Why Orbital Method

Why the orbit/wall-following method worked (camera toward room centre)

Summary

- We captured the room with inward-facing orbits at two heights, followed by dedicated floor and ceiling passes. This delivered high overlap, strong parallax on walls/corners, and uniform coverage, resulting in stable alignment and a more complete mesh with fewer holes.

Method used

- Walked full perimeter twice (lower and upper height), camera aimed toward room centre.
- Maintained consistent distance, overlap, and lens settings.
- Added targeted floor and ceiling image sets.

1. High overlap + multiple view angles

- According to best-practice guides, photogrammetry demands strong image overlap (both frontal and side) so that features can be matched reliably across images.
- Orbiting around the room ensures that each wall, floor and ceiling region appears in many photos with slightly different viewpoints. That improves feature correspondences and alignment robustness (reduces “non estimated cameras”).

2. Convergent camera geometry and scene coverage

- One paper state: “Convergent geometry requires multiple camera positions on a circular path around a building corner such that the camera optical axis at each camera position points to the object corner.”
- In other words: by pointing the camera toward the room center (and following the walls), you create slightly inward angles, not strictly parallel to walls. That helps capture vertical surfaces (walls) better than if you pointed flat along the wall.
- This inward-facing orbit helps with depth estimation for walls (parallax) and ensures surfaces aren’t captured only head-on but from many angles.

3. Systematic path and consistent height/lens parameters

- According to a digital skills toolkit: “Walk around the object taking overlapping pictures… systematic capture of images ensuring adequate overlap … moving in a circular fashion around the object at different heights ensures good coverage.”
- The method of two height levels + floor/ceiling shots matches this principle: multiple elevations give fuller coverage and avoid missing underside/ceiling details.

4. Reducing risk of missing areas or holes

- Another source: “Without multiple images capturing duplicate points, most software algorithms struggle… so taking pictures at every possible angle is also key to successful scan.”
- By walking complete circuits at each height and then capturing ceiling/floor, you minimise blind spots and ensure every surface is seen in multiple images, that decreases holes in your mesh.

Alternatives considered

- **Zig-zag/ “painting”**: Covered planes but introduced viewpoint jumps and uneven overlap; alignment less reliable.
- **Grid passes**: Suited to aerial/open spaces, not enclosed rooms with close verticals (Pix4D guidance).
- **Single-point 360°**: Fast but lacked parallax for walls/corners; missed ceiling/floor detail.

Outcome

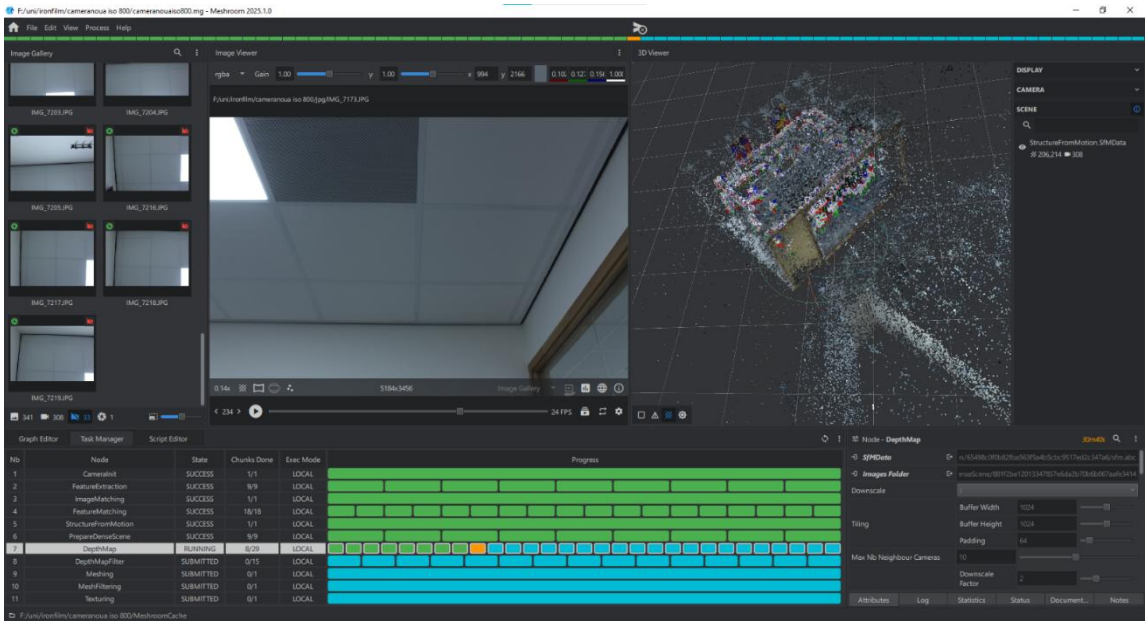
- Orbit capture produced fewer non-estimated cameras, stronger alignment, and a denser, more complete mesh than zig-zag in the same room.
- Coverage of walls, corners, floor,
  and ceiling was uniform across both height levels with minimal holes.

