User Guide

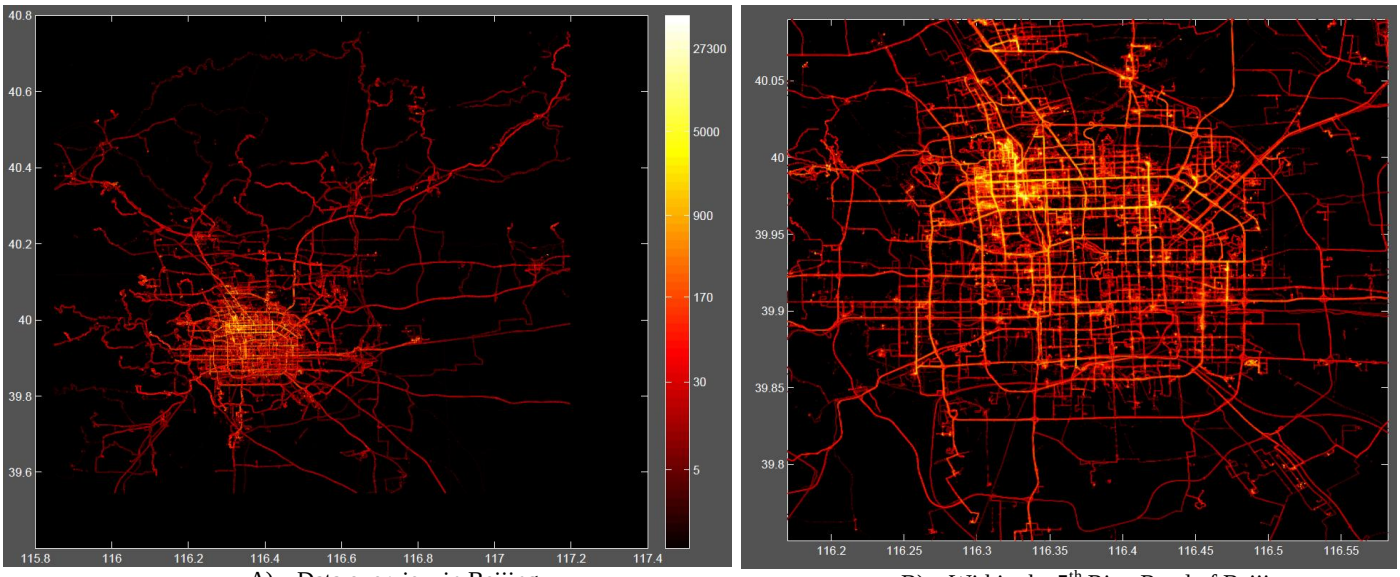
Version 1.2 (2011/10/31)

1. Data Description

This GPS trajectory dataset was collected in (Microsoft Research Asia) Geolife project by 178 users in a period of over four years (from April 2007 to October 2011). A GPS trajectory of this dataset is represented by a sequence of time-stamped points, each of which contains the information of latitude, longitude and altitude. This dataset contains 17,621 trajectories with a total distance of 1,251,654 kilometers and a total duration of 48,203 hours. These trajectories were recorded by different GPS loggers and GPS-phones, and have a variety of sampling rates. 91 percent of the trajectories are logged in a dense representation, e.g. every 1~5 seconds or every 5~10 meters per point.

This dataset recoded a broad range of users' outdoor movements, including not only life routines like go home and go to work but also some entertainments and sports activities, such as shopping, sightseeing, dining, hiking, and cycling. This trajectory dataset can be used in many research fields, such as mobility pattern mining, user activity recognition, location-based social networks, location privacy, and location recommendation.

Although this dataset is wildly distributed in over 30 cities of China and even in some cities located in the USA and Europe, the majority of the data was created in Beijing, China. Figure 1 plots the distribution (heat map) of this dataset in Beijing. The figures standing on the right side of the heat bar denote the number of points generated in a location.



