

# Annotation Tool

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Available at  
<http://www.ipb.uni-bonn.de/~flip/annotation-tool/>



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# Chapter 1

## Introduction

### 1.1 What is Annotation Tool?

*Annotation Tool* is a MATLAB-based image annotation tool developed at University of Bonn for the eTRIMS<sup>1</sup> Image Database. The Annotation Tool employs the LabelMe MATLAB Toolbox developed at MIT. LabelMe is also a WEB-based open image annotation tool developed at MIT for the LabelMe Image Database.

### 1.2 Setup

Download the MATLAB Toolbox for the LabelMe Image Database<sup>2</sup> and add it to MATLAB search path, e.g.:

```
C:\LabelMeToolbox
```

Download the Annotation Tool<sup>3</sup> and add it to MATLAB search path, e.g.:

```
C:\AnnotationTool
```

Create home folders for your image data and annotations, e.g.:

```
C:\my-image-database\images
```

```
C:\my-image-database\annotations
```

---

<sup>1</sup><http://www.ipb.uni-bonn.de/projects/etrims/>

<sup>2</sup><http://labelme.csail.mit.edu/LabelMeToolbox/LabelMeToolbox.zip>

<sup>3</sup><http://www.ipb.uni-bonn.de/~filip/annotation-tool/>

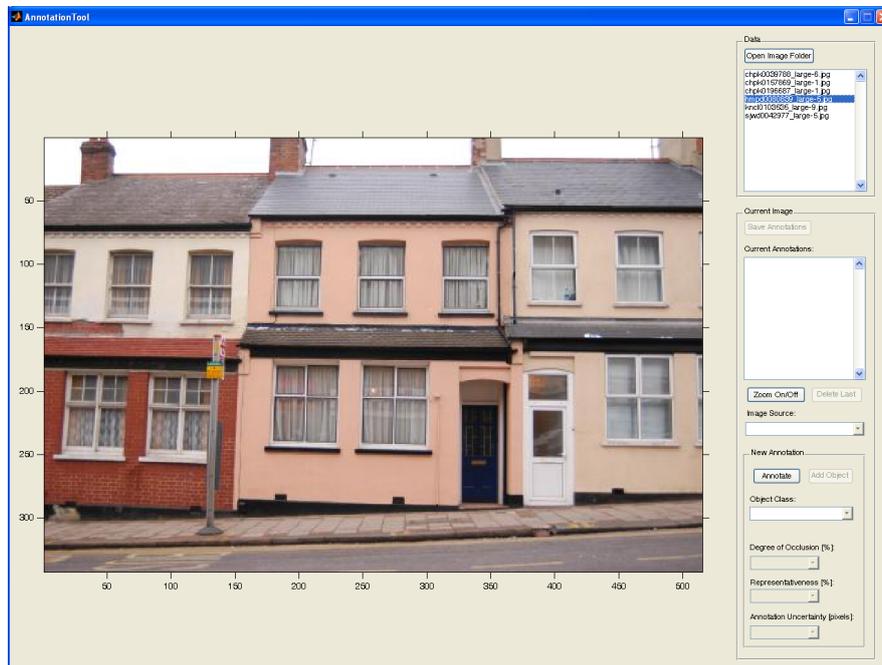


Figure 1.1: A screen shot of the Annotation Tool.

The Annotation Tool comes along with three text files two of which should contain the home folder paths. Write the image data home directory and the annotations home directory in the corresponding text files:

```
C:\AnnotationTool\home-images.txt
```

```
C:\AnnotationTool\home-annotations.txt
```

Now you should create directories with your image data sets, e.g.:

```
C:\my-image-database\images\image-dataset1
```

```
C:\my-image-database\images\image-dataset2
```

and copy your image data in these, e.g.:

```
C:\my-image-database\images\image-dataset1\my-image.jpg
```

It is obligatory to create the image data set subdirectory as this folder name will be stored with the annotation.

