Google Smartphone Decimeter Challenge at ION GNSS+ 2021

Date: May 12, 2021
Google Android GPS Team

Call for Abstracts:

Session Title: High Precision GNSS Positioning on Smartphones Competition (sponsored by Google):

Session Description: Academic and research teams are encouraged to compete in a challenge using a pool of GNSS datasets collected from smartphones, and high accuracy ground truth. The motivation is to encourage the GNSS community to develop high precision GNSS positioning on smartphones. Teams will compete to achieve the best location accuracy with the datasets provided.

Participation in the competition is open to everyone. To be eligible for prizes, participants are expected to register for the conference and present their results at the conference. Competitors wanting a peer reviewed version of their results to appear in the conference proceedings are required to have full results and accompanying paper submitted per competition and conference guidelines by June 30 for peer review.

Paper selection for presentation at the conference will be based on the accuracy results and theoretical innovation. Top teams will also receive cash prizes.

Details can be found at: g.co/gnssTools

Chairs: Dr. Michael Fu and Dr. Frank van Diggelen, Google.

The Challenge:

- Currently available on Kaggle!
- **Training datasets:** Google releases 73 datasets together with high accuracy ground truth, g.co/gnssTools. These datasets can immediately be used for algorithms development, training and validation.
- **Test datasets:** Google releases 48 datasets collected by smartphones, without releasing the ground truth.
- Competitors will submit their location results to Kaggle for evaluation and scoring on the test datasets.
- Winners will be identified by their score on the private test datasets.
- Winners will present their algorithms and results in a dedicated session at the ION GNSS+ 2021 conference.
- Winners will receive prizes at the ION GNSS+ 2021.

- For the challenge, participating teams or individuals must register and submit the generated results in a required format no later than Aug 4, 2021.

Rules

- Any eligible registrant on Kaggle, including members of academia and not-for-profit research organizations, are allowed to participate.
- Members from industry can participate, but winners are prohibited from using proprietary software.
- External data, including pre-trained models, may be used if they are publicly available at no cost to other users.
- Determination about eligibility, evaluation of all entries and all competition decisions shall be defined by Google in the Competition's Rules.
- Accuracy metrics: The evaluation of results will be done automatically by Kaggle's platform on the back-end. The results will be compared to the known (but not published) Ground Truth, and compute both 50th-percentile and 95th-percentile horizontal errors. Percentiles are based on the total number of epochs in each trace, so if you miss an epoch, it counts against your accuracy number. A team's final score is computed by taking the mean of the 50th-percentile and 95th-percentile of each trace, and then taking the average of these values.
    - Example (for two traces):

      Trace 1: 50th-percentile error 0.5 m, 95-percentile error 1.0 m, mean(50th,95th) = 0.75 m

      Trace 2: 50th-percentile error 0.4 m, 95-percentile error 1.2 m, mean(50th,95th) = 0.80 m

      Final score = mean(0.75, 0.80) = 0.775 m

About the Datasets

- **Training datasets**
  Google releases 73 traces in the challenge, whose collection process is described in a paper published in the proceedings of ION GNSS+ 2020 [1]. Most traces are collected in US Bay area highways with open sky. Small portions of some traces exhibit sparse buildings, overpasses, or trees. GnssLogger files, RINEX observation files, ground truth files, error corrections (e.g. Observation Space Representation, or OSR) of these traces are published.

The GnssLogger files include: receivedSvTime (equivalent: pseudorange), pseudorange-rate (Doppler), Accumulated Delta Range (carrier phase), for all visible GNSS satellites: {GPS, GLO, GAL, BDS, QZS} at 1Hz. Data also includes uncalibrated accelerometer, gyroscope, and magnetic field readings. More details can be found in the Kaggle challenge webpage.

- **Test datasets**
  Google releases 48 more traces, which include the same types of data and follow the same convention as the training dataset, except that the ground truth files will not be provided. Results of test datasets will be used for deciding winning teams.

Important Dates

Year 2021

Dec 28	Training datasets released
Mar 5	ION GNSS+ 2021 extended abstract deadline.
Apr 26	ION GNSS+ 2021 speakers acceptance notifications. Acceptance will be based both on achieved accuracy from training datasets and theoretical innovation.
May 12	Competition start date via Kaggle. Test datasets will be released.
June 30	Participants who want peer review need to submit a full paper and results by this date. Results should be based on the released datasets in the challenge.
Aug 4	Competition deadline for full results via Kaggle. The winners will be notified soon after this date.
Aug 25	Final conference program published. Winners will be listed.
Sep 20	ION GNSS+ 2021 Conference Starts

Questions?

Questions regarding the datasets can be sent to android-gps-datasets@google.com

Reference

[1] Fu, Guoyu (Michael), Khider, Mohammed, van Diggelen, Frank, "Android Raw GNSS Measurement Datasets for Precise Positioning," Proceedings of the 33rd International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2020), September 2020, pp. 1925-1937. https://doi.org/10.33012/2020.17628