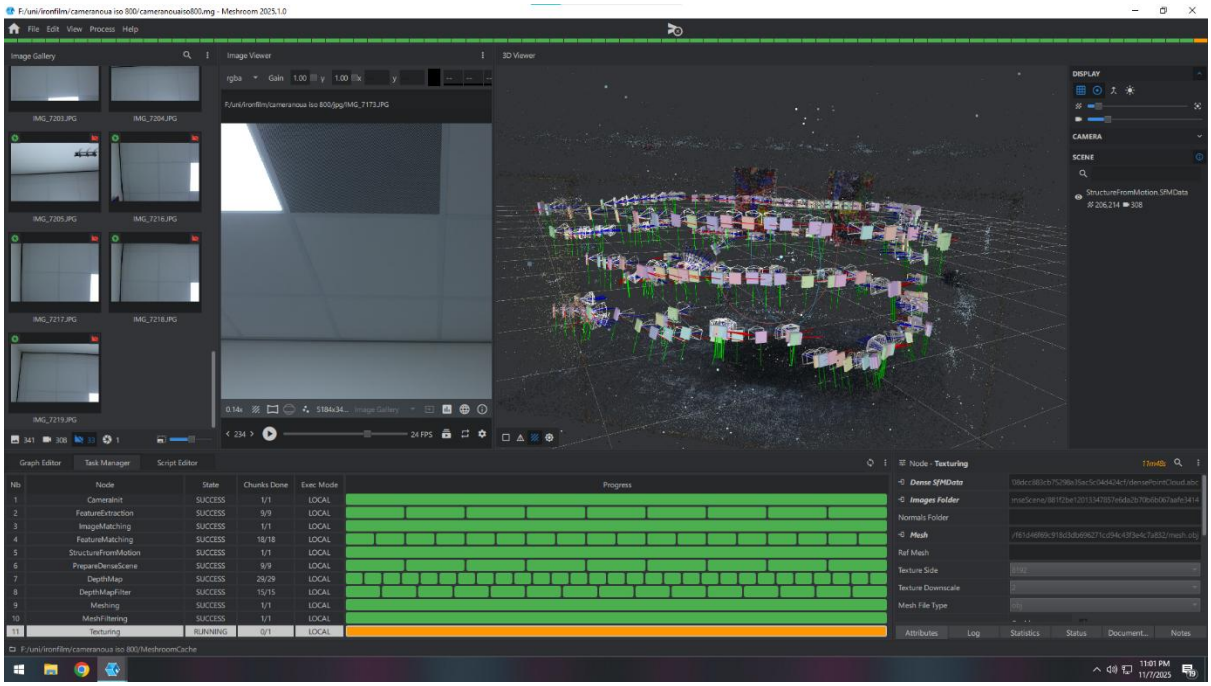
REF:

