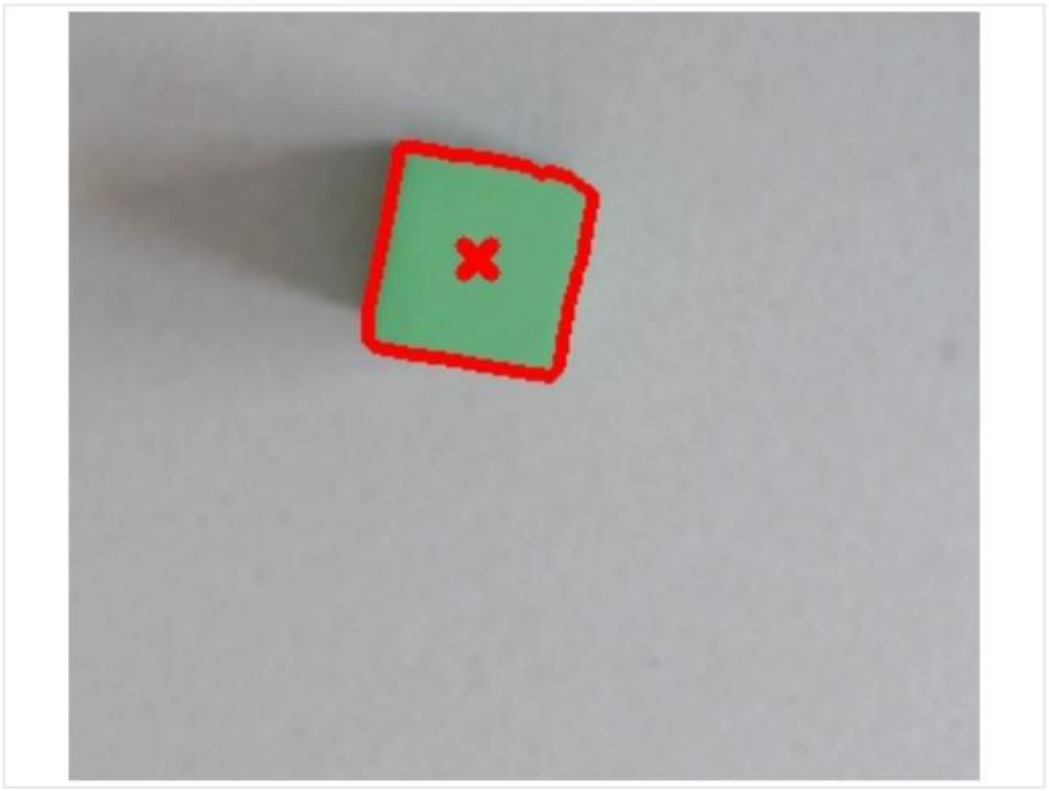
If the object is in the rectangle the picture "filtered" must be selected.

If you click on the image, the color of the pixel will be shown. Now you can click the button "Add for detection" to add the color for detection. You can add serval color pixel to be detected. If a color area is detected, the center and contour will be marked.

The following picture shows how the detection could look after adding the first color. A lot of small areas are detected and marked.



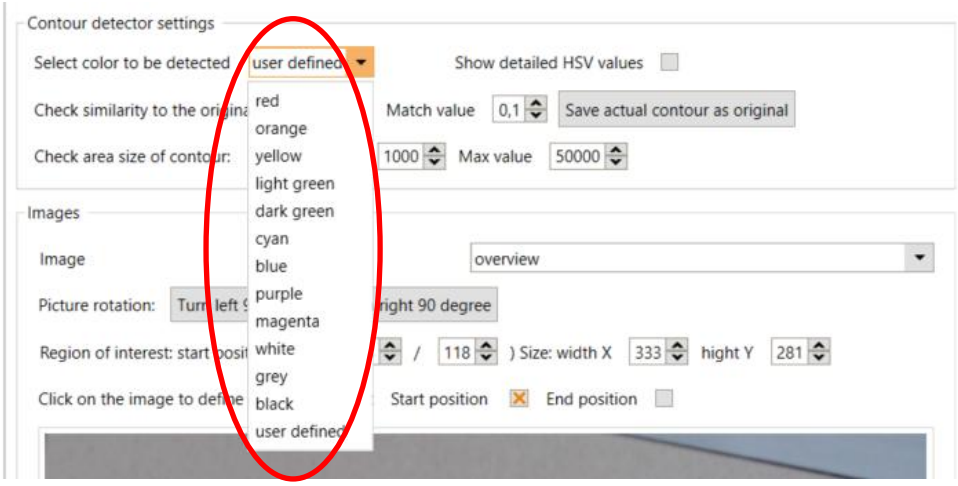
After adding more colors by clicking on the pixels and "Add for detection" the area is getting bigger and in the end you have only one area with the center marked with a red x. This is shown in the following picture.



If you added a lot of pixels and still get more than one area, you can set the values of min and max area. This is explained in 8.3.

8.1.2 Select predefined value

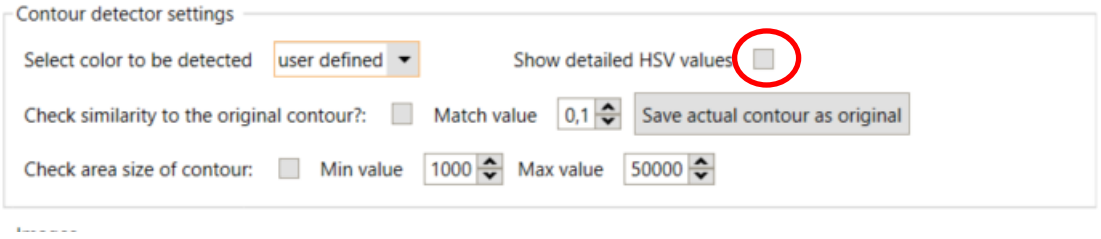
It is possible to select a color of a list with predefined colors. You can select the color in the drop-down menu.

