

How to use Pick-it Teach

This article describes how to get started with the Pick-it Teach engine. The Pick-it Teach engine stores one specific shape of a model and can only find parts similar to this specific shape.

Using Pick-it Teach is an intuitive two step process. First you show the part to the camera and store a model of it in the memory of the processor. Second this stored model is used to find similar parts in a new scene.

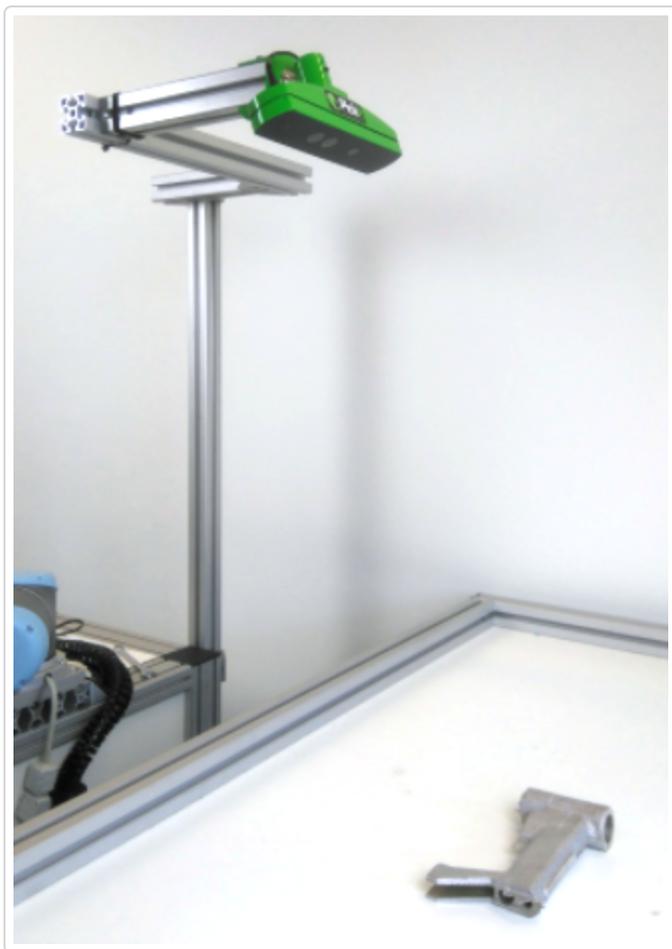
The typical workflow when using the Teach engine is as following:

1. Teach a model based on your product (#chapter01)
2. Detecting different parts in a new setup (#chapter02)

1. Teach a model based on your product

1.a. Initial steps

Mount the camera above a flat surface that is larger than the footprint of the object that has to be taught. The optimal camera height is the height that brings the top of the object to approximately 50-70 cm from the camera.



It's useful to keep the 2D image view open so you have the most accurate representation of what the camera sees.

Next, create a new setup file 'MySetupForTeaching' and a new product file 'MyModel'.

1.b. Isolating the part

Pick-it stores a point cloud of the model which then will be used to find similar parts. So it is important that a good point cloud is stored as a model. A good model contains lots of information of the part and no information of things that don't belong to the part. Therefore it is necessary to isolate the part from its surroundings. This is done by using the Region of Interest box ([//support.pickit3d.com/article/42-define-the-boundaries-of-your-application-with-the-roi-box](https://support.pickit3d.com/article/42-define-the-boundaries-of-your-application-with-the-roi-box)) (ROI).

The ROI box is a hard filter which filters out all points lying outside of this box. Normally, this box defines where Pick-it looks for objects, here, it is used to define which points belong to the model and which don't:

1. Go to the Region of Interest tab and define the Region of Interest box.

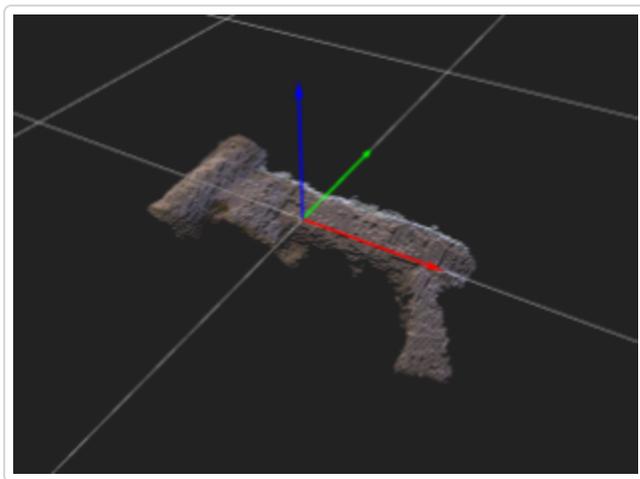
2. Press the Detect button to take a snapshot in the newly defined Region of Interest.
3. Go to the points view and verify the following:
 - a. All parts of the object that are expected to be visible are covered by points. The top part might be missing e.g. because the top of the Region of Interest box is not high enough.
 - b. There should be no other points than the ones belonging to the object. Wrong points might appear because the bottom of the Region of Interest box is not high enough or because your hand is accidentally in the Region of Interest box.