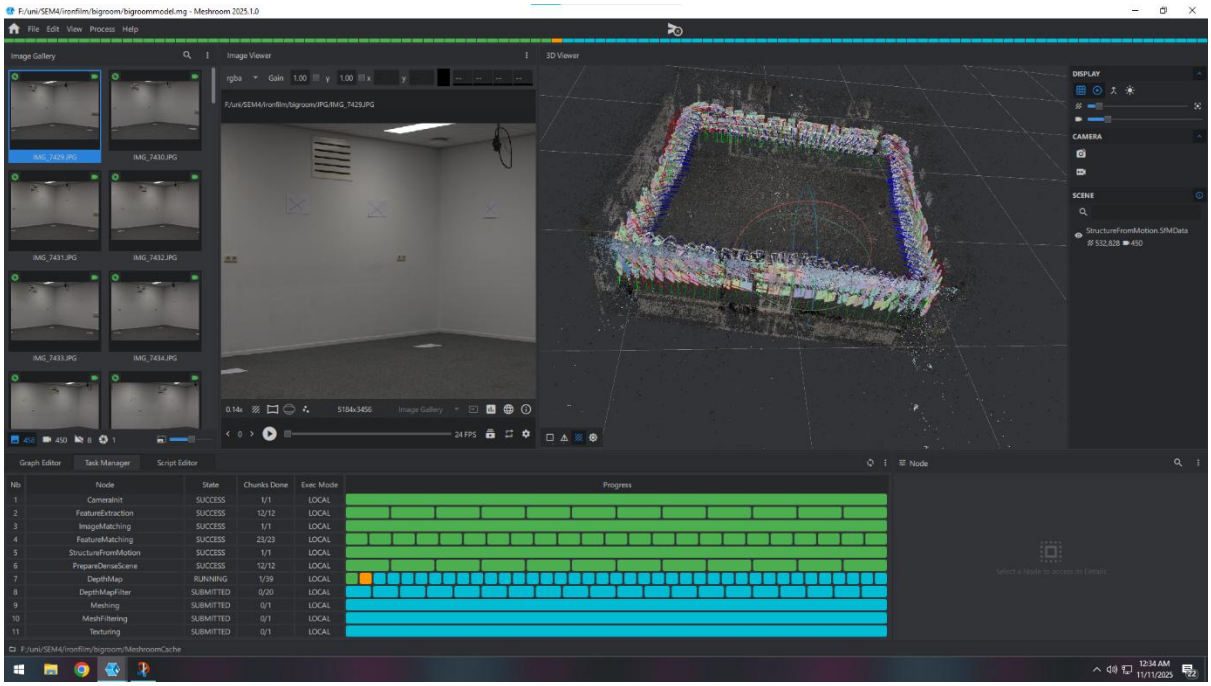
https://support.pix4d.com/hc/best-practices-for-image-acquisition-and-photogrammetry

https://isprs-archives.copernicus.org/articles/XLIII-B2-2022/29/2022/isprs-archives-XLIII-B2-2022-29-2022.pdf

https://culturedigitalskills.github.io/2024-digitisation-3d-photogrammetry/instructor/photogrammetry-setup.html



