Project:

Furniture Volume Estimation using VGGT Depth Map

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Overview:

This project uses the VGGT deep learning model to predict depth maps and reconstruct 3D point maps from a single RGB image of furniture. The main goal is to estimate the real-world volume of furniture objects using the predicted depth and a reference object for scale calibration.

Workflow:

1. Load and preprocess an input image of furniture.

2. Use the VGGT model to predict a depth map and extract a 3D point map for the image.

3. Display and save the depth map for verification.

4. Visualize the 3D point map as a scatter plot to inspect the reconstructed scene and objects.

5. Estimate the convex hull volume for all reconstructed objects in the image (main_2.py).

6. For real-world volume estimation, interactively select a reference object by clicking its endpoints in the image window and entering its real-world length in meters (main_2.py).

7. For single-object volume estimation, use main.py, which estimates the volume of a single furniture object using a reference object and bounding box from the depth map.

8. The script computes the scale and converts the volume to cubic meters (m^3) or cubic centimeters (cm^3).

9. Print the estimated volume in the terminal.

Key Files:

- main_2.py: Advanced script for image processing, depth prediction, 3D point map extraction, and multi-object volume estimation.

- main.py: Script for single-object volume estimation using reference object and bounding box.

- predicted_depth_main2.npy / predicted_depth_main2.png: Saved NumPy array and visualization of the predicted depth map from main_2.py.

- predicted_depth.npy / predicted_depth.png: Saved NumPy array and visualization of the predicted depth map from main.py.

- project_documentation.pdf: PDF version of this documentation.

How to Use:

- Place an image of furniture in the specified folder (images/).

- Run main_2.py or main.py in the Python environment (vggt_env).

- For main_2.py: When prompted, click the endpoints of your reference object in the image window, then enter its real-world length in meters.

- For main.py: When prompted, enter the reference object length in pixels and centimeters.

- The script will output the estimated furniture volume.