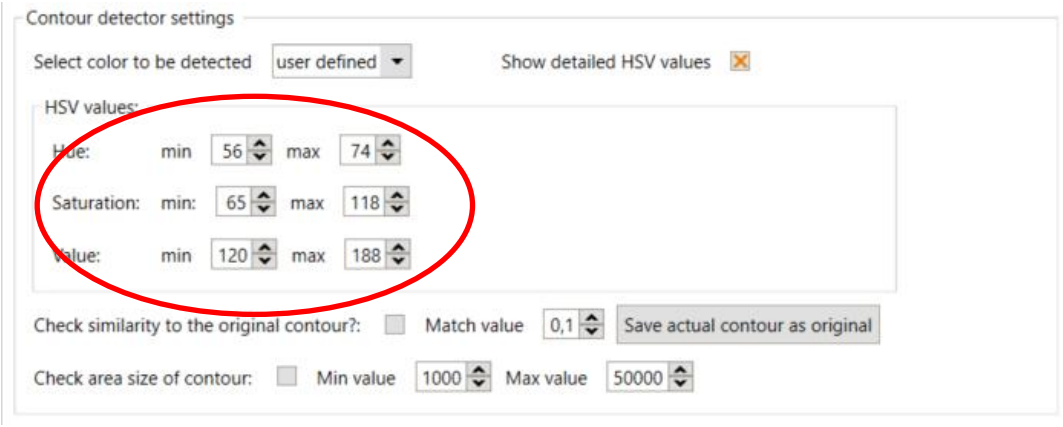


Please notice that it can be possible that your object will not be detected even if you chose the right color. This depends on different brightness and contrast, depending on light and camera. If the color cannot be detected, add the color manually as explained in 8.1.1.

8.1.3 Define HSV values

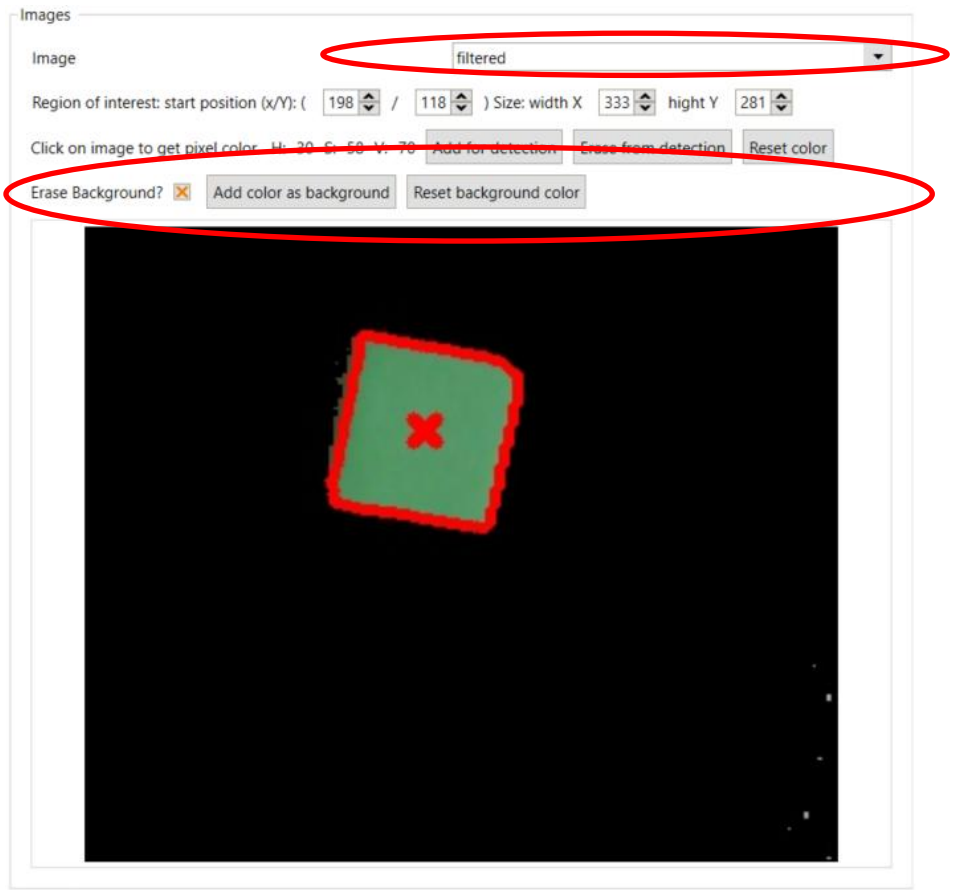
You can change the HSV values manually. Check the button „Show detailed HSV values" to show the values. All colors between the min and max area will be detected.





