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ISPRS Open Data Challenge

Report of 2015 Scientific Initiatives

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Background

In the big data era, one of the challenges of researchers and students is how to access the "big data". To foster new ideas and works on spatial big data, we applied the scientific initiative and released over one million AFC data collected by transit smart cards. Smart cards have been widely used in mass transit fare payment systems. They produce large quantities of AFC (Auto Fare Collection) data such as smart card ID, onboard time, and fares. Smart card data together with bus GPS trajectory data can be very useful to detect individual travel behavior, and for public transit planning, and many other applications as well. The ISPRS scientific initiative -- open data challenge 2015 aims at promoting research and excellent work on open data, and encourages creative ideas. At the meantime, a series benchmark algorithm has been opened to the research community.

Time span:
Registration: By June 30
Qualification Round: August 5
Final Round: August 11 to September 30
Awarding Ceremony and Workshop: December 12, 2015

Data

Smart cards have been widely used in mass transit fare payment systems. They produce large quantities of AFC data such as smart card ID, onboard time, and fares. Smart card data together with bus GPS trajectory data can be very useful to detect individual travel behavior, and for public transit planning and many other applications as well. We released 9 days data which includes 1,200 bus GPS traces on 1,839 routes, 53,558 stops,

and over 3 millions AFC records per day. Following is the information about the open data:

1) Bus AFC Data

Table 1. Description of Bus AFC Data

Field	Type	Description	Instance
guid	Int	unique record id	6321716
card_id	String	smart card id	1
day	Int	flag of the day (1-9)	1
time	Int	transaction time(seconds of the day, 1-86400)	26027(DAY 1)
bus_id	Int	vehicle id	2888

2) Bus GPS Data

Table 2. Description of Bus GPS Data

Field	Type	Description	Instance
bus_id	Int	vehicle id	611
day	Int	flag of the day (1-9)	1
time	Int	gps time(seconds of the day, 1-86400)	26027(DAY 1)
lng	Double	longitude	114.027732
lat	Double	latitude	22.661525

3) Dictionary of Bus id and Route id

Table 3. Description of Bus_id-Route_id Dictionary

Field	Type	Description	Instance
bus_id	Int	vehicle id	1
route_id	Int	route id of a bus route	9

4) Road Network

Table 4. Description of Road Network

Field	Type	Description	Instance
roadid	Int	id of a road segment	101
direction	Int	direction of a road segment(0,1: two-way road; 2: one-way road; 3: one-way road with reverse direction)	2

5) Bus Stops Training Data

Bus stops training data contains a list of 80 routes.

Table 5. Description of Bus Stops Training Data

Field	Type	Description	Instance

Field	Type	Description	Instance
route_id	Int	route id of a bus route	9

6) Passenger Alighting Stations Training Data

Passenger alighting stations training data contains a list of 500,000 transaction id.

Table 6. Description of Passenger Alighting Stations Training Data

Field	Type	Description	Instance
guid	Int	unique record id	6321716

Procedure

The contest contains a qualification round and a final round. Since most bus companies adopt the flat fare system, only boarding information was recorded in AFC. In the qualification round, participants need to finish algorithms to identify bus stops and passenger alighting stations from over one million anonymous AFC data and associated bus trajectories in a metropolis area. In the qualification round, contest participants used the cluster provided by the organizer to design the computer programs and submit their final results. Each registered team were assigned a Team ID, a Node ID, and a Secret Key by the organizer.

The score of each team is based on the accuracy of the detected bus stops (*Pstop*) and passenger alighting stations (*Palighting*). The *Pstop* score and *Palighting* score count for 25% and 75% respectively.Top-10 teams were invited to attend the final round competition. The winner teams obtained a free copy of the above dataset and were authorized to use the data for non-commercial usage. In the final round, each team were required to design a creative project using the above data and any other open data with open software. The qualification round score will count for 60% and the final round score will count for 40%.The first place team received CNY5,000 (CHF 755), the second places received CNY3,000 (CHF 450), and the third places received CNY1,000 (CHF 150).

Results

Lasting for over 5 months, the 2015 ISPRS Open Data Challenge supported by ISPRS Scientific Initiative awarding ceremony was held on Dec. 12, 2015 at Shenzhen

University, China, hosted by the Shenzhen Key Laboratory of Spatial Smart Sensing and Services, Shenzhen University.

The final places were determined by their qualification round score (60%) and the final round score (40%). In the final round on Dec. 12, 2015, 5 teams presented their works, and 7 experts from transportation, computer science, and IT companies were invited as the judgers. The team from Zhejiang University of Technology (RunBunny) won the first prize, two teams (Vi-Yoghourt, WHUGCM) won the second prizes, and three teams (moonlight, TYUT_GIS_LAB, and mango) won the third places. Dr. Songnian Li, President of ISPRS Technical Commission II, Prof. Qingquan Li, Chair of ISPRS WG II/7, and Prof. Shil-Lung Shaw, Co-Chair of ISPRS WG II/7 attended the ceremony.

