

3D reconstruction of the surgical scene using structured light

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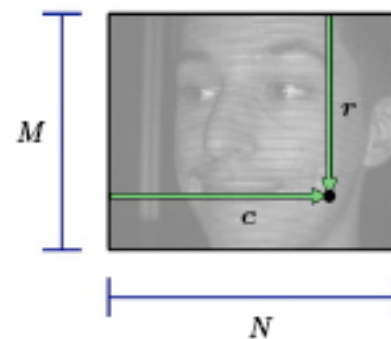
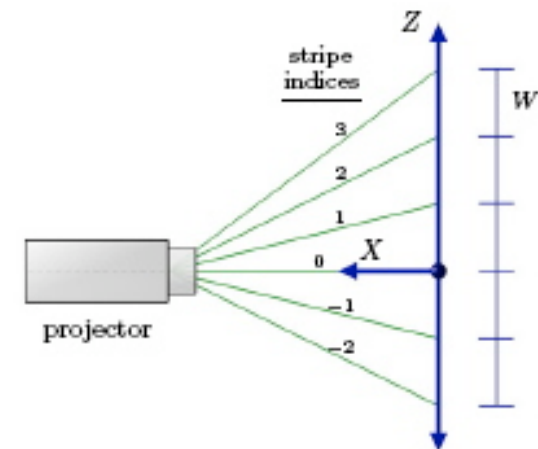
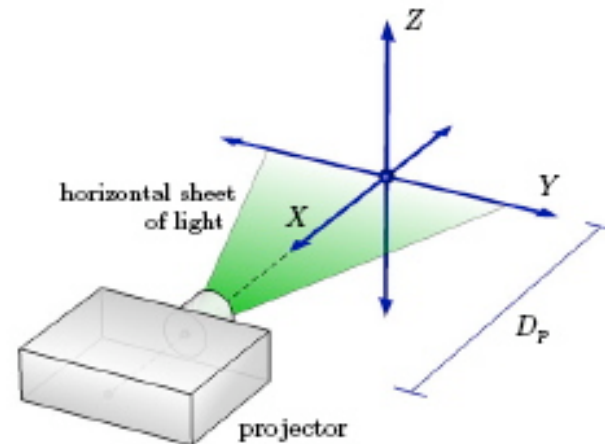
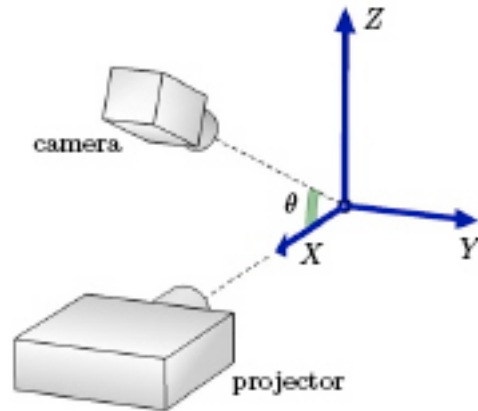
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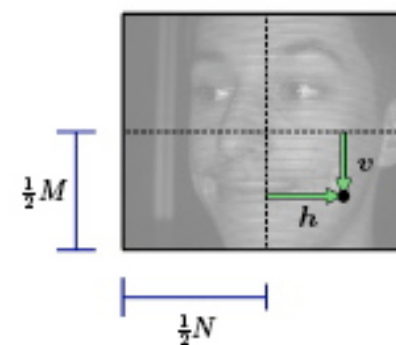
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3D RECONSTRUCTION OF THE SURGICAL SCENE USING STRUCTURED LIGHT

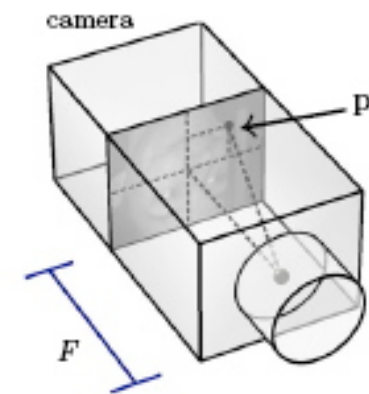
The technique: Camera + projector Visible + NIR



