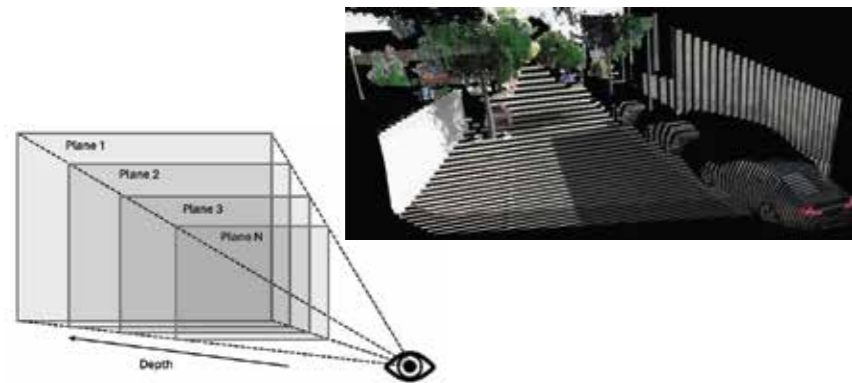


1. Context

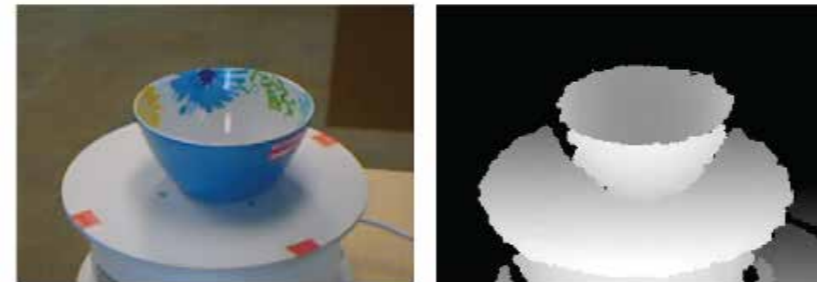
What are Multiplane Images/MPIs?

MPIs are sets of semitransparent images stacked to create parallax. They have simple geometry, and are thus suitable for low-power devices and websites.



What are RGBD images?

RGBD images contain both color information (Red, Green, Blue) and Depth information. They can be created synthetically by rendering out a depth map, or can be captured using a LiDAR scanner or a depth camera like Microsoft Kinect or Intel RealSense.



2. Problem

How can we build MPIs from RGBD?

All comparable techniques fall into two categories:

1. Machine learning is used, usually meaning the conversion from RGBD to MPI is slow. Models may also infer incorrect information to fill gaps.
2. Output information is not meant to be used for visualization, but rather as input for other systems, such as robots or autonomous vehicles.

Our proposed approach is fast, deterministic and suitable for visualization on low-power hardware.

3. Method

Building MPIs from input images:

1. Detect depth range of main viewpoint
2. Initialize fully transparent planes
3. Project main viewpoint's pixels directly
4. For each auxiliary viewpoint, project the MPI onto that viewpoint and fill in occluded areas
5. Take weighted average and normalize colors

Performance evaluation:

- Measure total time needed to build an MPI.
- Measure time needed to add one auxiliary viewpoint to the MPI

4. Results

Performance: Good

Building an MPI takes approximately:

- 32 ms
- + 2.8 ms per plane
- + 7.0 ms per auxiliary viewpoint
- + 58 μ s per plane per auxiliary viewpoint

Hardware: Windows 11 laptop

- CPU: AMD Ryzen™ 9 7940HS
- GPU: AMD Radeon™ RX 7700S
- RAM: 64GB, 5600MT/s

Visual quality: Not great

Original
MPI
Difference

