Project: Furniture Volume Estimation using VGGT Depth Map

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.

Updated 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 (default behavior).
6. For real-world volume estimation, interactively select a reference object by clicking its endpoints in the image window.
7. Enter the real-world length (in meters) of the reference object when prompted.
8. The script computes the scale and converts the convex hull volume to cubic meters (m^3).
9. For single-object volume estimation, segment or mask the point map to include only the desired object's points before running the convex hull calculation.
10. Print the estimated volume in the terminal.

Key Files:

- main_2.py: Main script for image processing, depth prediction, 3D point map extraction, and volume estimation.
- predicted_depth_main2.npy: Saved NumPy array of the predicted depth map.
- predicted_depth_main2.png: Saved visualization of the depth map.

How to Use:

- Place an image of furniture in the specified folder.

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

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

- The script will output the estimated volume for all objects (or a selected object if segmented).

- Inspect the 3D point map visualization to verify the reconstruction and object coverage.

Next Steps:

- Add support for object segmentation/masking for single-object volume estimation.

- Improve segmentation for more accurate volume estimation.

- Visualize and save the mask and bounding box.

- Support multi-view images for 3D reconstruction.

- Add error handling and user guidance for reference measurement.

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