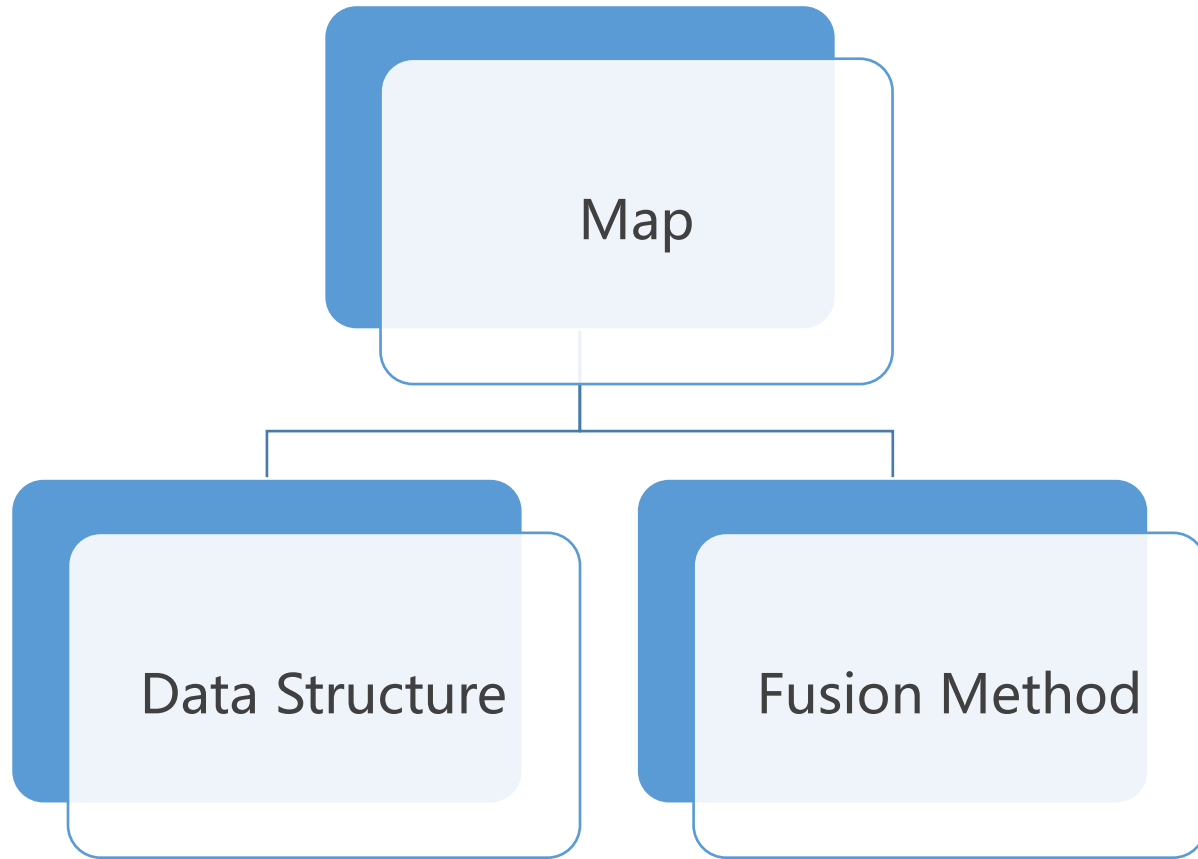
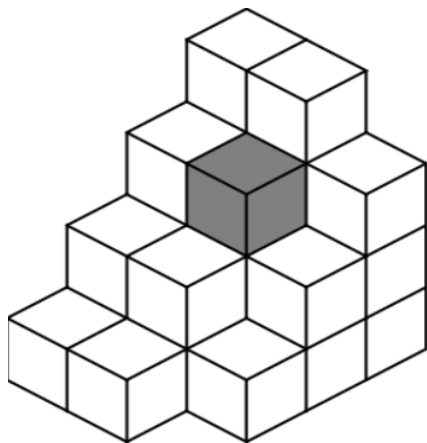