In MATLAB you can now run `AnnotationTool.m`. After the first image is labeled, the annotation is stored in an XML file of the same name as the labeled image. This XML file with annotation is saved in the annotations home directory in a directory of the same name as the image data set directory of the labeled image, e.g.:

```
C:\my-image-database\annotations\image-dataset1\my-image.xml
```

# Chapter 2

## Image Annotation

### 2.1 Labeling Image Data

Have a look at the *Data* panel in the upper right corner of Fig. 1.1 first. Open an image dataset folder by pressing the button *Open Image Folder*. Then select an image in the list box underneath. You may now specify the *Image Source* on the *Current Image* panel. In case the pop up menu does not offer a relevant option, you may specify an alternative source of the image by choosing the option “*other...*”, see Fig. 2.2a,d.

After pressing the *Annotate* button on the *New Annotation* panel the tool will switch to annotation mode where only image labeling using the mouse is allowed. Annotate by pressing the left mouse button and clicking in the image area. Pressing the right mouse button will finish object labeling and will close the polygon, see Fig. 2.1. If you press the *Annotate* button now, the previous label will be erased and you may label the object again. Pressing the right mouse button without having labeled anything will just cancel the annotation mode.

The zoom feature should ease the annotation of smaller objects. By pressing the *Zoom On/Off* button on the *Current Image* panel the tool will switch to zoom mode where only zooming using the mouse is allowed. Pressing the left mouse button will zoom in, pressing the left mouse button with the *Alt* modifier key will zoom out. You have to press the *Zoom On/Off* button again to return from the zoom mode, see Fig. 2.6. Labeling may now take place in the zoomed image.

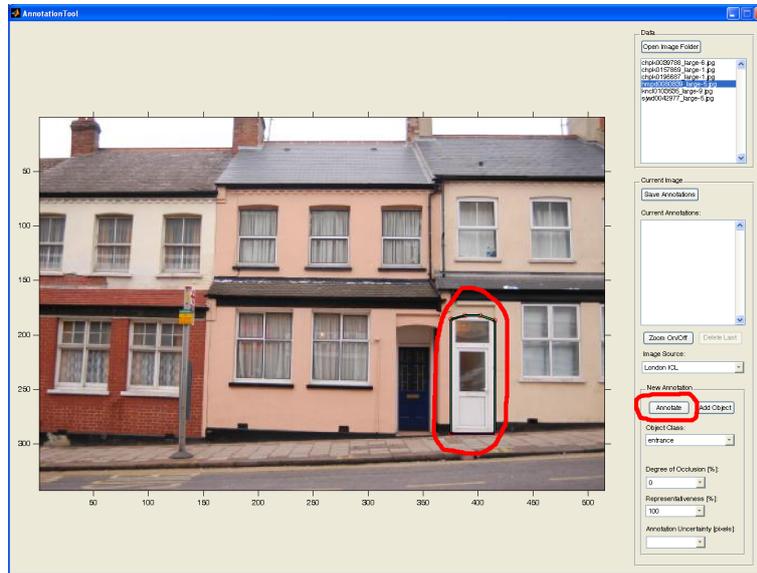


Figure 2.1: Annotating an image object.

## 2.2 Object Annotation

Having labeled an image object you may now specify its class, degree of its occlusion and representativeness, see Fig. 2.2 for illustration.

It is possible to specify an alternative object class name by choosing the option “*other...*” in the *Object Class* pop up menu. The Annotation Tool comes along with three text files, one of which, called `object-classes.txt`, contains a list of the object class names. You may also extend the set of classes by simply editing the text file.

Last value to specify is the annotation uncertainty: A labeler’s estimate in pixels of how precise the labeling is. Fig. 2.3 illustrates a tool helping the labeler to estimate the value. A set of green and red concentric circles is drawn in the middle of the new object label. A diameter of the red circle in pixels corresponds to the value chosen in the *Annotation Uncertainty* pop up menu.