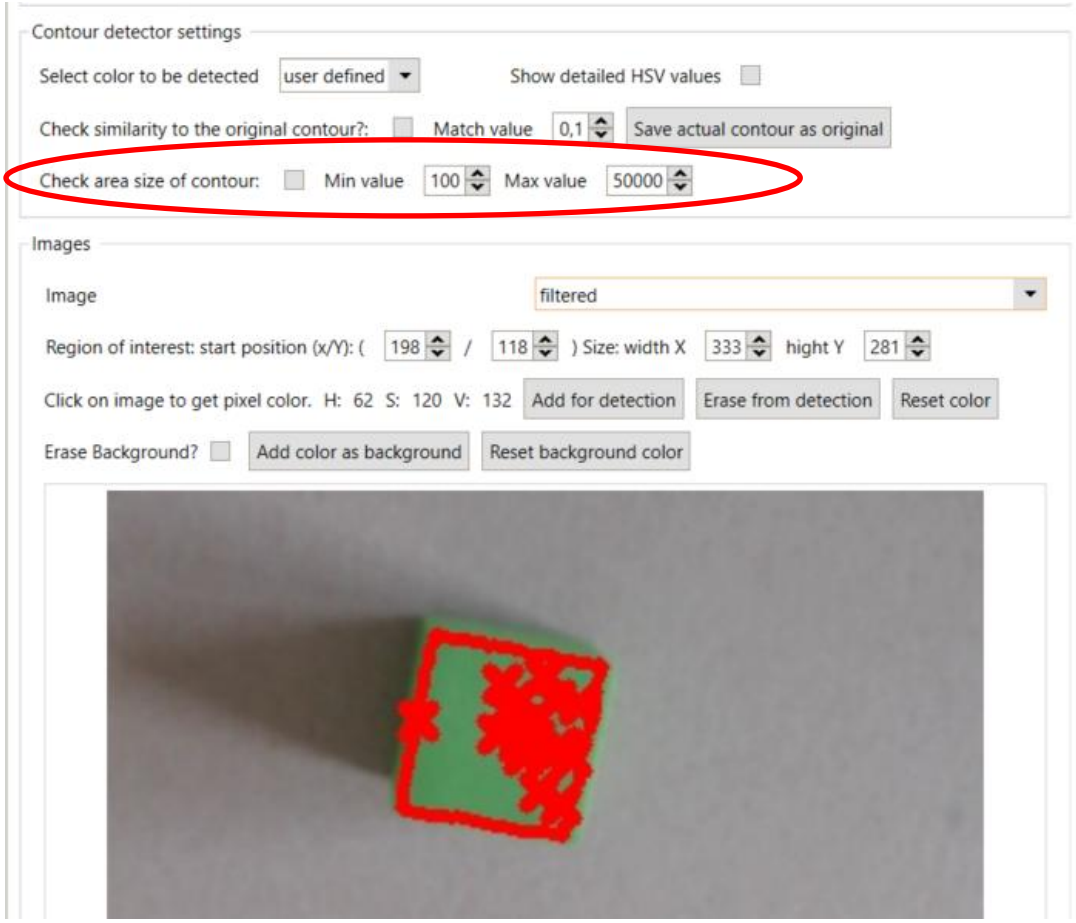
8.2 Define background color

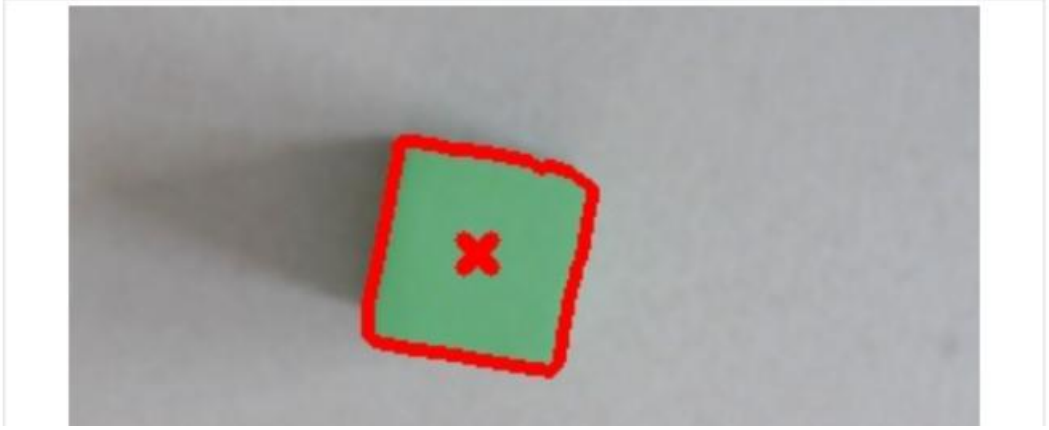
In addition to the color that is detected, a background color can also be defined, which should be hidden. This is helpful if you have a multicolored object to be found or the background is colored. You can activate the background removement by checking "Erase Background". Afterwards you can add colors to the background by clicking on the pixel, like adding the colors to be detected, explained in 3.1.1.



8.3 Filter Object Size

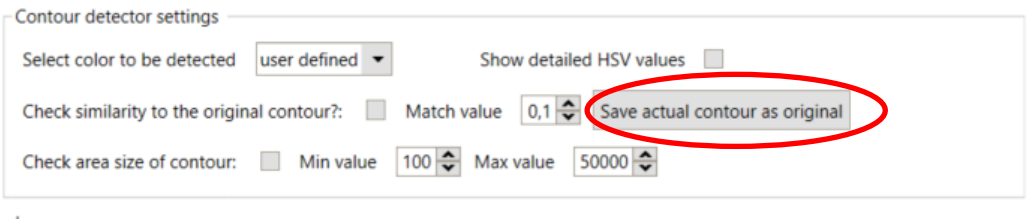
Contours can be filtered by area. Only contours which are between the min and the max area will be shown. If you want to activate this filter you have to check the checkbox. On the first picture the contours are not filtered by area. On the second picture the contours are filtered and small contours will not be detected anymore.



