

Unsupervised 3D Category Discovery and Point Labeling from a Large Urban Environment (1)

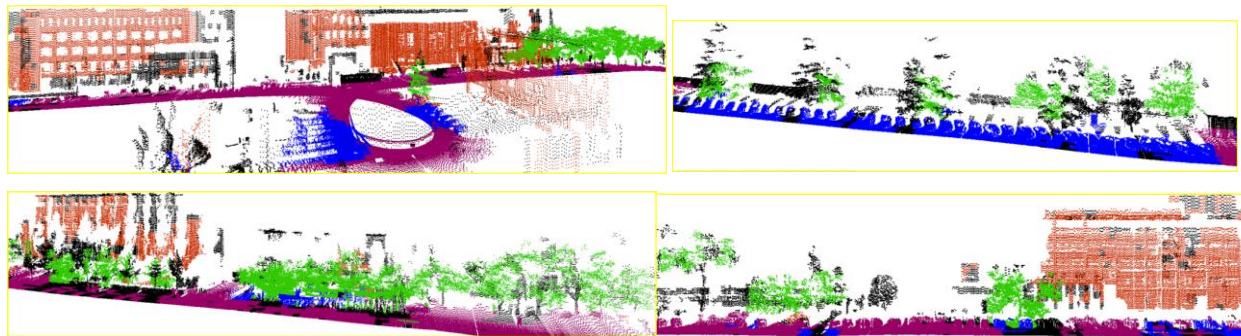
Quanshi Zhang, Xuan Song, Xiaowei Shao, Huijing Zhao, Ryosuke Shibasaki



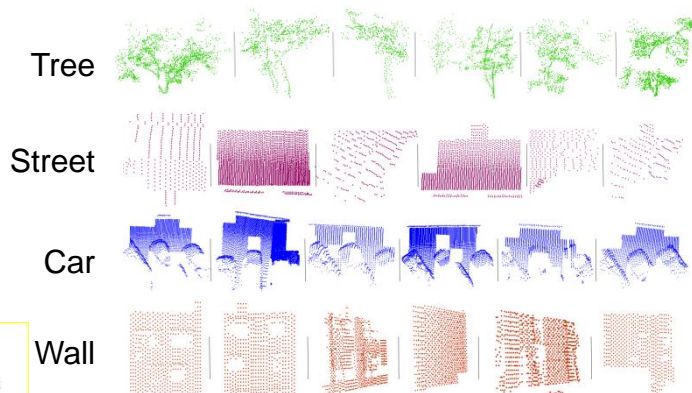
How to do sample collection and environment understanding when

1. **The depth noise is large** for local surface extraction
2. **The global object shape is complex** (E.g Tree)

Environment understanding



Sample Collection



Unsupervised 3D Category Discovery and Point Labeling from a Large Urban Environment (2)

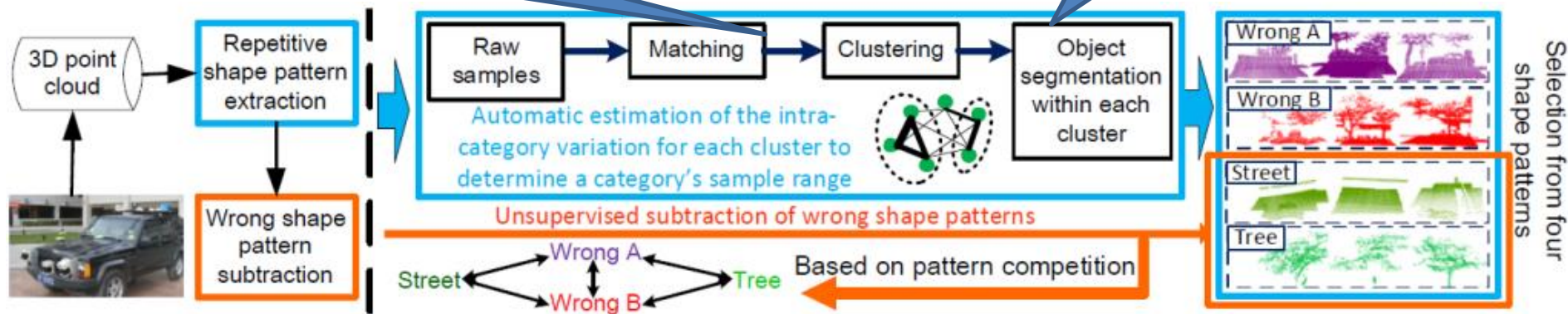
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We focus on the understanding of the global structure of objects, rather than the local-based segmentation, due to the large noise of the depth information.

