



2-dn International Workshop on Traffic and Street Surveillance for Safety and Security

in conjunction with IEEE AVSS 2018, November 29, Auckland, New Zeland

Title

Challenge on advanced traffic monitoring

Motivation and description

The increasing progress of transportation systems caused a tremendous increase in demand for smart systems capable to monitor the traffic state and the street safety.

Fundamental to these applications are algorithms for multi-object detection and multi-object tracking. It is thus an important for a practitioner to know the pros and cons of different works in these categories. It is goal of this Challenge to provide a comprehensive performance evaluation to state-of-the-art detection and tracking algorithms.

The challenge is based on UA-DETRAC, a real-world multi-object detection and multi-object tracking benchmark. The dataset is based on a huge set of traffic video sequences opportunely annotated with bounding box, tracking path and difficult/environment difficult level.

We divided the challenge in two different task (detection and tracking) and two different degree of difficult.

The challenge has been organized in conjunction with the International Workshop on Traffic and Street Surveillance for Safety and Security (IWT4S), currently proposed in AVSS 2018, in order to guarantee the publishing of the paper associated with the solutions proposed for the challenge.

Participation and joint workshop

All the participants must submit the obtained results on UA-DETRAC dataset and a paper describing the applied methodology (maximum 6 pages).

All the works, whose results will be over a baseline threshold, will be automatically published in the workshop proceeding (in association with the AVSS 2018 conference) and will be presented in the workshop day session.

Moreover, a paper resuming the overall detection/tracking results will be published, including the name of all participant to the challenge whose results over the baseline threshold.

Submissions to the workshop that do not participate the challenge are permitted, but are subject to the standard peer review process (see workshop proposal).

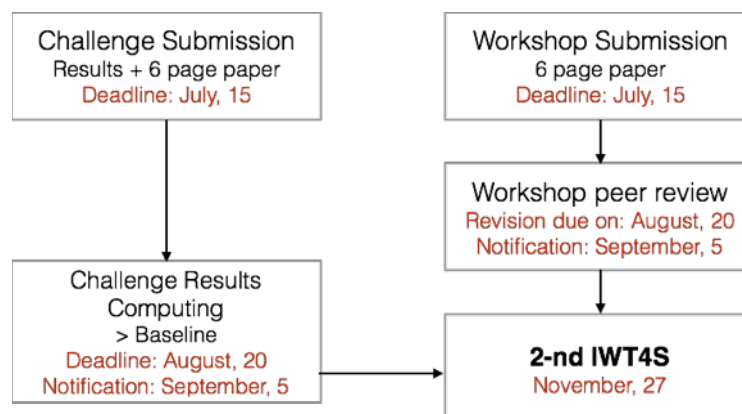
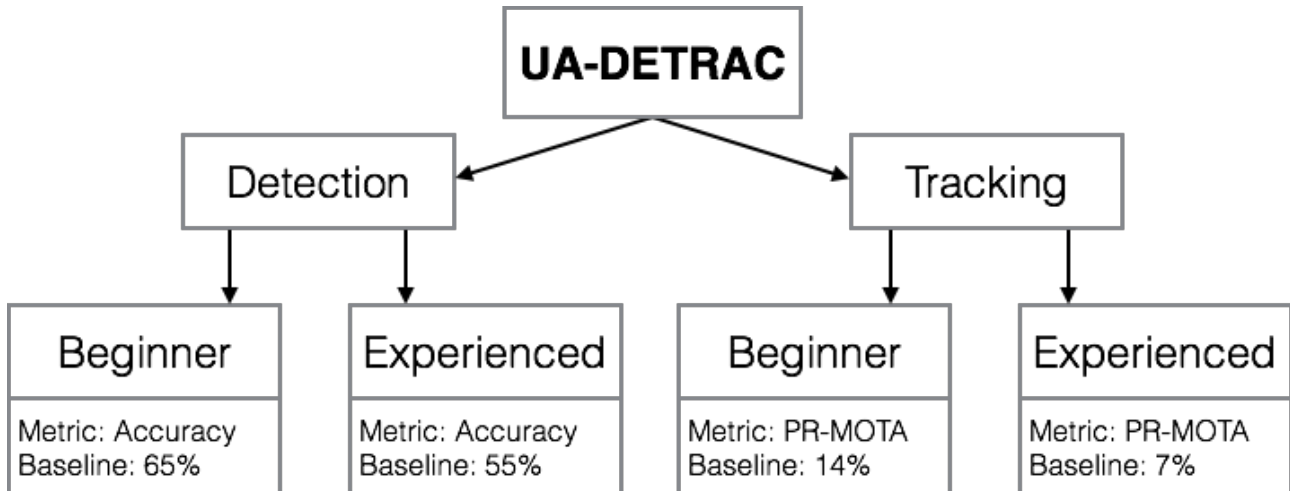


Figure 1: Workshop/Challenge relations

Challenge organization and evaluation

In order to allow a wider participation to the challenge, a 'task'/'degree of difficult' division has been considered leading to 4 different tracks as in figure below



Dataset specifics: The dataset consists of 10 hours of videos captured with a Canon EOS 550D camera at 24 different locations at Beijing and Tianjin in China.

The videos are recorded at 25 frames per seconds (fps), with resolution of 960×540 pixels. There are more than 140 thousand frames in the UA-DETRAC dataset and 8250 vehicles that are manually annotated, leading to a total of 1.21 million labeled bounding boxes of objects.

