3D RECONSTRUCTION OF ROOM

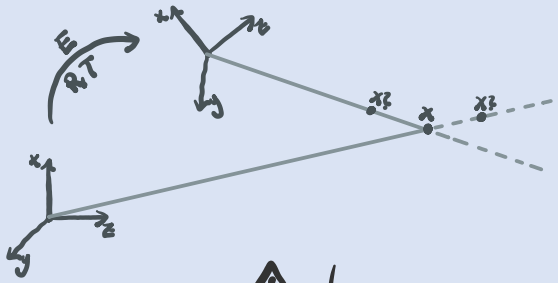
1 FIND & MATCH FEATURES

2 ESTIMATE E → R,T

5 POINT ALGORITHM

$$x_{i+1}^T E x_i = 0$$

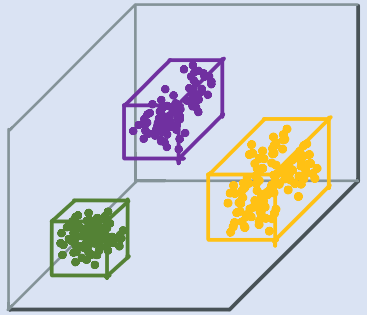
3 TRIANGULATION



4 FRAME TRANSFORMATION

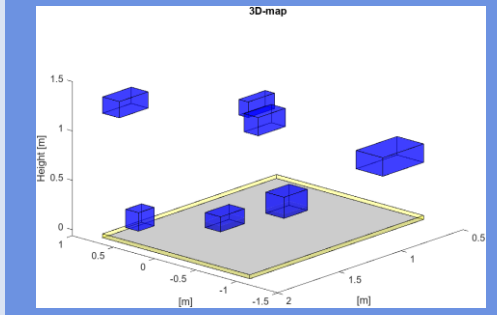
$$P_{i+1} = \begin{bmatrix} R & T \\ 0 & 1 \end{bmatrix} \begin{bmatrix} P_i \\ 1 \end{bmatrix} = R P_i + T$$

5 OBJECT DETECTION



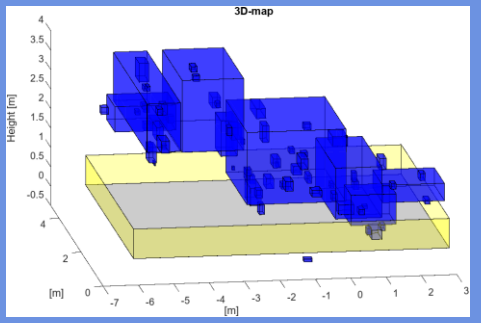
RESULTS

OFFICE



Source: office dataset from ETH3D, https://www.eth3d.net/datasets

CONFERENCE HALL



CHALLENGES

- Not all pictures in sequence have enough matches to create E
- Traveling salesman problem – NP hard
- Not deterministic - MSAC
- More possible poses from inaccurate E
- Fitting boxes to 3D-points, rotation and minimum volume

DEPLOYED ALGORITHMS

1
detectHarrisFeatures
extractFeatures
matchFeatures

2
estimateEssentialMatrix
estrelpose

3
triangulate

4
cameraProjection
transformPointsForward

5
dbscan

REFERENCES

- Harris, C., and M. Stephens, "A Combined Corner and Edge Detector," *Proceedings of the 4th Alvey Vision Conference*, August 1988, pp. 147-151
- Nister, D.. "An Efficient Solution to the Five-Point Relative Pose Problem." *IEEE Transactions on Pattern Analysis and Machine Intelligence*.Volume 26, Issue 6, June 2004, 756-770.

GitHub

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