Step 1: Generate raw shape patterns (repetitive pattern discovery)

Step 2: Common shape refinement within each pattern (detailed segmentation)



Unsupervised 3D Category Discovery and Point Labeling from a Large Urban Environment (3)

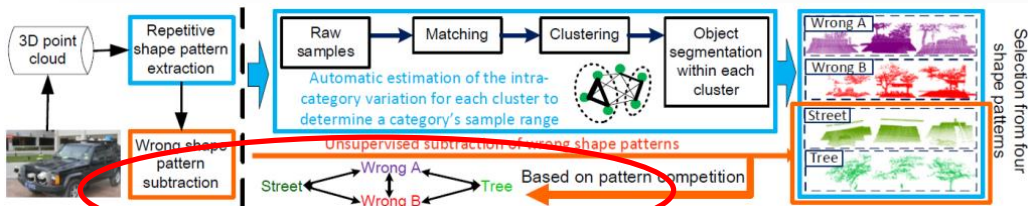
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Step 3: Overlapping pattern competition to select correct patterns

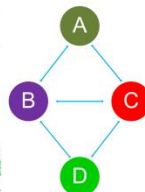
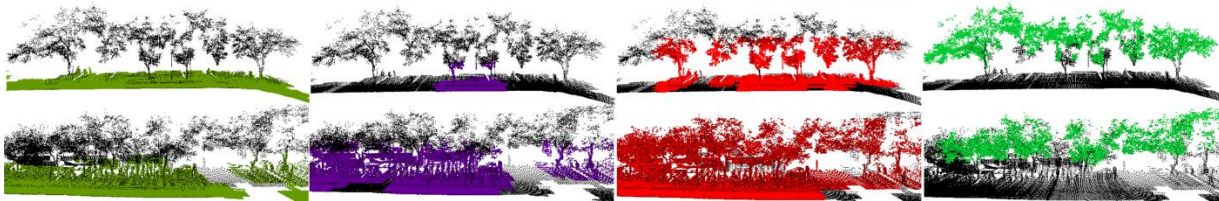
The **raw global shape patterns** of objects produced by low-level clustering are just repetitive patterns and may **not be correct according to human cognition**.

We use an **entropy-based pattern competition** to select a set of reliable patterns.



Recurrent patterns may not be correct object-level patterns.

Object samples of the four tree shape patterns



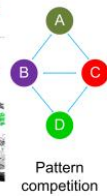
Pattern competition

Conflict of description area between the four tree patterns

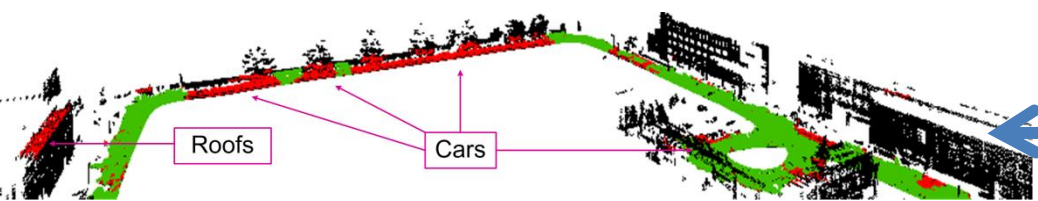
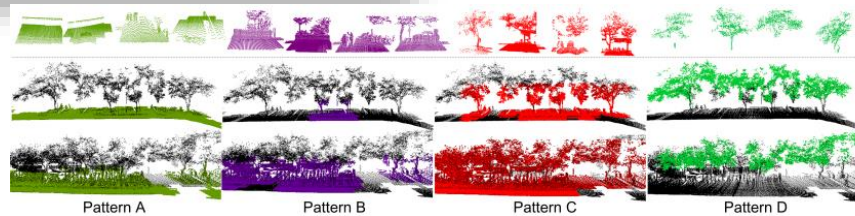


Unsupervised 3D Category Discovery and Point Labeling from a Large Urban Environment (4)

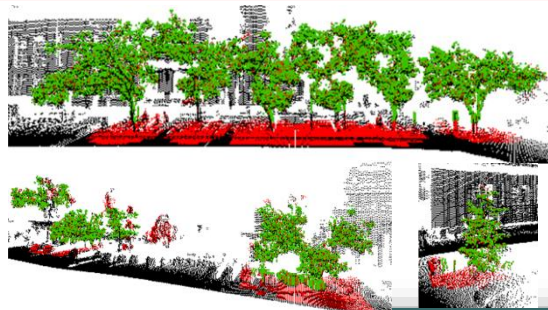
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Green + Red : the description area of all street patterns
Green : the description area of the remaining street patterns after pattern competition



For tree patterns before and after pattern competition



Point labeling and sample collection results before & after pattern competition