Track 2: “Image-based Localization(off-site)”

1. Introduction

Along with recent progress in vision based deep learning, visual localization gets more interest with the increasing usage of camera in daily life, but this technical approach is not mature enough. Although there have been evolved many technical approaches in visual localization, still it is quite challenging to prove the operation within only one day. Therefore, this competition track is organized to get researchers more interested in this field. Among the various technical approaches, Track2 is designed assuming the pose regression method, which estimates the position and orientation from images by using deep neural network.

2. Track 2 set-up

In 2018 and 2019, camera-based positioning track were held on-site. Thus, competitors were given one day (8~ 10 hrs) for calibration and site surveying. Although Track 2 will be held off-site, competitors will be asked to process data as if they are under on-site environment. Competing teams can test their algorithm or model with the data sets that will be served twice.

A. 1st Training and testing data

40 days before the competition day, we will provide the first dataset collected at a given site (Site A) to the participants for developing purposes.

The dataset will contain images and position/orientation data in the following format.

Column	**Sample**
image_path	“relative/path/to/ image_00000.png”
longitude	1.23456789
latitude	12.34567890
floor	1
q_w	1.0
q_x	0.0
q_y	0.0
q_z	0.0
phone_model	“Samsung SM-N986N”

Position is encoded in the order of ‘longitude, latitude, floor’. Orientation is encoded in a quaternion. Images will be in PNG format with 480x640 resolution, captured with a smartphone camera in portrait orientation.

B. Testing server

30 days before the competition date we will open a testing server, where participants will be able to test their implementations to ensure that communication between their client and the testing server is correct. For reference purposes, we will provide a sample client

implementation in python that will communicate with the testing server, decode the inputs (e.g., image to a numpy array), and encode the outputs.

The main client/server interaction is described in the figure below.

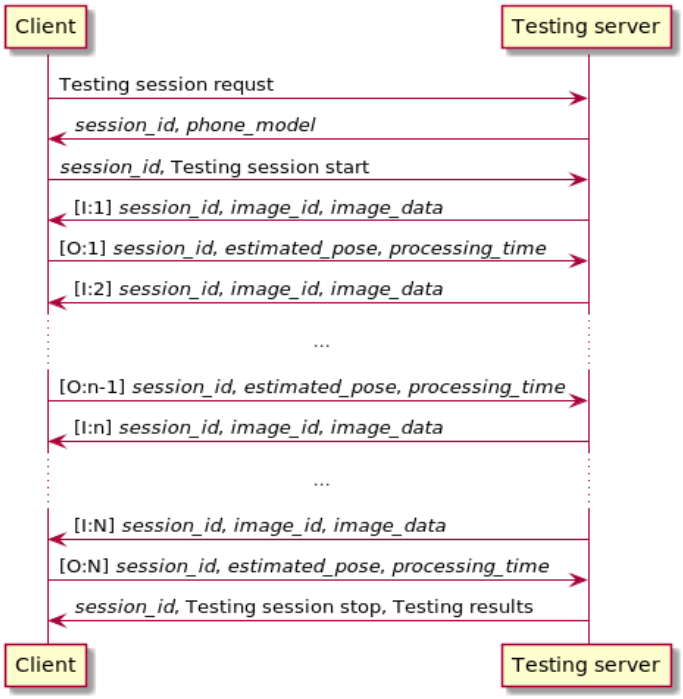


Fig.1 Interaction between client and testing server

Where,

estimated_pose is expected to follow the format in the dataset:

[*longitude, latitude, floor, q_w, q_x, q_y, q_z*].

processing_time should be computed at client side as the time interval from receiving the input image to sending back the estimated pose. Details will be included in the sample client implementation.

Testing results will contain a list vectors of length N [*position_err, floor_err, orientation_err*], where

position_err [m] is the Euclidean distance between estimated position and the corresponding ground truth;

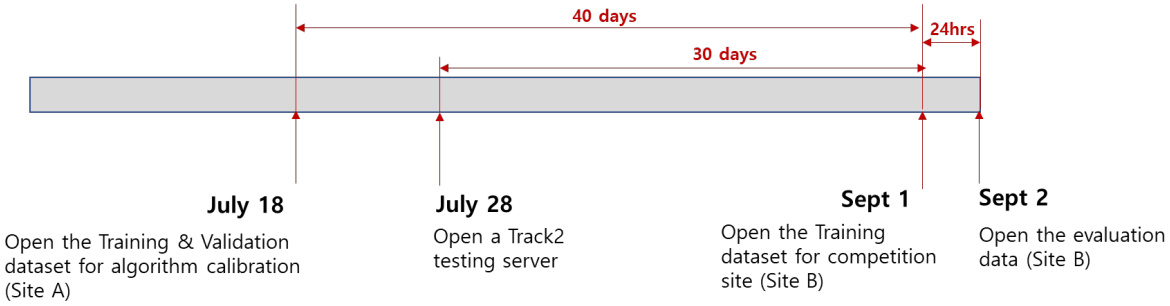
floor_err is the difference between estimated floor and the corresponding ground truth; and

orientation_err [rad] is the rotational angle between the estimated orientation and the corresponding ground truth

C. 2nd Training and testing data and Track 2 Competition

One day before the competition day (1 September) we will provide a dataset for the testing site (Site B). The dataset will follow the format of the previously provided dataset from Site A.

On the day of the competition (2 September), in a predefined order, the participants will evaluate the performance of their implementations using the test server. The client/server interaction will be the same as above with one difference - the testing results at the end of the session will be withheld for later announcement.



3. Evaluation criterion

The accuracy score will be the third quartile of the localization errors at the keypoints. The localization error is the distance between the competitor's estimate and the real position of a keypoint. The error will be measured based on x, y coordinates (longitude and latitude). To this, we are considering weighted sum of position_error, floor_error, and orientation error. Detailed criteria will be updated in June.

Final scores will be disclosed at the end of the competition, and the competing systems ranked according to this final score.

4. Contact Information

For any question about this competition track, please contact us at Soyeon Lee (sylee@etri.re.kr) and Vladimirov Blagovest Iordanov (vladimirov@etri.re.kr).