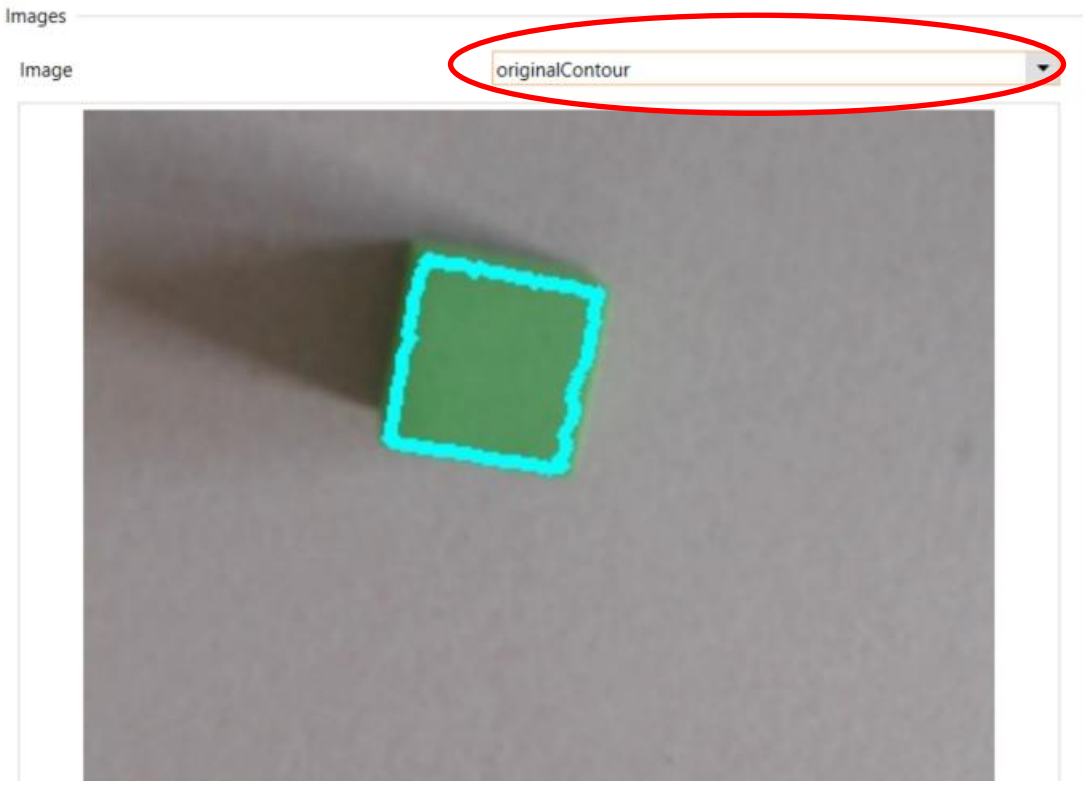


8.4 Define contours

You can define contours and only search for contours, which are like the original contour. First you must save the original contour. Put the object under the camera and change the settings, like brightness, contrast, and color, until only the original contour is detected. Now click "Save actual contour as original".

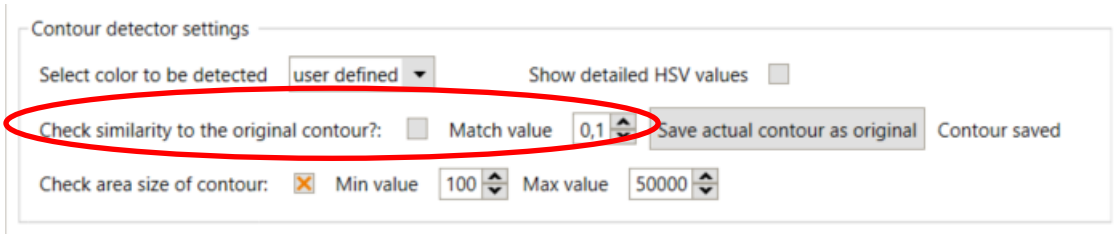


"Contour saved" will be shown if the contour is saved successfully. If you want to look at the saved original contour select the image "original contour".



Now you can compare every found contour with the original contour. Therefore you have to check „Check similarity to the original contour?". Afterwards only the contours which are like the original contour will be shown. You can change the match value to define how close the similarity must be. If the match value is close

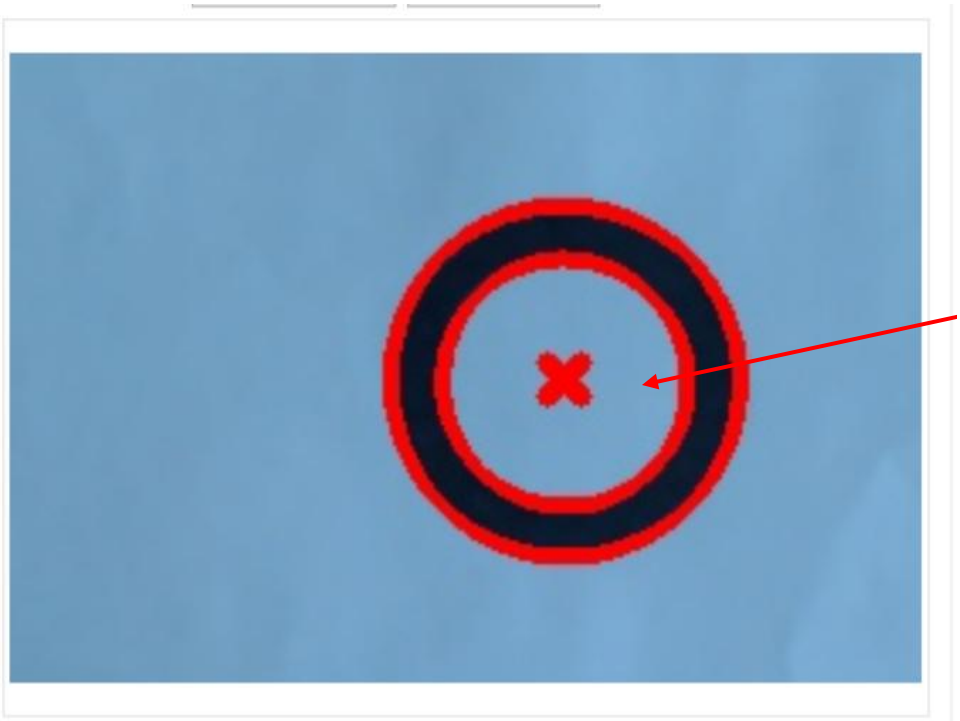
to 0, the founded objects must be nearly identical to be found.

