CLASSIFICATION OF MOBILE LASER SCANNING POINT CLOUDS FROM HEIGHT FEATURES

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Introduction

- Point cloud data is increasingly easy to obtain given the rapid development of remote sensing technologies.

- As the fundamental research of common applications from point cloud data sets, object classification of urban scenes has been paid great attention.
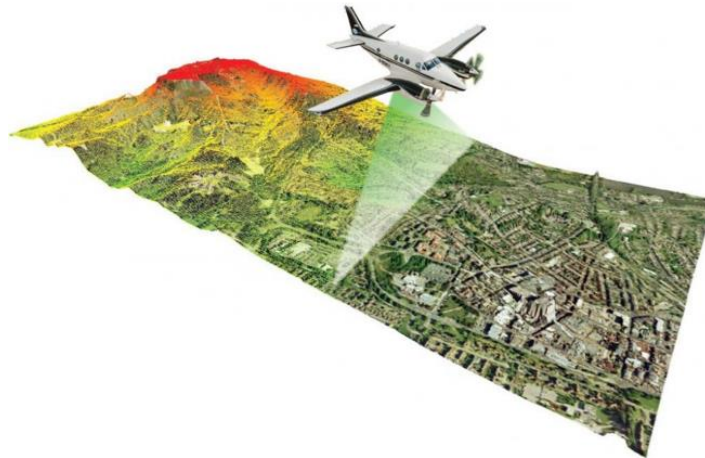
Dataset

Dataset: rueMadame_database

A benchmark dataset generated by the Robotics laboratory (CAOR) at MINES ParisTech, France

Selected classes:

- Facade,
- Cars,
- Pedestrians,
- Motorcycles,
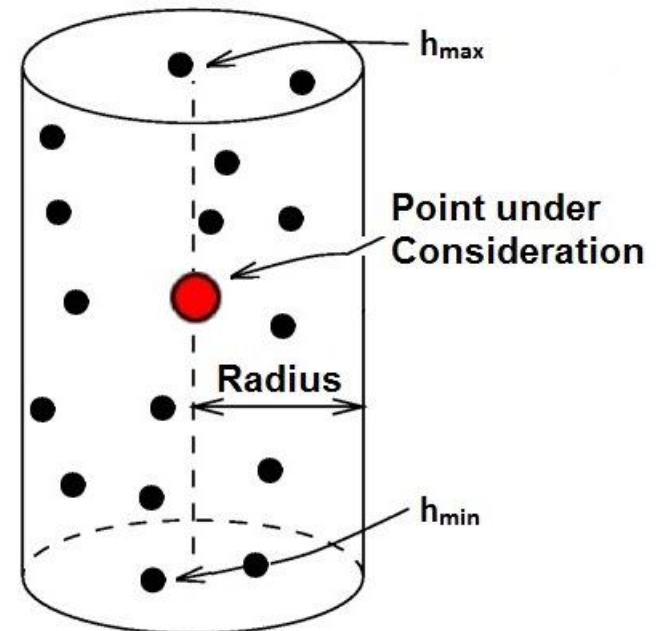- Traffic signs

Fig.1 Orthophoto of the benchmark site:
Rue Madame, Paris, France

Research Question

- Question:

    How to assign these five classes?

- Solution:

Extract **height based features** of every point.

Methodology

- Our approach relied on point-based classification. We considered **height difference** and **number of points** within a column spanned up by a cylinder, in addition to exploiting **the reflectance value** to present every point.

Experiment detail

- Number of points in each class:

