Imagetagger: An Open Source Online Platform for Collaborative Image Labeling **Niklas Fiedler**

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Abstract

The Imagetagger is a database with integrated tools to create and manage image data and related labels. It was designed for the RoboCup to create training data for neural networks and evaluation data for diverse object recognition methods. Therefore cooperative labeling of the same data set, flexible further use of the images and labels and the option to share the data had to be made possible.

Introduction

In 2016 Daniel Speck presented a neural network architecture to localize balls on images in the RoboCup environment [1]. In the future work section he proposed to increase the training data set for better results. The lack of sufficient training data motivated the development of the Imagetagger. As a result of providing the tool as online platform, the exchange of image sets between teams is promoted. The process of manual image labeling has to be efficient enough to label large amounts of images.

To manage the large amount of images, image sets are used. An image set consists of the images it contains and additional information about the whole set. This information includes the location where the images got created. On the server side, the image sets are represented in directories (in the file system), allowing it to also work directly on the files. Image sets are owned by teams, thus they are allowed to edit properties and add or delete images.

Imagetagger	Home Explore r
Create new Expertformet	
Create new Exportformat:	
Name	
Team	

Image Labeling

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zig_robocup16_004.862.png				
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zig_robocup16_004.865.png			393	
zig_robocup16_004.866.png		y1	365	
zig_robocup16_004.867.png				
zig_robocup16_004.868.png		y2	414	
zig_robocup16_004.869.png				
zig_robocup16_004.870.png				
Zig_robocup16_004.871.png			Save (v)	Sect (r)
zig_robocup16_004.872.png				
2/g_robocup16_004.873.png		<	Last (a)	< Back (s)
zig_robocup16_004.875 ppg				
zig_robocup16_004.876.png			>Skip (d)	> RNext (f)
zig_robocup16_004.877 ppg				
zig_robocup16_004.878 png				
zig_robocup16_004.879.png				
pzig robocup16 004.880.png	Annotations:			
pzig robocup16 004.881.png				
zig robocup16 004.882.png	ball:			
zig robocup16 004.883.png	x2: 386 • x1: 332 • y2: 413 • y1: 359			
zig_robocup16_004.884.png				
zig_robocup16_004.885.png				
pzig_robocup16_004.886.png				

Figure 1: The labeling view consisting of the list of images, the image itself, a list of already existing labels and the annotation tool window.



Imagesets

Imagetagger

bitbots-nagoya-01 (1000 images)

Collaboration

- bitbots-nagoya-euro-ball-01 (3736 images)
- bitbots-nagoya-euro-ball-game-01 (5240 images)
- bitbots-set00-01 (1000 images)
- bitbots-set00-02 (1000 images)
- bitbots-set00-03 (1000 images)
- bitbots-set00-04 (1000 images)
- bitbots-set00-05 (1000 images)
- bitbots-set00-06 (1000 images)
- bitbots-set00-07 (1000 images)
- bitbots-set00-08 (1000 images)
- bitbots-set00-09 (1000 images)
- bitbots-sequence-leipzig-fabian (1673 images)

Membe	rs			
Add member	username	Ad	ld	
10bestman		[kick]	[grant admin]	
jenny		[kick]	[grant admin]	
Jonas		[kick]	[grant admin]	
6stelter		[kick]	[grant admin]	

Figure 3: In the team view, the image sets and members are listed with the option to add team members and create new image sets.

The Imagetagger provides features to enable a collaboration on two levels: The members of a team and the teams among themselves. It offers multiple options to export labels and up- or download images which teams can use to easily share their data set. Every team member is able to create and edit image sets owned by the team. Image sets owned by the team can be set either private, to be only accessible for team members, or public, which allows all users to use the image set. This system offers a convenient way to share the training data while providing the possibility to keep an image set closed for public access when needed.