Having specified all the required information you may add the annotation to the *Current Annotations* list box by pressing the *Add Object* button. An illustration is given in Fig. 2.4. A login that should specify the labeler and the place of annotation is required when adding the first object. This information is added to the annotation of every labeled object. You need to restart the Annotation Tool if a new labeler wants to log in.

After adding the new annotation to the pool of the current annotations you have the possibility of deleting it by pressing the *Delete Last* button. It

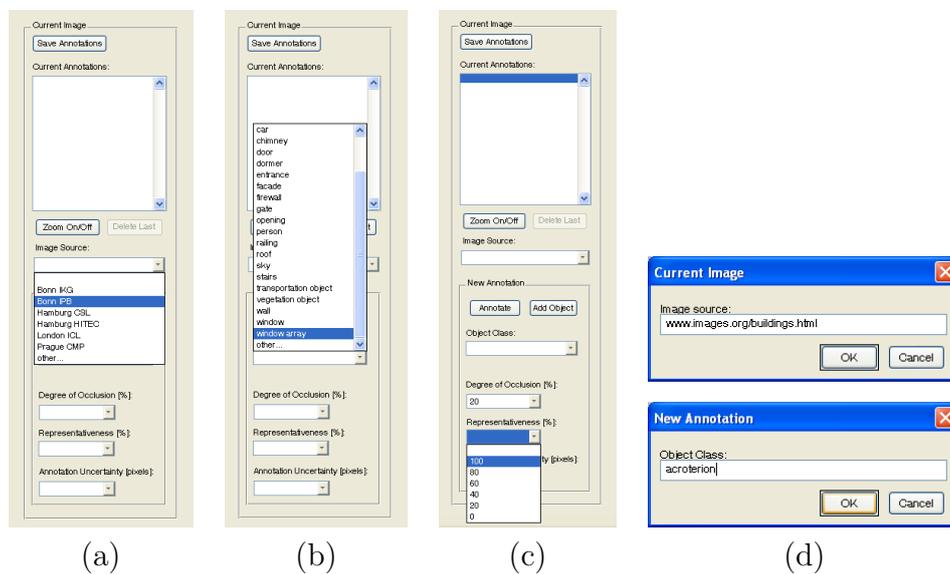


Figure 2.2: Specifying the image source (a), class of the image object (b), degree of its occlusion and representativeness (c). It is possible to specify an alternative source of an image and an alternative object class name (d).

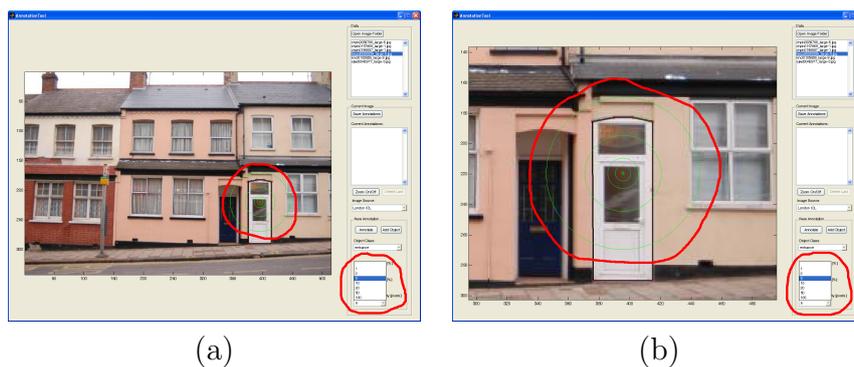


Figure 2.3: Specification of annotation uncertainty. A simple tool helps the labeler to estimate the value (a). A zoom feature allows us to view the tool in detail (b).