A) Data overview in Beijing

B) Within the 5th Ring Road of Beijing

Figure 1 Distribution of the dataset in Beijing city

The distributions of distance and duration of the trajectories are presented in Figure 2 and Figure 3.

In the data collection program, a portion of users have carried a GPS logger for years, while some of the others only have a trajectory dataset of a few weeks. This distribution is presented in Figure 4, and the distribution of the number of trajectories collected by each user is shown in Figure 5.

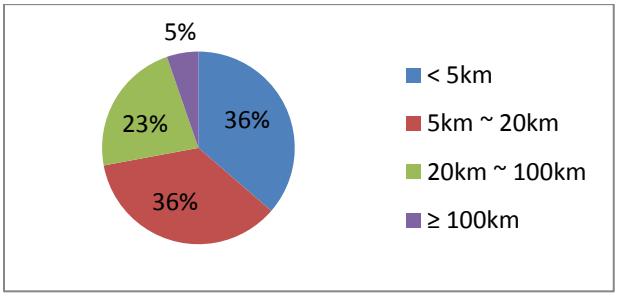


Figure 2 Distribution of trajectories by distance

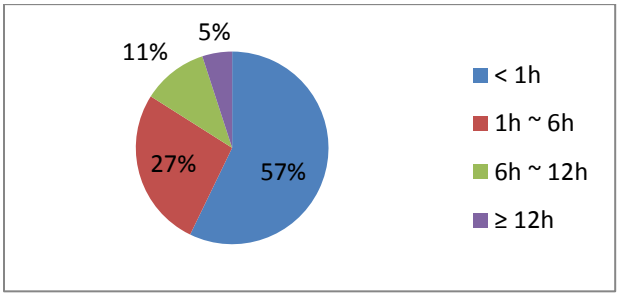


Figure 3 Distribution of trajectories by effective duration

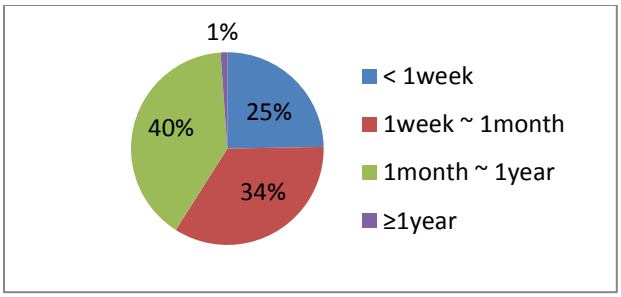


Figure 4 Distribution of users by data collection period

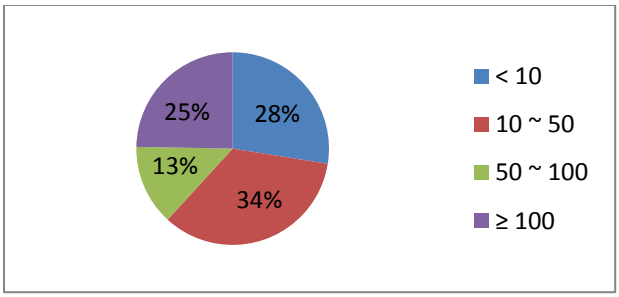


Figure 5 Distribution of users by trajectories

2. What's new?

2.1. Transportation mode labels

69 users have labeled their trajectories with **transportation mode**, such as driving, taking a bus, riding a bike and walking. There is a label file storing the transportation mode labels in each user's folder. See section 4.2 for the format of labels.

The total distance and duration of transportation modes are listed in Figure 6. Though this only covers a part of the dataset used in the following papers, the scale of this released dataset can still support transportation mode learning.

Transportation mode	Distance (km)	Duration (hour)
Walk	10,092	5,436
Bike	6,244	2,352
Bus	20,230	1,492
Car & taxi	32,848	2,383
Train	36,253	745
Airplane	24,789	40
Other	9,493	404
Total	139,953	12,856

Figure 6 Total distance and duration of transportation modes

2.2. Changes on the scale of dataset

Changes on the scale of dataset between version 1.1 and version 1.2 are listed in Figure 7. Effective days refer to the total number of days where there's a record in the dataset.