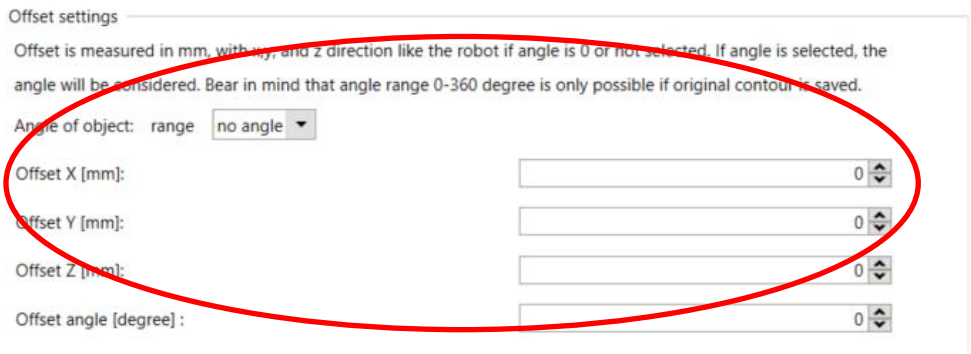


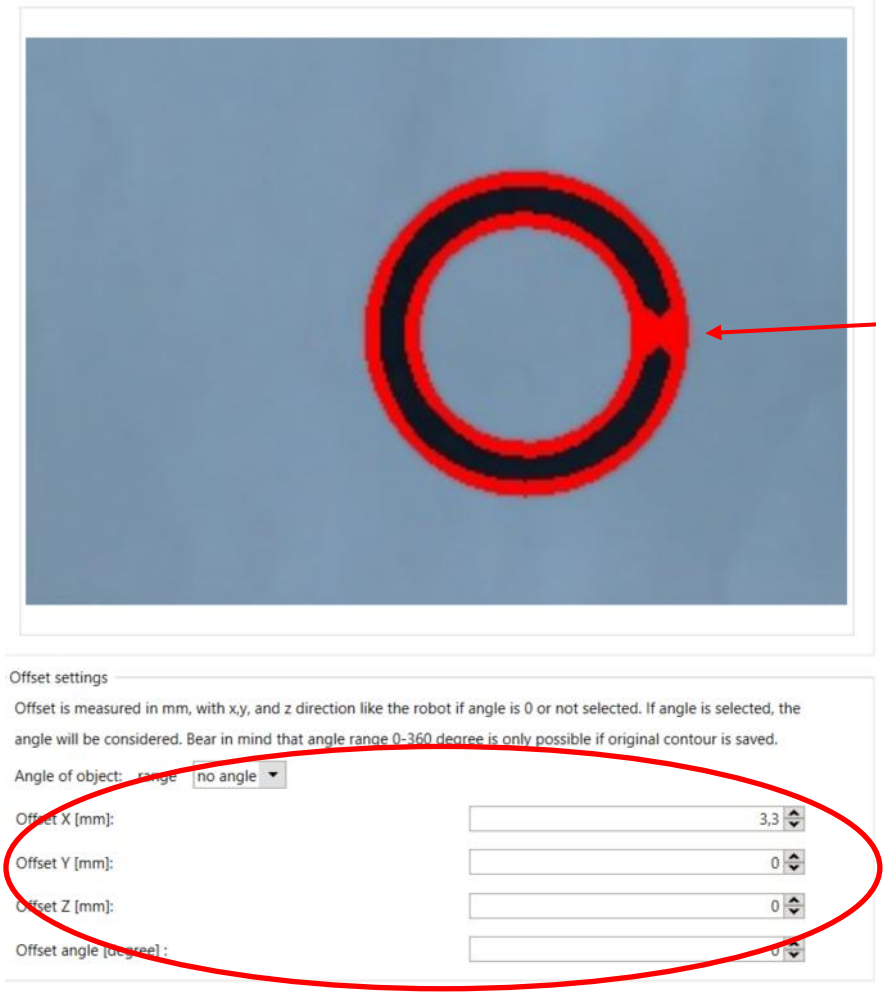
If no original contour is saved and you check the box, the box will be automatically unchecked after a short time.

9. Offset

The detection gives you the center of the detected object. Sometimes objects can not be taken in the middle of the object, because there is a hole such as a ring. In that case it is necessary to change the Point with an offset. The offsets can be set in group “Offset”. This offset will be added to your point. The offset coordinates are in robot coordinates, this means the x offset will be in robot x direction, which may not fit to x direction on picture.