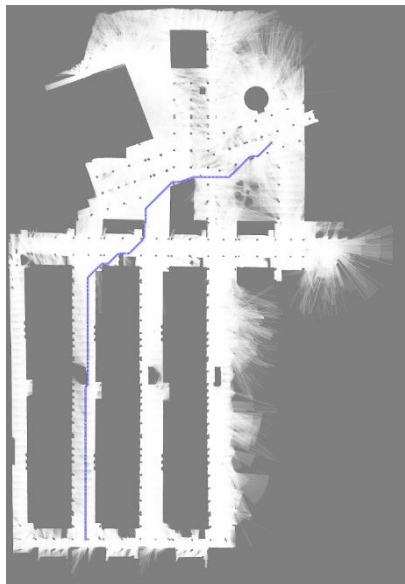
Map Representation



Occupancy grid map



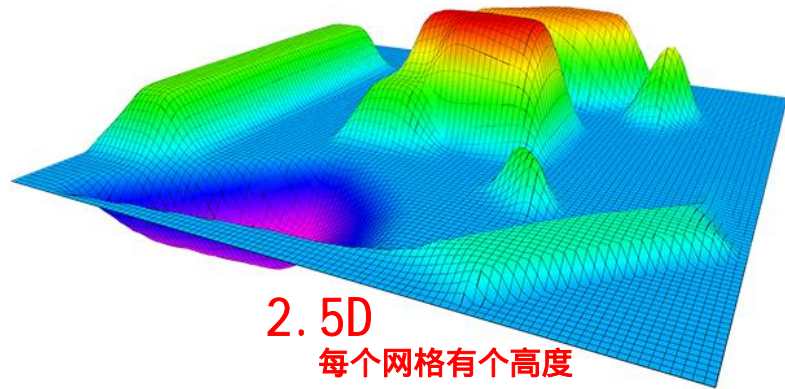
3D



2D

这种地图的特点：

- Most Dense-密集切分，内存消耗大
- Structural
- Direct Index Query-直接查询xyz，复杂度 $O(1)$

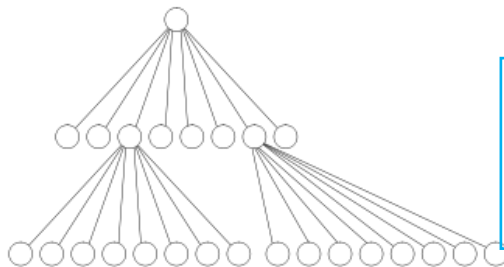
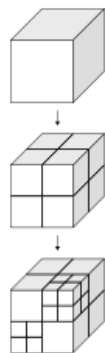
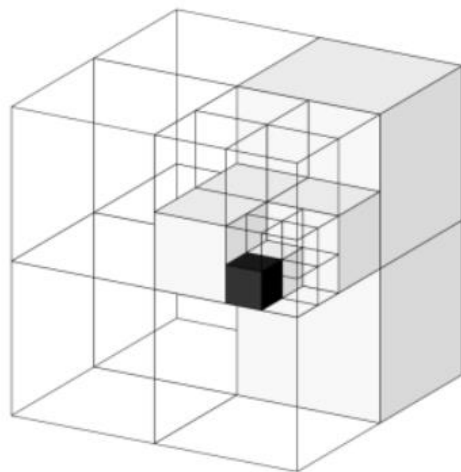


2.5D

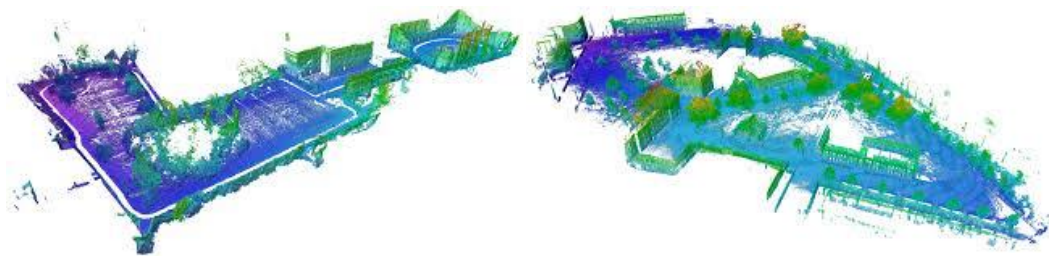
每个网格有个高度

https://github.com/ANYbotics/grid_map

Octo-map (八叉树地图)