Before going to the next step, save the changes to your 'MySetupForTeaching' setup file by pressing the SAVE button at the bottom of the Region of interest page. Note that the model is not yet saved now.

1.c. Teaching and verifying the model

In this step, the actual model will be defined and saved. Make sure to select Pick-it Teach as the detection algorithm on the Detection page.

1. In the Detection tab go to the Teach model step and press the Teach Model button.
2. In the Product model view, the new model is now displayed.



3. Finally, you can save the changes to your 'MyModel' product file by pressing the Save button at the bottom of the Detection page.

Note that always the full resolution model is saved. Hence, the downsampling resolution, discussed in the next section, can still be changed for a model that has been saved already.

2. Detecting different parts in a new setup

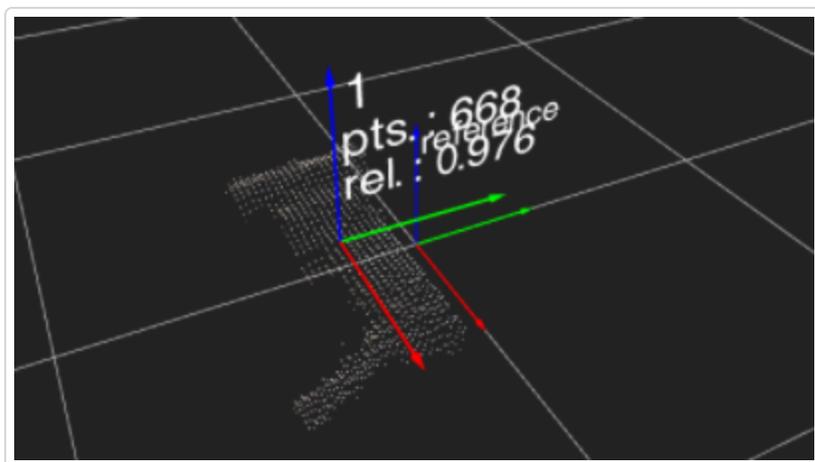
To start using the product model for actual picking, create a new setup file 'MySetup' on the Configuration page. Next, define the Region of Interest on the Region of Interest tab according to your scenario and save it.

2.a. Testing different product scenarios

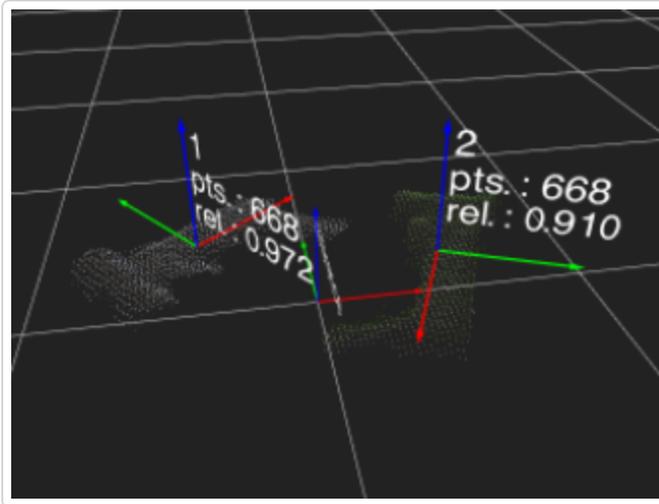
Before testing make sure that downsampling is set to none, both in the Optimize 3D image and the Teach model page.

1. Place one object inside the region of interest box and press the Detect button.

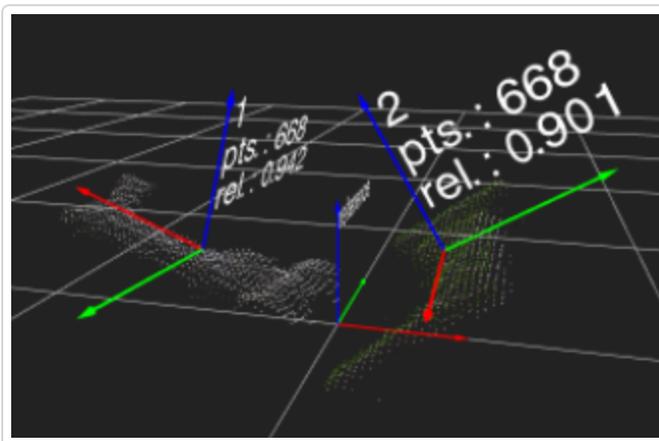
One successfully detected object should appear in the Valid Matches view and the matching score should be close to 1.