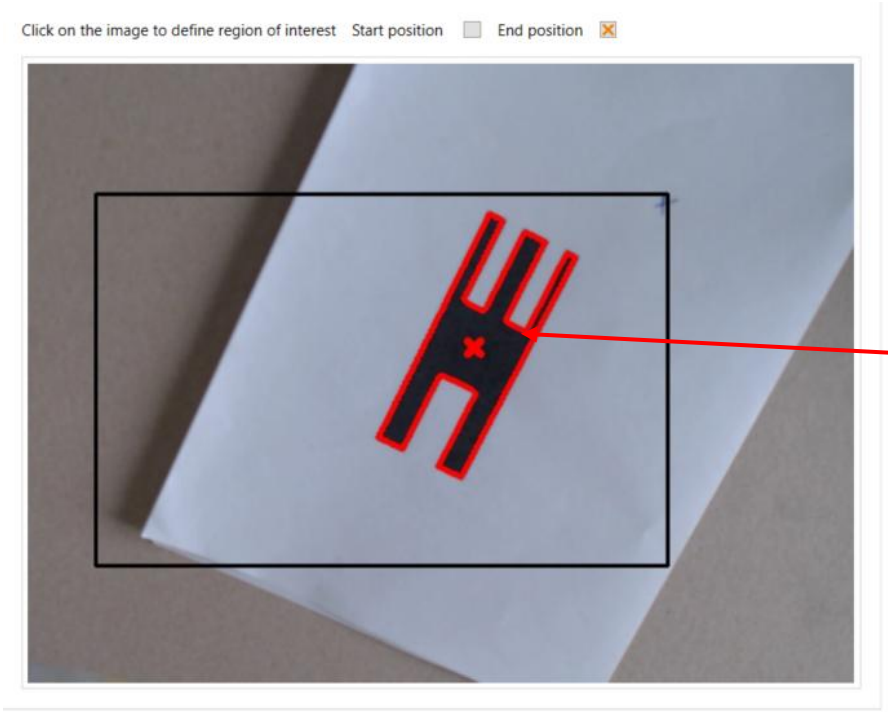

Grip point
not
possible


Offset settings
Offset is measured in mm, with x-, y-, and z direction like the robot if angle is 0 or not selected. If angle is selected, the
angle will be considered. Bear in mind that angle range 0-360 degree is only possible if original contour is saved.
Angle of object: range no angle
Offset X [mm]: 0
Offset Y [mm]: 0
Offset Z [mm]: 0
Offset angle [degree] : 0



You can use this offset for z as well, if the calibration had a different z value as the object.

Offset may be interesting as well if you have unsymmetric objects and want to grap the outside the center. If you want to do this, you can select the range of the angle the object is symmetric. If you have 0 degree the direction offset will be in direction of robot coordinates. If you rotate the object, the offset will be turned as well. If you have an unsymmetric object with an angle between 0-360 degrees, you need to save the original contour first (see 7.4). Otherwise the angle can not be calculated. The following picture will show this.



Grip point without offset

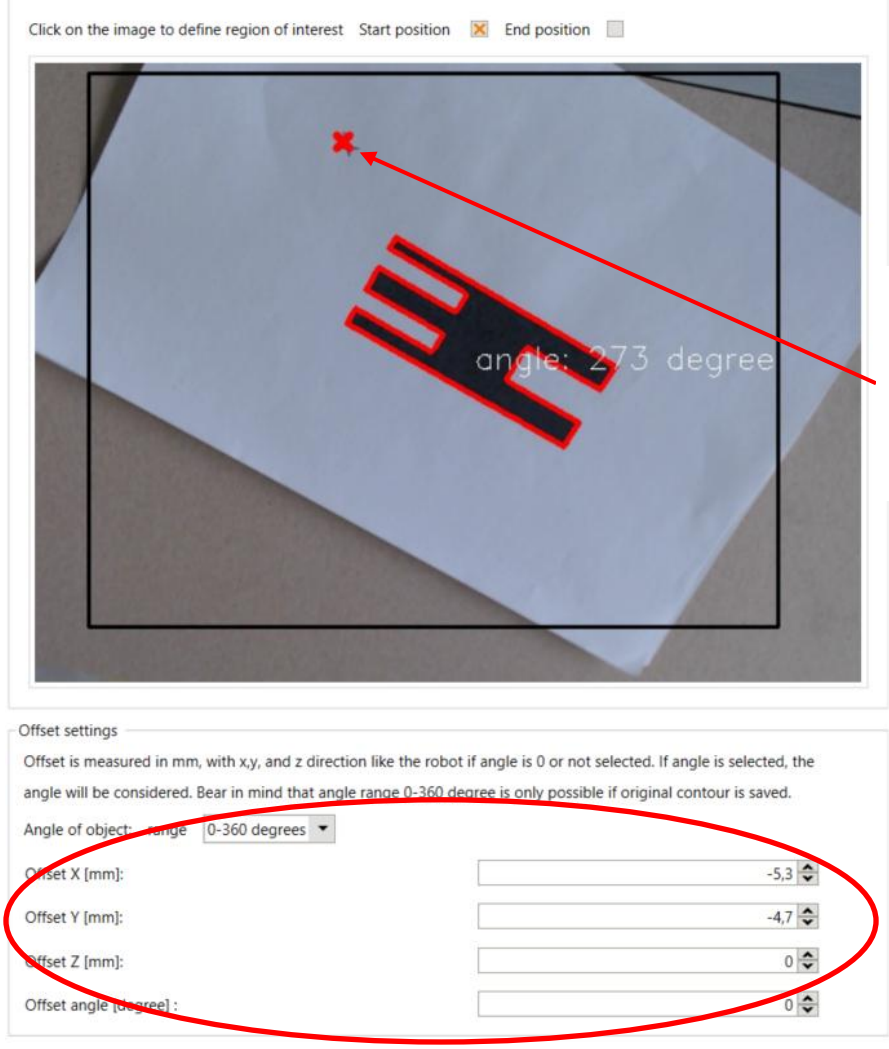
Offset settings

Offset is measured in mm, with x,y, and z direction like the robot if angle is 0 or not selected. If angle is selected, the angle will be considered. Bear in mind that angle range 0-360 degree is only possible if original contour is saved.