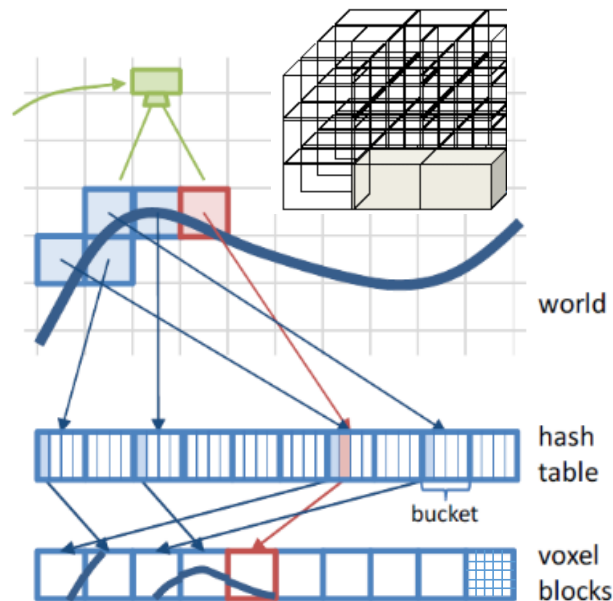
- Sparse
- Structural
- Indirect Index Query-递归查询



<https://octomap.github.io/>

Voxel hashing

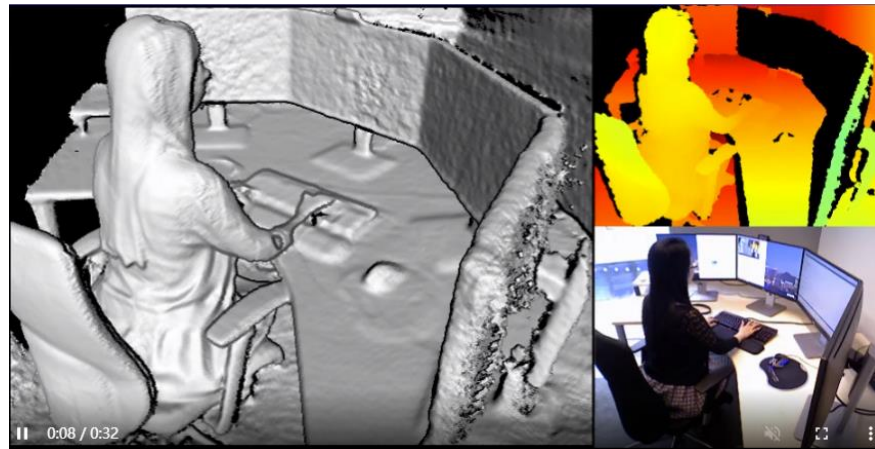
3D的grid



Voxel Hashing:

<https://github.com/niessner/VoxelHashing>

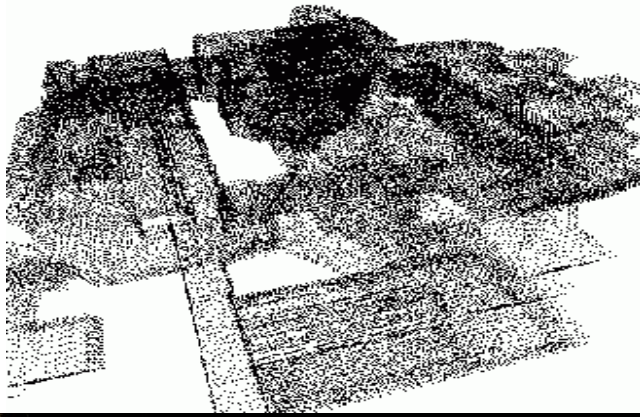
- Most Sparse
- Structural
- Indirect Index Query



