Open Research Challenge –
Video analysis / statistics

Labeling Instruction

rc-spl-tc@lists.robocup.org
Arne Moos - Member of the TC

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1 Introduction

Dear participating team, this is a short guide regarding the necessary labeling of image sequences for this challenge. For this, the Go-Pro videos of the team Berlin United from RoboCup 2019 were taken (in the best case each team should have received a sequence for a game with itself[1]) from which then a continuous sequence of 5000 frames was selected and which must now be annotated until February 01, 2022.

These image sequences were extracted[2] from the Go-Pro videos[3][4] and renamed according to their timestamp (in milliseconds) since the beginning of this halftime. A frame rate of 29.97 fps was used for the calculation and the delay between the start package and the starting of the recording was compensated as well as possible. In addition, the GameController and TeamCom logs are uploaded, once in raw format[5][6] (i.e. Java serialization) and once in converted form using the JSON format. For the JSON format GameController (`*.g.json`) and TeamCom (`*.tc.json`) logs are separated.
Consequently, the timestamp in the image name and the timestamp in the GC/TC logs should match. However please note that the GameController / TeamCom events may still be delayed from the image timestamp!

[1] `https://tu-dortmund.sciebo.de/s/1akh5dJbuNcss0i`
[2] `ffmpeg -i video.MP4 -qscale:v 2 frames/%%05d.jpg`
[3] `https://logs.naoth.de/2019-07-02_RC19-others/`
[4] `https://logs.naoth.de/2019-07-02_RC19/`
[5] `https://github.com/RoboCup-SPL/GameController/blob/RoboCup2019/src/data/AdvancedData.java`
[6] `https://github.com/RoboCup-SPL/GameController/blob/master/include/RoboCupGameControlData.h`

2 Labeling

As already described in the official rules[7], the following things should be labeled:

- Labeling of all robots participating in the game and the (main) ball: These objects should be labeled using bounding boxes, characterized by the top-left and bottom-right corner, see Sec. 3. Special attention should be paid to the bottom edge as this will be used to determine the position of the object.
- In addition, the robots must be labeled with their jersey color and jersey number, see Sec. 3. However if the jersey number is not identifiable an ID starting with the number 100 and upwards should be used instead to clearly identify this robot in the sequence.
  Note: It could happen that you can't identify a robot and therefore give it an unique ID $\geq$100 and later you see its player number. Then this robot should also get its jersey number retroactively for all previous frames instead of the ID $\geq$100.

Here now follow some more details:

- The upper left corner of the images has the coordinate (0/0) and the lower right corner has the coordinate (1919/1079).
- If an object is not completely hidden and you can still see a little bit of it, this object should be labeled with the estimated full size of the object.
- If a robot with a number/ID is completely hidden and appears afterwards again (e.g. during a penalty) than this object should NOT get a new number/ID. Instead it should be merged with the previous one. Conversely, this means that almost never more than 6 (5 + one potential substitute) numbers/IDs are assigned to robots per log file/image sequence and team!
- Here you can find a link to the RoboCupTools[8] repository where the team Berlin United did already some stuff with the images from their cameras, especially an intrinsic (and extrinsic) calibration.

3 Format

The annotations should be saved and uploaded (to the same folder as you downloaded the images/gc data) as a single file per image sequence (so only one file per participating team) in the CSV[9] format where the columns must be as follows:

[7] https://github.com/RoboCup-SPL/Rules

[8] https://github.com/BerlinUnited/RoboCupTools/blob/master/Tracking/calculate_camera_parameters.py#L54

[9] https://en.wikipedia.org/wiki/Comma-separated_values

Filename	Label	x_{min}	y_{min}	x_{max}	y_{max}	Color	Number
test.jpg	0	0	0	1919	1079	0	100
test.jpg	1	300	300	400	400	-1	-1
...	...	...	...	...	...	...	...

Thus this CSV file would look like that:

```
test.jpg,0,0,0,1919,1079,0,100
test.jpg,1,300,300,400,400,-1,-1
```

The following values/cases can occur for the different columns:

Label		Coordinates		Color		Number	
0	Roboter	0-1919	x-Coordinate	-1	Unknown	-1	if ball label
1	Ball	0-1079	y-Coordinate	0	Blue	1-6	if recognizable
				1	Red	>100	else
				2	Yellow		
				3	Black		
				4	White		
				5	Green		
				6	Orange		
				7	Purple		
				8	Brown		
				9	Gray		

4 Discord

For better communication I have created a text channel (`#open-research-challenge-visual-statistics`) on the RoboCup SPL Discord which can be found at the following link: `https://discord.gg/MwEW8bgzcZ`

Especially for the selection/use of suitable label tools this chat can be used, because e.g. Berlin United and maybe others can pass on some experience and expertise.