Angle of object: range no angle

Offset X [mm]:	0
Offset Y [mm]:	0
Offset Z [mm]:	0
Offset angle [degree] :	0

Grip point with offset without rotation

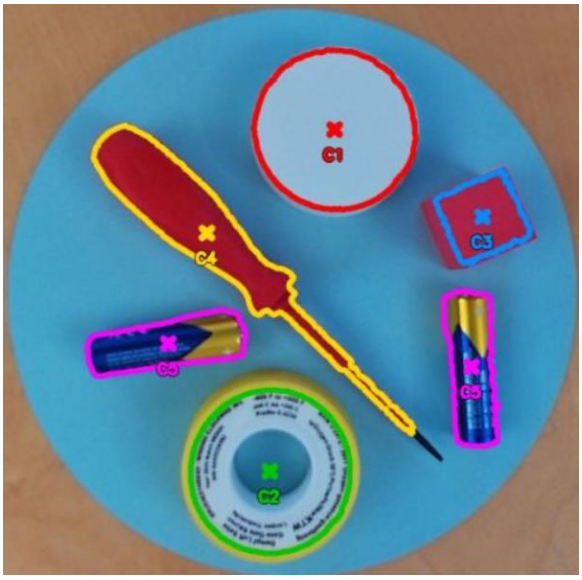


Grip point with offset and rotation

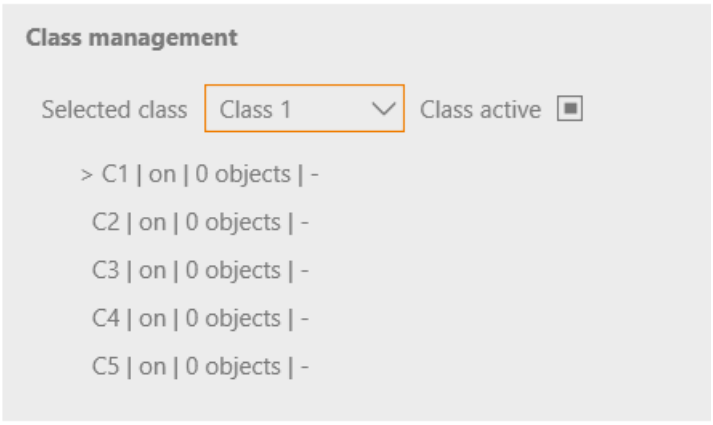
If you add an Offset angle, the offset will be added to the detected angle. In the picture the angle will not be modified, just the angle send to robot will be changed.

10. Class Management PRO

In the 'Pro'-version of the vision app, you can define up to 5 different objects, that will be detected. Those can be trained on color, size and shape of the objects.



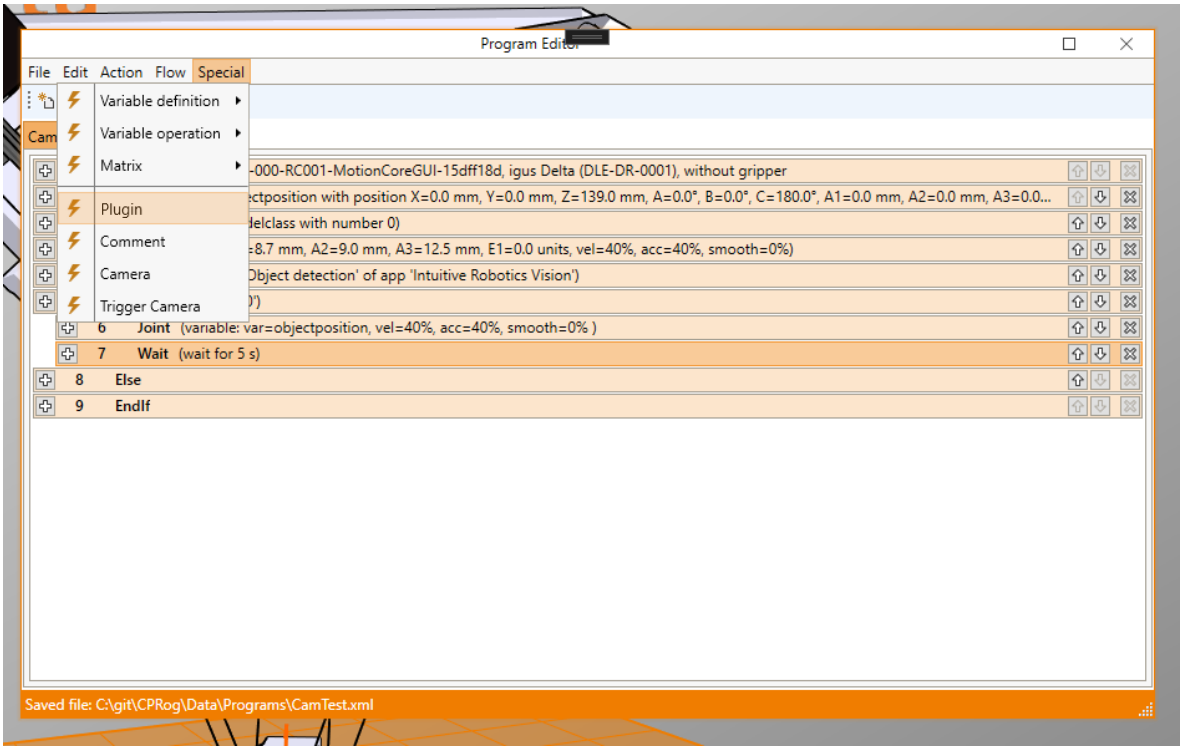
To choose the different classes, go to "Class management" and select the class you want to train.