2. Add a few more objects into the Region of Interest area and press the Detect button again. At least one successfully detected object should appear in the Valid Matches view and the matching score should still be close to 1.



3. Change the orientation of some of the objects into the Region of Interest area and press the Detect button again. At least one successfully detected object should appear in the Valid Matches view. Depending on how much the object orientation varies from the orientation at the moment of teaching the model, the matching score will be lower, since the number of model points overlapping with the scene reduces.



4. In case there is only one red failed fit (see below), but it does look like a good fit, you can reduce the minimal model coverage 3D on the Filter objects page.

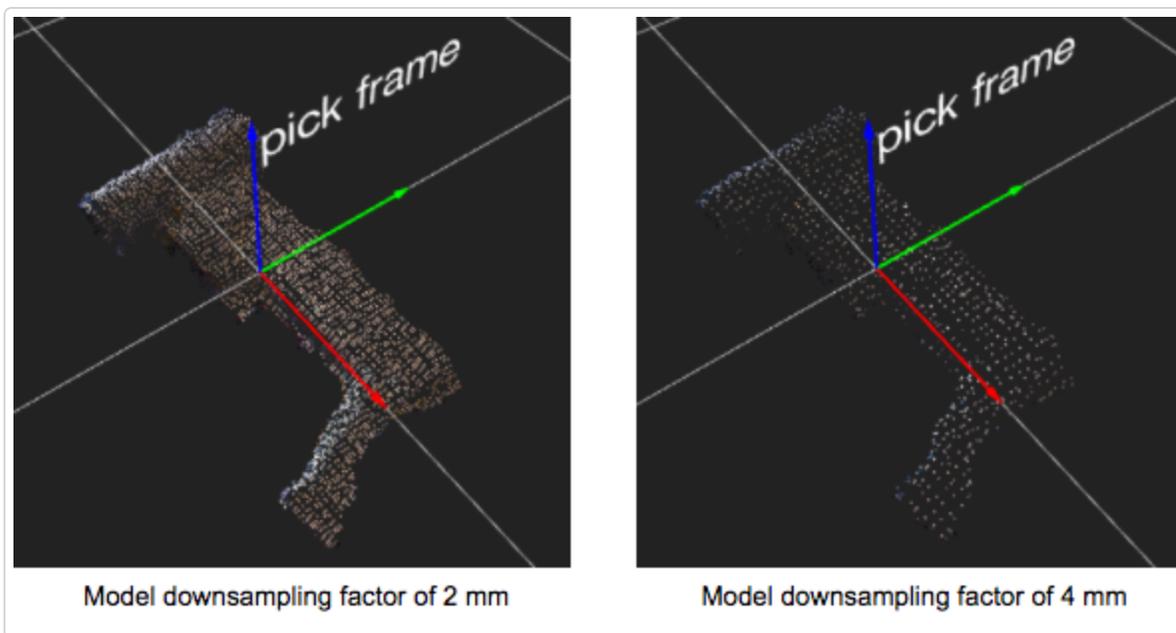
NOTE: There is a hard limit on the Teach matching time of 5 seconds. Before applying any downsampling, this limit is likely to be reached. Optimizing the balance between computational speed and accuracy is discussed in the next section.

2.b. Optimize detection time

Depending on the model and the scenario, the detection time resulting in a good balance between computational speed and accuracy can vary from **1 to 5 seconds**. If you want to reduce the detection time, you can look at downsampling both the model and the scene.

A model providing a good balance between computational speed and accuracy is about 500 to 1000 points large. If the size of the model is too large, you have to increase the Model downsampling resolution to reduce the number of points in the model. Also the scene can be downsampled by means on the Scene downsampling resolution.

The effect of downsampling can be verified in the Product model view for the model and in the Points view for the scene.



A typical value for the *Model downsampling resolution* is smaller than 5 mm. A good value for the Scene downsampling resolution depends on the scenario:

- Table-top picking: the sole purpose of downsampling the scene is to speed up the detection time. It is recommended to use the same value as for the Model downsampling resolution.
- Bin picking: the Pick-it camera resolution drops exponentially with the distance to the camera. Hence, the downsampling can be used to create a more uniform resolution over the whole depth range required for covering the bin. If the resolution is uniform, also the detection time and the resulting model coverages will be uniform over the depth range.

An in depth explanation of the different parameters of Pick-it Teach is explained in this article.
([//support.pickit3d.com/article/48-explaining-the-teach-detection-parameters](http://support.pickit3d.com/article/48-explaining-the-teach-detection-parameters))

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