

Room Layout Estimation in AR

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1 Introduction

This project uses the Magic Leap 2 platform to develop a **room layout estimation system**. By combining images and depth captured by the device, alongside ST-RoomNet and OneFormer, **the system extracts room boundaries and renders them in 3D with customizable features**.

2 Background

Motivation:

- **Interior Decoration/Design:** Should I put furniture here?
- **Better AR Device:** Locate myself with room layout lines!
- **Real Estate:** Buy satisfying room!

Problem: Single image → 2D room layout
→ 3D Rendering

Would it be possible if I put a microwave here??

3 Method Overview

- **Data Capture:** Magic Leap 2 → images with depth captured
- **Backend Processing:** Images + Neural estimators in 2D → boundaries in 2D + depth captured → boundaries in 3D
- **Rendering:** Boundaries in 3D → coordinates transformation → Magic Leap 2
- **UI Control:** Console → customize visualization.

Magic Leap 2

2D Neural Estimator

OneFormer

ST-RoomNet

Backend Processing

From [u, v] to [u, v, z=depth]

line detector

mask

UI Control

Rendering

	x	y	z
0.637	0.185	0.148	
0.176	0.456	0.247	
0.624	0.314	0.341	
0.793	0.252	0.635	
...	

4 Results and Discussion

- **Backend Output:** Only depth information filtered by OneFormer will be considered
- **Final UI Output:** Allow customization and ask for help.
- **Data Transmission:** Images with depth captured → server → 2D Neural Estimator → Magic Leap 2 → rendering.

Magic Leap 2 → 0.6 seconds → Server

Server → Processing → 1 seconds → Magic Leap 2 → 0.3 seconds → Visualizing

5 seconds (loop back from Visualizing to Processing)

5 Conclusions

- Room layout estimation system **developed:**
 - Visualize furniture placement and optimize room flow
 - Enhance spatial awareness with AR
- **Future:**
 - **Reduce latency**
 - **Enhance real-time**

References

1. H. Ibrahim, A. Salem, and H.-S. Kang, "ST-RoomNet: Learning Room Layout Estimation From Single Image Through Unsupervised Spatial Transformations," in "Proc. IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR) Workshops", Jun. 2023, pp. 3375–3383.

2. Jain, J., Li, J., Chiu, M., Hassani, A., Orlov, N., & Shi, H. (2023). OneFormer: Universal Image Segmentation. CVPR.