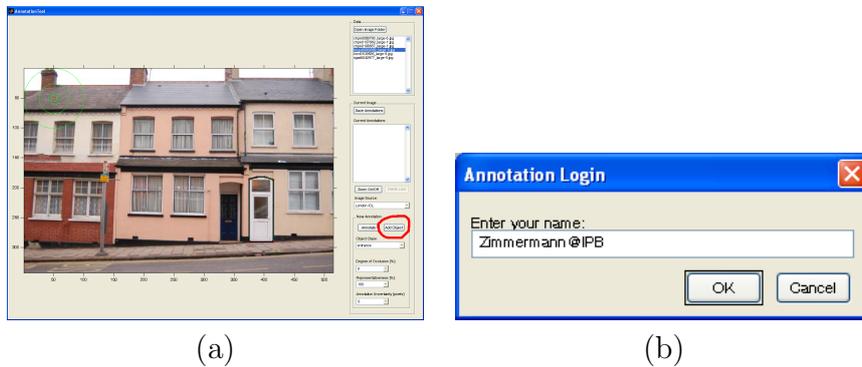


Figure 2.4: Adding an annotated image object to current annotations (a). A login specifying the labeler and the place of annotation is required when adding the first object (b).

is only the last added annotation that a labeler is allowed to erase. Press the *Save Annotations* button if you wish to save all current annotations to a file.

## 2.3 Viewing Labels

After some annotations have been added you may browse the list of *Current Annotations* and view single image object labels as you can see in Fig. 2.5. While viewing the annotations, you may zoom the image in and out and view labels in detail, see Fig. 2.6.

In case you wish to view all labels click on the image file in the list box on the *Data* panel. All labels at once will be displayed superimposed on the image, see Fig. 2.7.

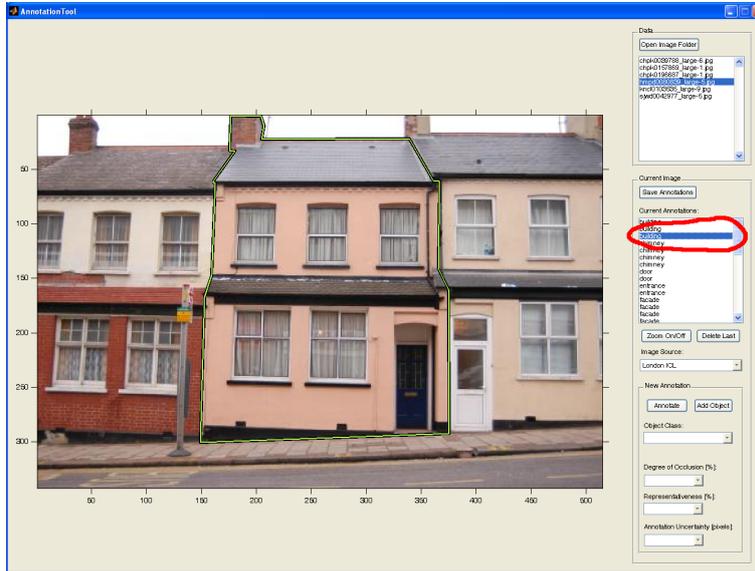


Figure 2.5: Browsing the list of current annotations and viewing single image object labels.