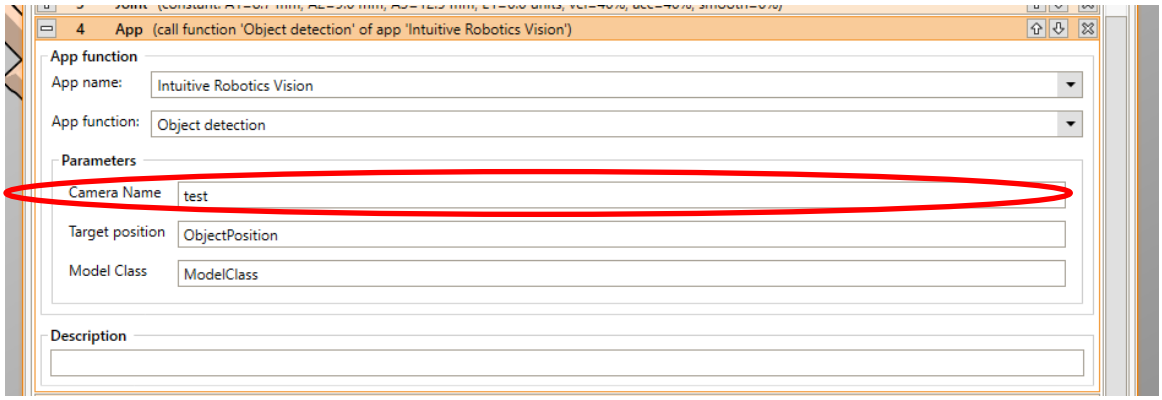
Go through the steps defined in the previous section, to define the class definition. Every setting can be adjusted individually for each class.

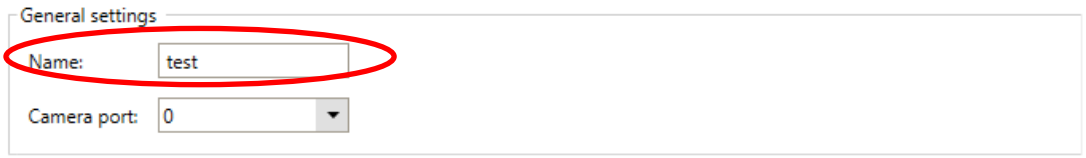
11. Program

You can use the camera by adding a plugin command.



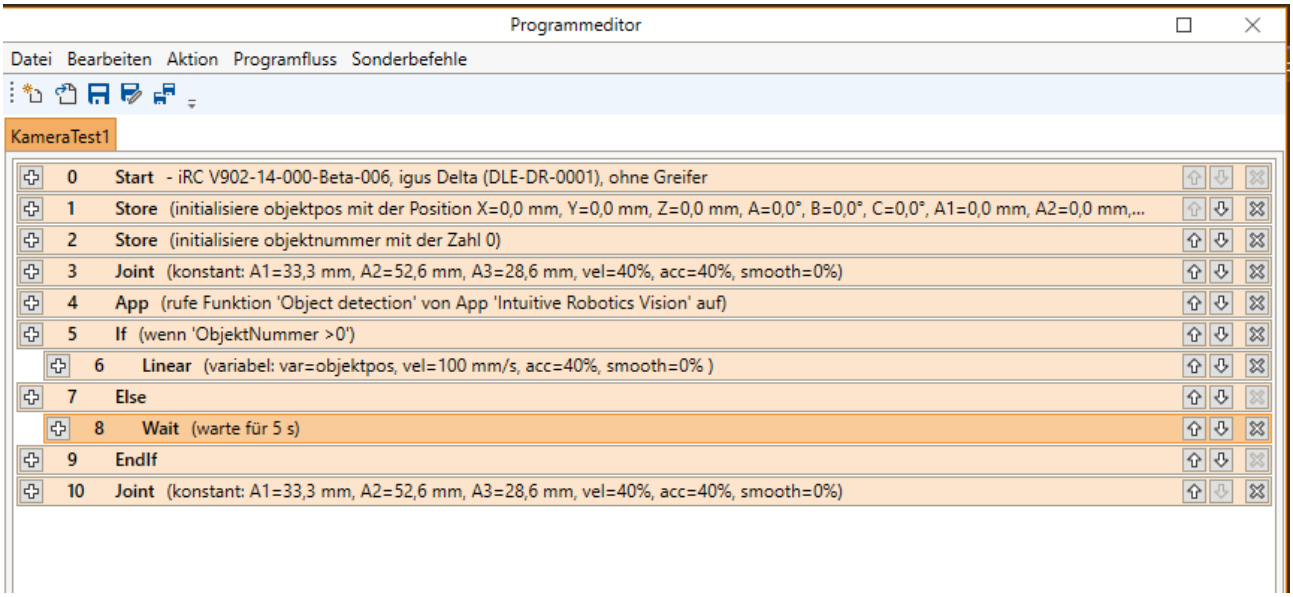
There you can chose Plugin and add Parameters. It is important that the Camera Name is the same as configured in the app.





The variable ObjectPosition gets the position with the configured Offset (see chapter 9) of the object if an object is found. The model class is 1 if an object is found.

Here is a short example where the robot moves to the position of the object if an object is found.



The best way to move to the position of the object is a linear move, because the app returns a cartesian position. It is possible to move to the object with a joint motion as well. The Position will be converted, but if the robot can not reach the position the robot will move to all Joints set to zero instead of returning an error code. In linear motion you will get an error if the robot can not reach the position.