The First Place Winner


Two Second Place Winner Teams


Three Third Place Winner Teams

1) Ranking of the Qualification Round

Rank	Team Name	Team No.	Affiliation	Team Leader	Score
1	RunBunny	028	Zhejiang University of Technology	DENG Yiling	0.64481
2	Mango	002	University of Electronic and Technology of China	ZHOU Yan	0.64119
3	Vi-Yoghourt	034	Shenzhen University	CHEN Liang	0.59975
4	BigBen	045	University College London	CHEN	0.59331

				Huanfa	
5	WHUGCM	018	Wuhan University	YU Yang, LU Binbin	0.58775
6	Pokfulam	008	The University of Hong Kong	QI Zhixin	0.57929
7	TYUT_GIS_Lab	021	Taiyuan University of Technology	ZHANG Jin	0.55632
8	moonlight	052	Wuhan University	KANG Chaogui	0.30623
9	FriendHH	051	University of Electronic and Technology of China	JIANG He	0.19489
10	MNS	057	The Chinese University of Hong Kong	ZHOU Yulun	0.18321

2) Ranking List in Final Round

Rank	Team Name	Affiliation	Team Leader	Team Members	Score of Qualification Round(60%)		Score of Final Round(40%)			Final Score
							Public Voting Score(15%)		Experts Score(25%)	
					Ori.	Nor.	Ori.	Nor.		
1	RunBunny	Zhejiang University of Technology (Personal)	DENG Yiling		0.64481	1.000	6172	1.000	87.57142857	1
2	Vi-Yoghourt	Shenzhen University	CHEN Liang	ZHANG Junchi WANG Jingfu CHEN Xiuqiong ZHANG Xiaowei XIE Huili	0.59975	0.930	4151	0.820	84.28571429	0.922
3	WHUGCM	Wuhan University	YU Yang LU Binbin	SHEN Xiangqian JIANG Huijuan ZHANG Qi	0.58775	0.912	4223	0.827	76.57142857	0.890
4	TYUT_GIS_Lab	Taiyuan University of Technology	ZHANG Jin	LI Jiayi WANG Qi ZHANG	0.55632	0.863	5093	0.908	72.57142857	0.861

				Jingwen PENG Dongping LI Genhong WANG Shunxin						
5	moonlight	Wuhan University	KANG Chaogui	YUE Mengxue ZHANG Ye	0.30623	0.475	2451	0.630	87.14285714	0.628

3) Winner Teams' Open Sources

The challenge open sourced the codes and algorithms from the top-10 teams in the qualification round at GitHub: http://citysensing.cn/opencup/opensources.html. For more information about the 2015 ISPRS Open Data Challenge, please visit the Challenge website: http://citysensing.cn/opencup/home.html

Team Name	Affiliation	Code Address	Remark
RunBunny	Zhejiang University of Technology	https://github.com/coralseu/ISPRS	Station_Recall:0.96593 Station_Precision:0.79805
mango	University of Electronic Science and Technology of China	https://github.com/wang3/ISPRSODC	Station_Recall:0.73618 Station_Precision:0.82832
Vi-Yoghourt	Shenzhen University	https://github.com/DASlabN609	Station_Recall:0.75372 Station_Precision:0.78543
BigBen	University College London	https://github.com/huanfachen/BusStopAfcAlightingDetection	Station_Recall:0.75532 Station_Precision:0.81339
WHUGCM	Wuhan University	https://github.com/xqshen/Open-Data-Challenge	Station_Recall:0.75481 Station_Precision:0.84582

Pokfulam	The University of Hong Kong	https://github.com/siufu/isprs_szu_2015	Station_Recall:0.76464 Station_Precision:0.82112
TYUT_GIS_Lab	Taiyuan University of Technology	https://github.com/ljytx/buscheck1	Station_Recall:0.47109 Station_Precision:0.7951
moonlight	Wuhan University	https://github.com/mxyue66/ISPRS	Station_Recall:0.60442 Station_Precision:0.687

Summary

This scientific initiative aims at promoting research and excellent work on open data, and encouraging creative ideas on big data. The challenge started from Jul. 2015 to Oct. 2015 We released over one million anonymous transit smart card data in a metropolis area, together with the associated bus GPS trajectories. Since most bus companies adopt the flat fare system, only boarding information was recorded in the AFC data. Participants were required to identify bus stops, passenger off-board stations, and then finished a project using the data. This challenge attracted 59 teams from mainland China, Hong Kong SAR., Japan, United States, and United Kingdom. A series benchmark algorithm has been open sourced at GitHut. Some affiliations have expressed their willingness to support another open data challenge in 2016, with their data or provide more financial support. We hope this scientific initiative will raise the awareness about open data and open software, as well as enhance the visibility of ISPRS research and events.

Organizers:

Qing-Quan Li Yang Yue (Tara)

WG II/7

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