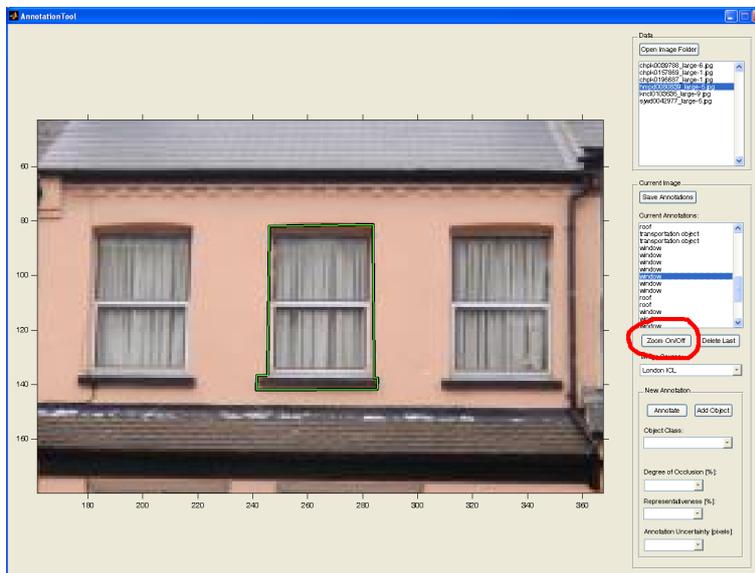


Figure 2.6: A zoom feature should ease the annotation of smaller objects and allow viewing current labels in detail.

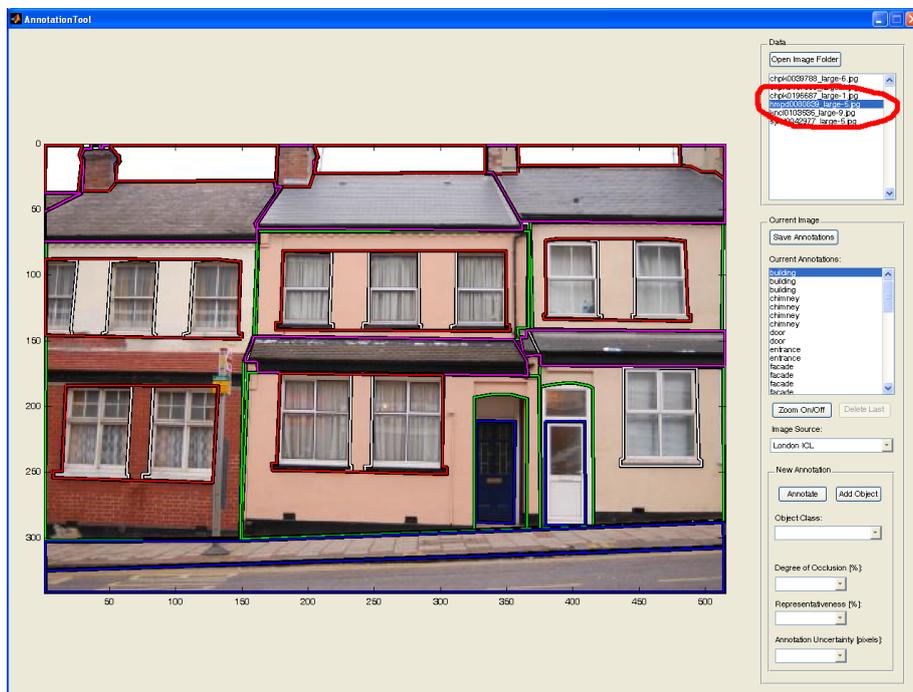


Figure 2.7: Viewing all image object labels at once.

## Chapter 3

# Annotation File

Image annotations are stored in XML files. Annotating a window in `my-image.jpg` image file will produce `my-image.xml` annotation file of the following form:

```
<annotation>
  <filename>my-image.jpg</filename>
  <folder>image-dataset1</folder>
  <sourceImage>popular art</sourceImage>
  <object>
    <name>window</name>
    <occlusion>0</occlusion>
    <representativeness>100</representativeness>
    <uncertainty>5</uncertainty>
    <deleted>0</deleted>
    <verified>0</verified>
    <date>11-Aug-2006</date>
    <sourceAnnotation>Zimmermann@IPB</sourceAnnotation>
    <polygon>
      <pt>
        <x>94.3898</x>
        <y>122.5168</y>
      </pt>
      <pt>
        <x>94.3898</x>
        <y>142.7263</y>
      </pt>
      <pt>
        <x>117.4493</x>
        <y>142.8558</y>
      </pt>
    </polygon>
  </object>
</annotation>
```

```
</pt>  
<pt>  
  <x>117.5789</x>  
  <y>122.3873</y>  
</pt>  
</polygon>  
</object>  
</annotation>
```

# Appendix A

## Annotation Tool Version 1.7

### A.1 What is Annotation Tool Version 1.7?

The Annotation Tool was first released in August 2006 and it is regarded as Version 1.0. The Annotation Tool Version 1.7 was released in February 2007 and extends the original Version 1.0 with a number of new features.