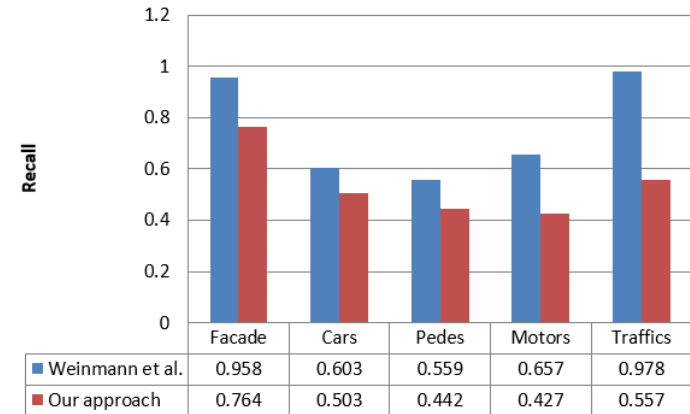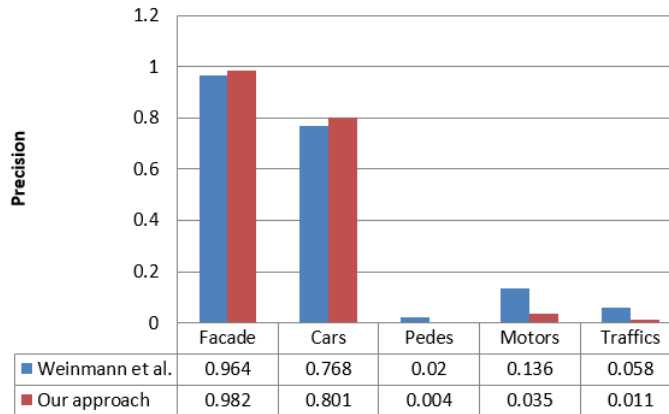|	Training points	Test points	Sum
Facade	1000	9,977,435	9,978,435
Cars	1000	1,834,383	1,835,383
Pedestrians	1000	9,048	10,048
Motorcycles	1000	97,867	98,867
Traffic signs	1000	14,480	15,480

- Classifier: Support Vector Machine (SVM)
- Software: MATLAB R2017a
- Platform: Inter(R) Core(TM) i7-7700HQ, 64-BIT Operating System

Results

Confusion matrix (i.e. Percent) of the five classes

Results

Precision	Facade	Cars	Pedes	Motors	Traffics
Weinmann et al.	0.964	0.768	0.02	0.136	0.058
Our approach	0.982	0.801	0.004	0.035	0.011

Precision values in the five classes

Recall	Facade	Cars	Pedes	Motors	Traffics
Weinmann et al.	0.958	0.603	0.559	0.657	0.978
Our approach	0.764	0.503	0.442	0.427	0.557

Recall values in the five classes

F1 score	Facade	Cars	Pedes	Motors	Traffics
Weinmann et al.	0.961	0.676	0.039	0.225	0.11
Our approach	0.86	0.618	0.008	0.065	0.022
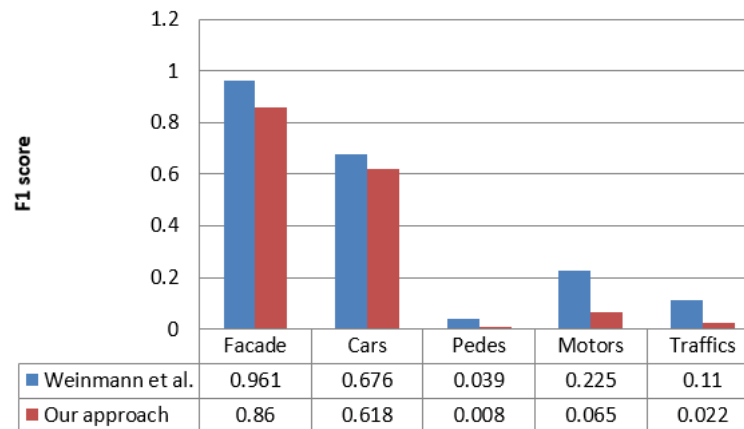
F1 score values in the five classes

Analysis and Discussion

	Facade	Cars	Pedestrians	Motorcycles	Traffic signs
Facade	77.62	2.10	8.09	6.74	5.45
Cars	7.36	50.59	11.43	25.83	4.79
Pedestrians	5.18	1.37	44.08	23.53	25.84
Motorcycles	0.22	20.05	25.82	42.60	11.31
Traffic signs	18.57	4.52	17.14	5.82	53.94

Conclusion and Future work

- We exploited three features and achieved an overall accuracy of 73%, which was really encouraging for further refining our approach.

- Topics for further experimentation are the setting of the radius size of the cylinder, feasibility of using different radius sizes for a multiscale approach, impact of the maximum likelihood classifier on the classification result, etc.

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Thanks for your attention!
Question?

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