AnnotationType: goal AnnotationType: Heron

AnnotationType: concealed ball

Minimum Amount of Verifications needed:

Base format

Create imageset

Name

Name

Location

Public 🗆

Create

Location

- Use the following placeholders to integrate specific details into your Format:
- %%imageset: name of the imageset
- %%setdescription: description of the imageset
- %%team: team of the imageset
- %%setlocation: location of the imageset
- %%content: the content of the annotation format and the not in image format

Annotation format
Use the following placeholders to integrate specific details into your Format:
%%image: name of the image
%%type:b annotation type
%%veriamount: the amount of verifications for the annotation
%%x1, %%relx1: x1-coordinate of the annotation, absolute or relative value
%%x2, %%relx2: x2-coordinate of the annotation, absolute or relative value
%%y1, %%rely1: y1-coordinate of the annotation, absolute or relative value
%%y2, %%rely2: y2-coordinate of the annotation, absolute or relative value
%%cx, %%relcx: x-coordinate of the center of the annotation, absolute or relative value
%%cy, %%relcy: y-coordinate of the center of the annotation, absolute or relative value
%%rad, %%relrad: radius of the annotation, absolute or relative value
%%dia, %%reldia: diameter of the annotation, absolute or relative value
%%width, %%relwidth: width of the annotation, absolute or relative value
%%height, %%relheight: heigth of the annotation, absolute or relative value

Not in image format Use the following placeholders to integrate specific details into your Format: %%image: name of the image %%type: type of the image

The actual labeling procedure is designed to be as intuitive and fast as possible. Therefore the UI is kept clean and simple with a flat menu structure. The most commonly used functions are mapped to keyboard shortcuts to optimize the labeling efficiency. A check box enables the option to keep the selection for the next image, which is useful when labeling a series of similar images. The choice to label "not in image" allows the user to explicitly label the absence of an object in an image. To support fast labeling, the next images get preloaded so even with a slow connection to the server the images are shown quickly.

Already existing labels can be edited and deleted directly in the labeling view. The bidirectional continue buttons allow two users to traverse through the image set towards each other.

Image Management

magetagger			Home Explore nikl
annotation type: ball • filter	bitbots-nagoya-01		Annotation management
images	Name	bitbots-nagoya-01	Manage annotationsVerify annotations
 ball_move_1_00002.png ball_move_1_00002.png 	Team	Bit-Bots	
 ball_move_1_00003.prig ball_move_1_00004.prg ball_move_1_00005.prig 	Location	nagoya	Export tags to file
 bail_move_1_00005.png ball_move_1_00006.png 	Description	nagoya images	Bit-Bots/Al Ball Export
 ball_move_1_00007.png ball_move_1_00008.png 	Image count	1000	Create Format
 ball_move_1_00009.png 	Appotation count	1176	

Automated Labeling

The automated labeling feature is currently work in progress. The Imagetagger offers a basis to enable automated labeling of images. As shown with a prototype, a large neural network is able to detect objects, e.g. soccer balls, precise enough to create usable labels. To be able to distribute the labeling to multiple systems and to separate the automated labeling from the website deployment, a REST-API could be used.

Label Verification

filter already verified tags

pitbots-set00-09

'y2': 349, 'y1': 325}

'y2': 353, 'y1': 328]

'y2': 356, 'y1': 332

'y2': 354, 'y1': 330

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	Home Explore	niklas 👻

Dark Ka			

Figure 5: To create an export format, the user has to define the name of the format, the types of labels and the base structure of the output.

To be useful for as many approaches as possible a flexible export format is needed. Every team has the possibility to export the labels in a format compatible to their existing conventions. This is achieved by the export format creator, which offers a way to individually specify the format in which annotations get exported into text files. With the format barrier removed, the collaboration among teams is possible even with completely different approaches and implementations of the use of the labels.

Conclusion

Currently the Imagetagger offers a way to manage and create images data sets and labels. In the near future an option to label automatically will be introduced to offer a way to produce a lot of labels. Additionally it is possible to extend the Imagetagger for labeling other types of data, because it's easily extendable and open source.



Figure 2: The image set management view showing the list of pictures included in the image set, status information, a download script, an editor for meta data and an upload area.



Figure 4: The image set management view showing the content of the image set, status information, a download script, an editor for meta data and an upload area.

Labels can be verified by users to increase the confidence in them. While manually created labels get verified by their creator or last editor by default, the automatically created labels are unverified on creation. These labels need to get verified by a user. The amount of verifications can be used to filter the labels.

The code is available on GitHub: https://github.com/bit-bots/imagetagger

References

[1] Daniel Speck. Ball localization for robocup soccer using convolutional neural networks, 2016.

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