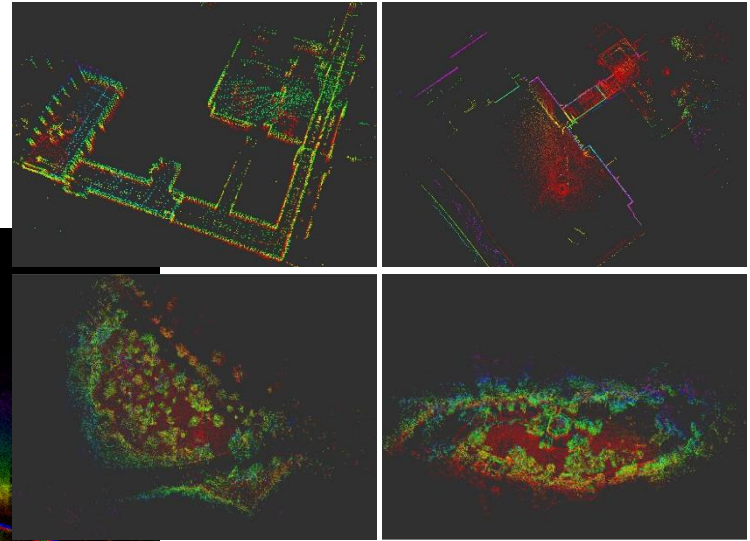
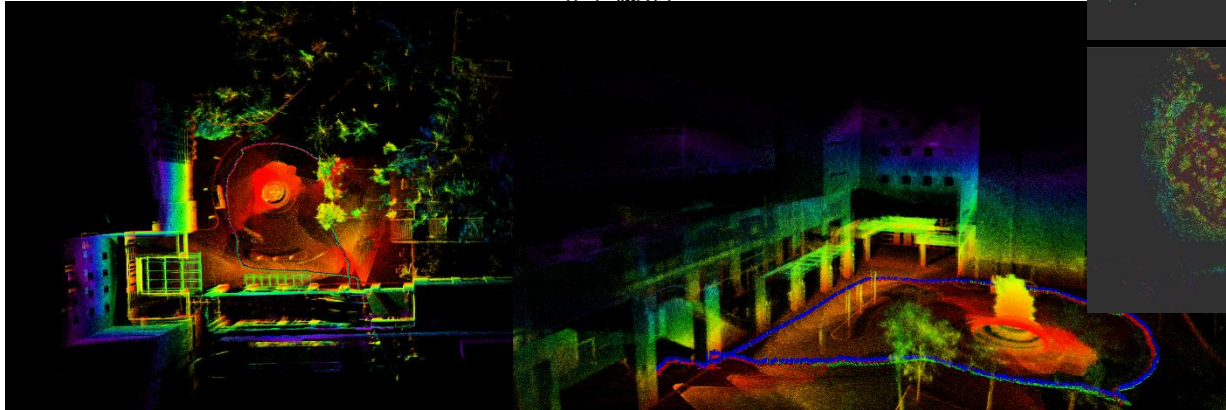
InfiniTAM:

<http://www.robots.ox.ac.uk/~victor/infinitam/>

Point cloud map



- Un-ordered
- No Index Query

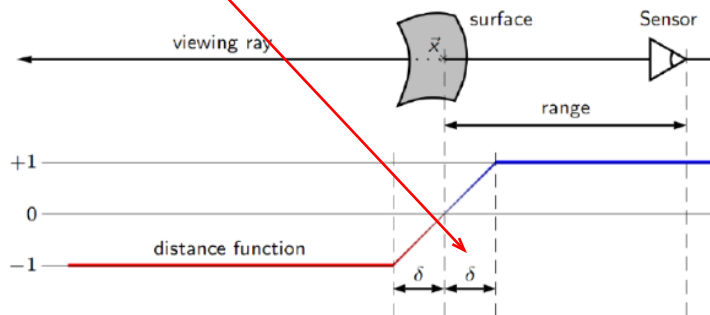


PCL

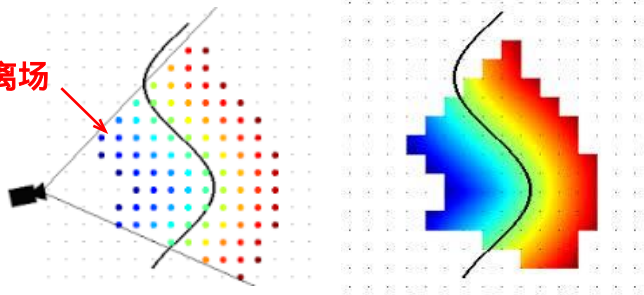
<http://pointclouds.org/>

TSDF map

Truncated Signed Distance Functions



距离场



只关心视锥内被截断的部分



OpenChisel

<https://github.com/personalrobotics/OpenChisel>

ESDF map

软约束轨迹优化需要用ESDF，因为要用距离场里面轨迹与障碍物距离的梯度信息，对轨迹进行调整。

Euclidean Signed Distance Functions

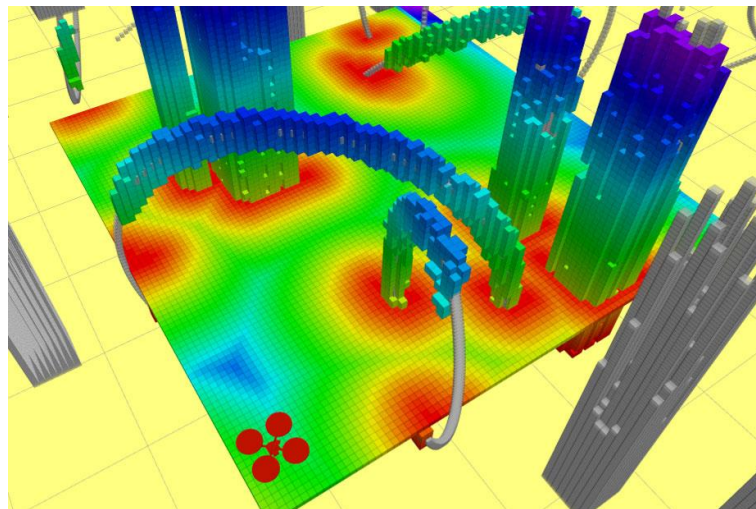
Incremental Update, Global Map

Batch Update, Local Map

Running the Cow_and_Lady Dataset[1]
Compare with Voxblox[2]

[1] <https://projects.asl.ethz.ch/datasets/doku.php?id=iros2017/>

[2] Helen Oleynikova, Zachary Taylor, Marius Fehr, Juan Nieto, and Roland Siegwart, "Voxblox: Building 3D Signed Distance Fields for Planning", In IEEE Int. Conf. on Intelligent Robots and Systems (IROS), October 2017.