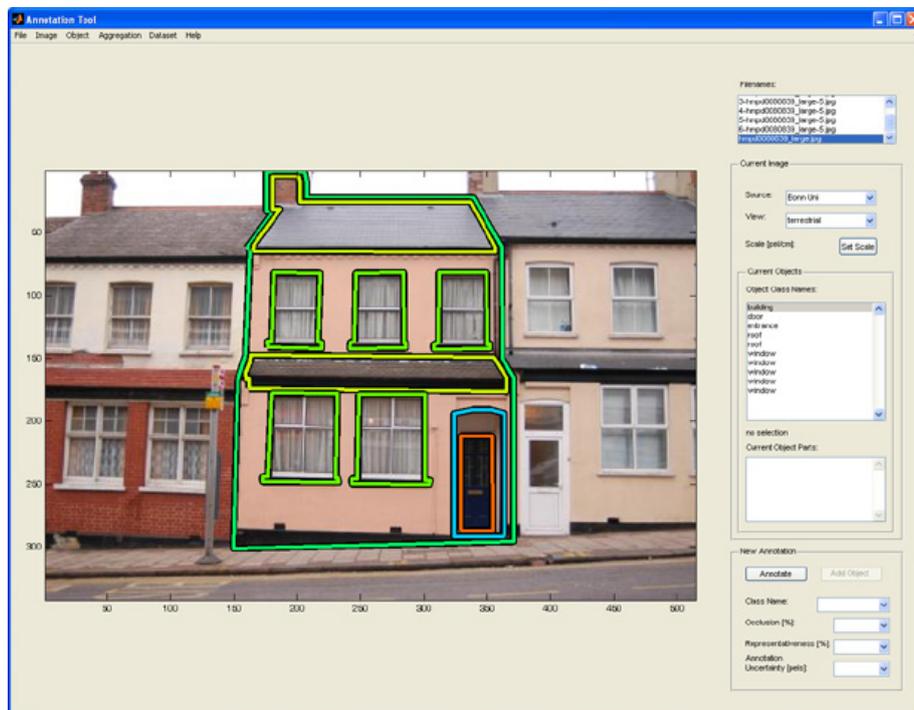


Figure A.1: A screen shot of the upgraded Annotation Tool.

## A.2 New Features and Changes

The following section summarizes what is new in Version 1.7 and addresses extensions of both the Annotation Tool and the Annotation XML.

### A.2.1 Extension of the Annotation Tool

#### Image Rectification Tool

Rectify an image by clicking the menu item *Rectify* or by pressing the corresponding shortcut keys. First, identify a pair of lines with a common vanishing point in the displayed image. Identify a line by clicking two points in the image that lie on the line. The automatic zoom feature allows the user to place these points more precisely. Second, identify a different pair of lines with other vanishing point. Afterwards, the image will automatically be transformed and saved in a file. The pairs of lines identified should appear parallel in the resulting image.

After rectification, relevant image-related annotation data of the original image are automatically loaded, displayed and saved in an annotation file of the new rectified image.

The rectification *transformation matrix* will automatically be saved in the annotation XML file of the original and the rectified image. The matrix coefficients are saved with precision of 15 digits.

After rectification, object-related annotation data of the original image are also automatically loaded and displayed. Object region boundaries, annotated in the original image, are automatically transformed to the coordinate system of the rectified image (in pixels). The transformed object region boundaries are automatically superimposed on the rectified image. The object-related annotation data is then saved along with the transformed object region boundaries in an annotation file of the rectified image.