The UA-DETRAC dataset is divided into training (UA-DETRAC-train) and testing (UA-DETRAC-test) sets, with 60 and 40 sequences, respectively. Training videos are taken at different locations from the testing videos, but similar traffic conditions and attributes are ensured.

The UA-DETRAC dataset contains videos with large variations in scale, pose and illumination, occlusion, and background clutters making useful to classify the test sequences in different level of difficulty (**easy**, **medium** and **hard**)

Detection: test sequences have been labeled based on the detection rate of the EdgeBox (more details and reference in the UA-DETRAC paper). This classification lead to 10 **easy** sequences, 20 **medium** sequences and 10 **hard** sequences.

Tracking: test sequences have been labeled based on the average PR-MOTA scores of six benchmarked object tracking methods (more details and reference in the UA-DETRAC paper). More precisely the 40 test sequences have been divided into 10 **easy** sequences, 20 **medium** sequences and 10 **hard** sequences.

Task: Following the UA-DETRAC organization the challenge is divided in two main task, the detection and tracking. The participation is disjoint: people can participate to the detection one, to the tracking one (employing known detection algorithm) or both of them in case where both elements in the proposed solution are innovative.

The solutions on detection task must present some innovative aspect.

The solutions on tracking task are allowed to exploit known detection algorithms keeping an innovation element in the tracking stage.

Some known detection and tracking algorithms are available (code too) in the UA-DETRAC website (<http://detrac-db.rit.albany.edu>).

	Detection	Tracking
Easy	MVI_40712	MVI_39211
	MVI_40774	MVI_39031
	MVI_40773	MVI_40712
	MVI_40772	MVI_40854
	MVI_40711	MVI_40701
	MVI_40771	MVI_40852
	MVI_40792	MVI_39401
	MVI_40775	MVI_40743
	MVI_39361	MVI_39361
	MVI_40901	MVI_39051
Medium	MVI_39401	MVI_39271
	MVI_39051	MVI_40853
	MVI_40793	MVI_40851
	MVI_40905	MVI_39371
	MVI_40743	MVI_40775
	MVI_40701	MVI_40711
	MVI_40742	MVI_40774
	MVI_40853	MVI_39311
	MVI_40854	MVI_40771
	MVI_40852	MVI_40773
	MVI_39211	MVI_40855
	MVI_39271	MVI_40892
	MVI_40904	MVI_40772
	MVI_39371	MVI_40891
	MVI_40851	MVI_40742
	MVI_40902	MVI_40902
	MVI_40763	MVI_40864
	MVI_40762	MVI_40792
	MVI_39031	MVI_40714
	MVI_39511	MVI_40793
Hard	MVI_40863	MVI_40901
	MVI_40892	MVI_40903
	MVI_40891	MVI_40762
	MVI_40714	MVI_39511
	MVI_40855	MVI_40863
	MVI_40903	MVI_40761
	MVI_40864	MVI_40763
	MVI_40761	MVI_40905
	MVI_39311	MVI_39501
	MVI_39501	MVI_40904

Table 1: List of test video sequences classified depending on the level of difficult and task

Levels of difficulty: the challenge has been divided in two different levels of difficult: easy (oriented to students or beginner Ph.D. student) and hard (targeted to the research groups or people with richer experience).

The difference depends on the video sequence considered:

- Easy: people participating to the easy degree of difficult must submit only the results referred to test video sequences marked as **easy** independently on the task (detection or tracking)
- Hard: people participating to the hard level of difficult must submit the results referred to the **overall** test video sequences set for the detection task and there results referred to the test video sequences marked as **hard and medium** for the tracking task.

Each task/level will be evaluated separately and will be subject to specific metrics and baselines

An accurate definition of the employed metrics and level of difficulty can be found in the UA-DETRAC website and paper:

L. Wen, D. Du, Z. Cai, Z. Lei, M. Chang, H. Qi, J. Lim, M. Yang, and S. Lyu. *UA-DETRAC: A new benchmark and protocol for multi-object tracking*. *CoRR*, abs/1511.04136, 2015. [PDF]

All the material is available at: <http://detrac-db.rit.albany.edu>

Previous editions

The **first edition** of the challenge was held jointly with the first edition of IWT4S workshop (August 29, 2017 in Lecce - Italy in conjunction with **AVSS 2017**). We received 30 works; 12 of which (above the threshold) have been presented in an ad hoc poster session during the workshop.

Moreover 4 prizes, provided by the sponsors, have been given to the best works.

Results have been presented in a general paper: Lyu, Siwei, et al. "UA-DETRAC 2017: Report of AVSS2017 & IWT4S Challenge on Advanced Traffic Monitoring." *Advanced Video and Signal Based Surveillance (AVSS), 2017 14th IEEE International Conference on*. IEEE, 2017.

Result and paper submission

The result must be submitted by means of the UA-DETRAC web site.

Participants have to:

1. Register an account at <http://detrac-db.rit.albany.edu/auth/register> and activate it by a verification email.
2. Upload their *detection/tracking* result files with the format described at <http://detrac-db.rit.albany.edu/instructions>.
3. Upload the paper related with the challenge submission. A template will be provided to the authors by considering the guidelines given by AVSS 2018 Workshop chairs.
4. Check email for the evaluation results for DETRAC-test set.

Results & paper submission and acceptance deadlines

Submission: July, 15th 2018

Notification: September, 5th 2018

Camera-Ready: September, 5th 2018

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Event Sponsors/Endorsers (to be confirmed)