Distance Transforms of Sampled Functions, PF Felzenszwalb

VoxBlox

<https://github.com/ethz-asl/voxblox>

FIESTA

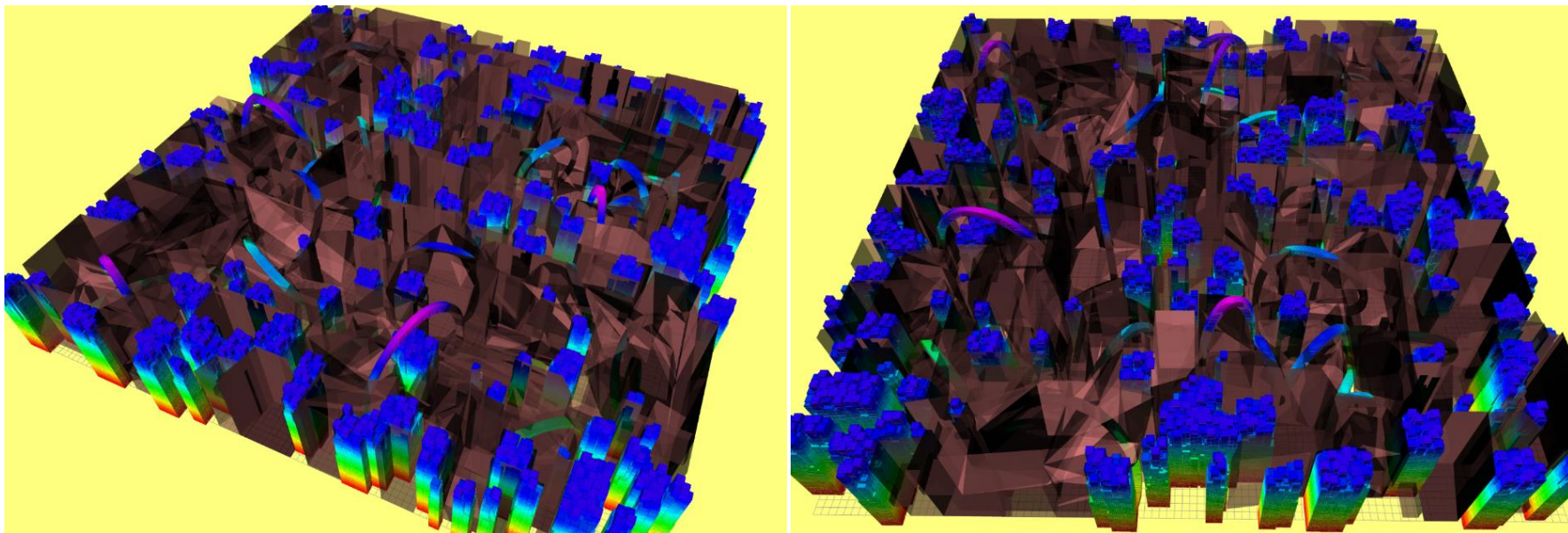
<https://github.com/HKUST-Aerial-Robotics/FIESTA>

TRR's Local Map

<https://github.com/HKUST-Aerial-Robotics/Teach-Repeat-Replan>

More ?

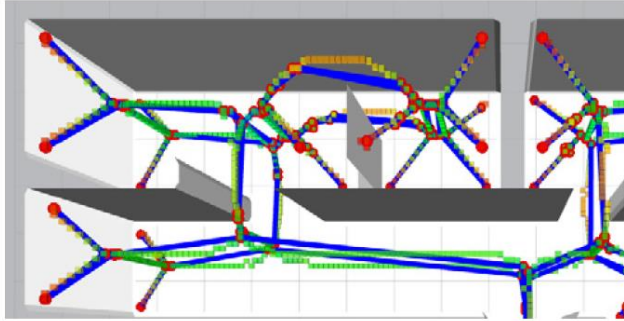
Free-space Roadmap



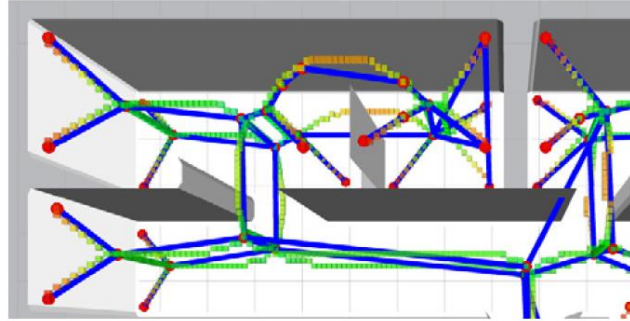
<https://github.com/HKUST-Aerial-Robotics/Teach-Repeat-Replan>

More ?

Voronoi Diagram Map



(a)



(b)