	Version 1.1	**Version 1.2**	**Change**
Time span of the collection	04/2007 – 12/2010	04/2007 – 10/2011	+10 months
Number of users	169	178	+9
Number of trajectories	16,550	17,621	+1,071
Number of points	21,363,084	23,667,828	+2,304,744
Total distance	1,212,451 km	1,251,654km	+39,203 km
Total duration	46,065 hour	48,203hour	+2,138 hour
Effective days	9,694	10,413	+719

Figure 7 Changes on the scale of dataset

3. Paper Citation

Please cite the following papers when using this GPS dataset.

[1] Yu Zheng, Lizhu Zhang, Xing Xie, Wei-Ying Ma. Mining interesting locations and travel sequences from GPS trajectories. In Proceedings of International conference on World Wild Web (WWW 2009), Madrid Spain. ACM Press: 791-800.

[2] Yu Zheng, Quannan Li, Yukun Chen, Xing Xie, Wei-Ying Ma. Understanding Mobility Based on GPS Data. In Proceedings of ACM conference on Ubiquitous Computing (UbiComp 2008), Seoul, Korea. ACM Press: 312-321.

[3] Yu Zheng, Xing Xie, Wei-Ying Ma, GeoLife: A Collaborative Social Networking Service among User, location and trajectory. Invited paper, in IEEE Data Engineering Bulletin. 33, 2, 2010, pp. 32-40.

4. Data Format

4.1. Trajectory file

Every single folder of this dataset stores a user's GPS log files, which were converted to PLT format. Each PLT file contains a single trajectory and is named by its starting time. To avoid potential confusion of time zone, we use **GMT** in the date/time property of each point, which is different from our previous release.

PLT format:

Line 1…6 are useless in this dataset, and can be ignored. Points are described in following lines, one for each line.

Field 1: Latitude in decimal degrees.

Field 2: Longitude in decimal degrees.

Field 3: All set to 0 for this dataset.

Field 4: Altitude in feet (-777 if not valid).

Field 5: Date - number of days (with fractional part) that have passed since 12/30/1899.

Field 6: Date as a string.

Field 7: Time as a string.

Note that field 5 and field 6&7 represent the same date/time in this dataset. You may use either of them.

Example:

39.906631,116.385564,0,492,40097.5864583333,2009-10-11,14:04:30

39.906554,116.385625,0,492,40097.5865162037,2009-10-11,14:04:35

4.2. Transportation mode labels

Possible transportation modes are: *walk*, *bike*, *bus*, *car*, subway, *train*, *airplane*, *boat*, *run* and *motorcycle*. Again, we have converted the date/time of all labels to **GMT**, even though most of them were created in China.

Example:

Start Time	End Time	Transportation Mode
2008/04/02 11:24:21	2008/04/02 11:50:45	bus
2008/04/03 01:07:03	2008/04/03 11:31:55	train
2008/04/03 11:32:24	2008/04/03 11:46:14	walk
2008/04/03 11:47:14	2008/04/03 11:55:07	car

First, you can regard the label of both *taxi* and *car* as *driving* although we set them with different labels for future usage. Second, a user could label the transportation mode of a *light rail* as *train* while others may use *subway* as the label. Actually, no trajectory can be recorded in an underground subway system since a GPS logger cannot receive any signal there. In Beijing, the light rails and subway systems are seamlessly connected, e.g., line 13 (a light rail) is connected with line 10 and line 2, which are subway systems. Sometimes, a line (like line 5) is comprised of partial subways and partial light rails. So, users may have a variety of understanding in their transportation modes. You can differentiate the real train trajectories (connecting two cities) from the light rail trajectory (generating in a city) according to their distances. Or, just treat them the same.

5. Contact

If you have any questions about this dataset, please contact Dr. Yu Zheng from Microsoft Research Asia.

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6. Release history

Version 1.2 (released 2011/10/31)

Version 1.1 (released 2011/07/25)

Version 1.0 (released 2010/09/30)

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<< GeoLife GPS Trajectories>>

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