#### Transformation of Annotated Object Regions

The transformation matrix saved in the annotation file of both the original and the rectified image is used to transform object region boundaries annotated in the original image to the coordinate system of the rectified image and vice versa. Hence, object regions may be annotated in either the original or the rectified image. It is then possible to transform, view and save the annotation in both kinds of images.

## Aggregation of Object Regions

Aggregation allows us to define a *part-of* relation between the object regions. That means that object regions may be defined to be parts of different aggregate object regions.

Set an aggregate by choosing an object from the listbox on the panel *Current Objects* and click the menu item *Set Aggregate*. Add an object as a part of the aggregate by choosing it from the same listbox on the panel *Current Objects* and clicking the menu item *Add Part* or pressing the corresponding shortcut keys. The name of the part will appear in the listbox *Current Object Parts*. Aggregate more parts in this way. Finish the aggregation procedure by clicking the menu item *Finish Aggregation*.

To view object regions with their parts, check mark the menu item *Show Aggregate with Parts*. Otherwise, only the object region boundary of the aggregate will be plotted into the axes. To view an individual part of an aggregate object, choose its name in the listbox *Current Object Parts*. The corresponding object region boundary will be plotted into the current axes.

Object parts are realized as a set of IDs within the aggregate object. The set of IDs is saved along with the object-related annotation data in the annotation XML file.

## Miscellaneous

The type of image view may now be specified in the popup menu *View*.

The image scale may be specified by clicking the button *Set Scale*. After pressing the button, click two points within the image with known vertical distance and enter the distance in centimeters. It is the difference of vertical coordinates of the two points that is considered in the computation of scale.

It is not only the object region boundary that is plotted into the current axes, when an object region is chosen in the listbox on the panel *Current Objects*, but also the corresponding object-related annotation parameters are displayed on the panel *Current Object*. To update an object-related annotation parameter of a previously annotated object region, select this object in the listbox and update the annotation parameter displayed on the panel *Current Object*.

## Tool Robustness, Annotation Safety and User Comfort

The graphical user interface (GUI) lay-out was re-designed and a menu was added to suit the complexity of the tool.

Relevant and irrelevant user interface controls are respectively enabled and disabled for greater robustness of the tool, comfort of the user and safety

of the annotation.

Functionality has been improved by adding features for deleting, sorting or canceling actions. Delete an annotated object region at all times by clicking the menu item *Delete Current Object*. Delete an object part any time by clicking the menu item *Delete Part*. Sort object class names of the annotated object regions by clicking the menu item *Sort* and save them in the sorted order in the annotation XML file by clicking the menu item *Save Annotation*. Cancel rectification procedure with the right mouse button any time.

The rectification zoom feature zooms in a neighborhood of the clicked point and allows the user to place a point more accurately. The size of the neighborhood is determined as a fraction of image diagonal and is thus independent of the image size.

The dataset directory name (folder tag) in the XML file is updated according to the current path when loading an annotation. The dataset directory may thus be renamed.

## **Changes**

It is now voluntary to specify the value of the *Representativeness* and *Annotation Uncertainty* listboxes.

## A.2.2 Extension of Annotation XML

New tags in the annotation XML:

- New *image*-related XML tags:
  - New tags accessible through GUI:
    - \* View Type - “aerial”, “terrestrial”, “other...”
    - \* Scale Estimate (in centimeters per pixel) - real number, “n/a” (not available)
  - New tags adjusted automatically:
    - \* Image Size (in pixels) - width, height
    - \* Rectification Transformation Matrix
    - \* Rectification Flag
- New *object*-related XML tags:
  - New tags are adjusted automatically
    - \* Object ID - number composed from date and time to within milliseconds precision. Created when new object annotation is added.
    - \* Object Parts - set of IDs corresponding to the object regions that have been identified by the labeler as parts of the object region.