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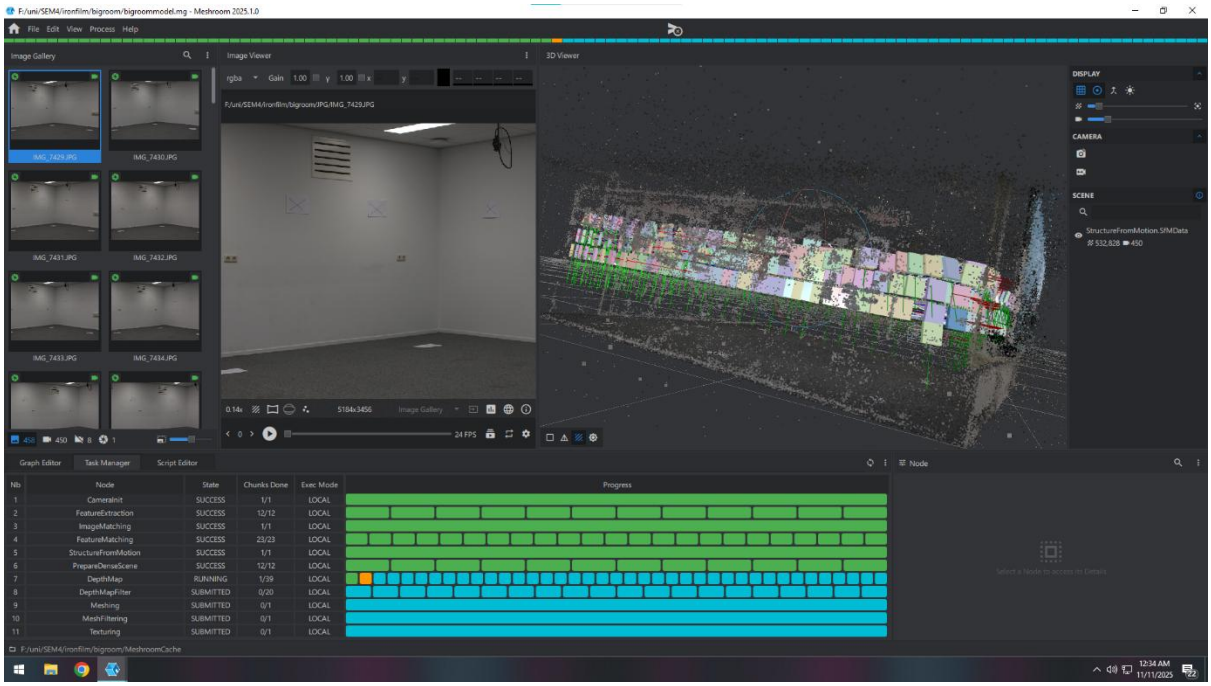
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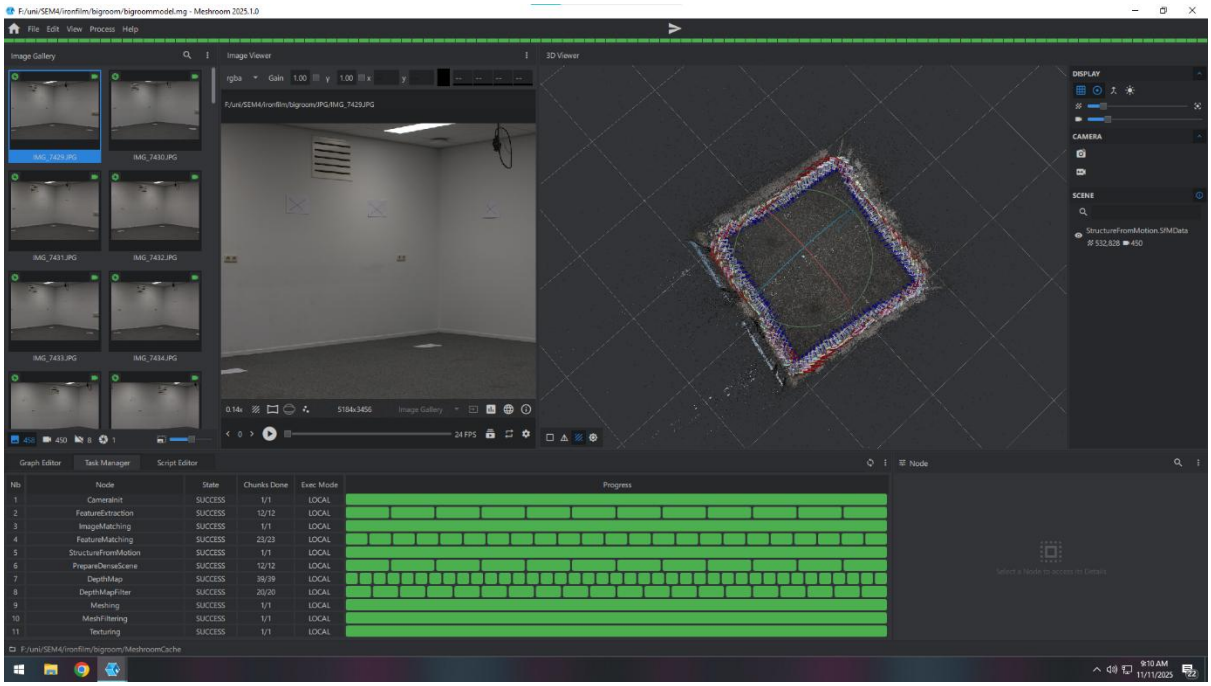
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