(a) image space

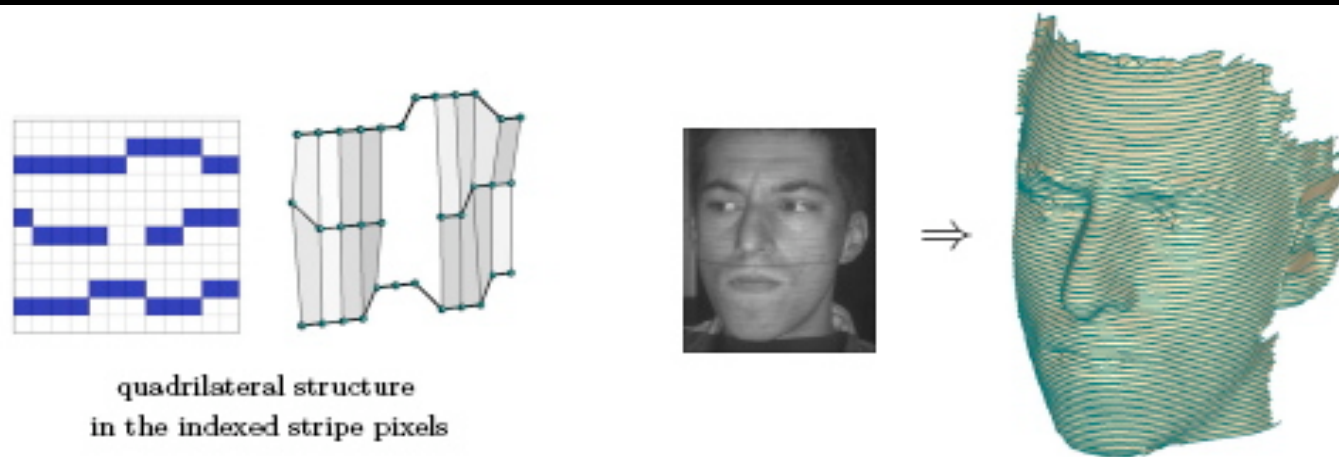
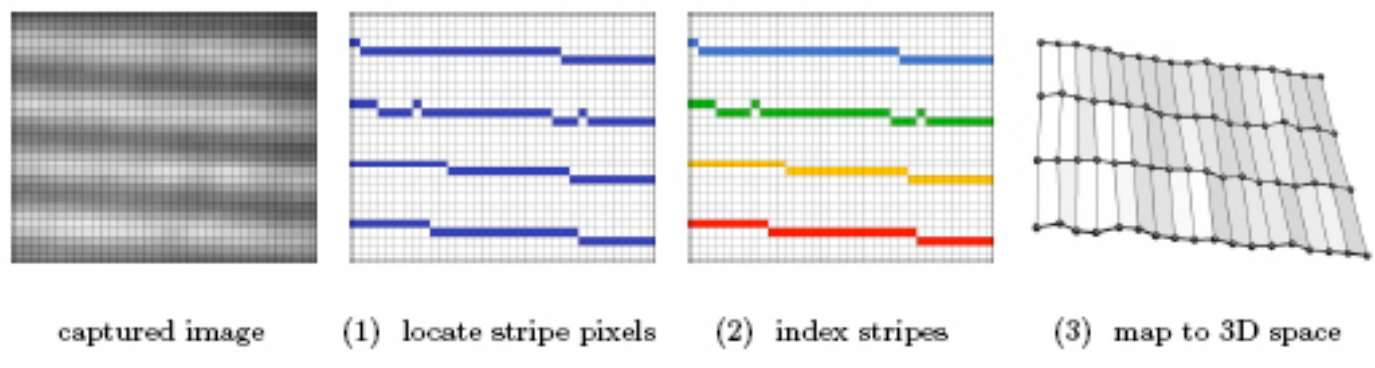


(b) centred



(c) system space

The core of the technology: Stripe indexing and generation of 3D data



Steps in 3D reconstruction

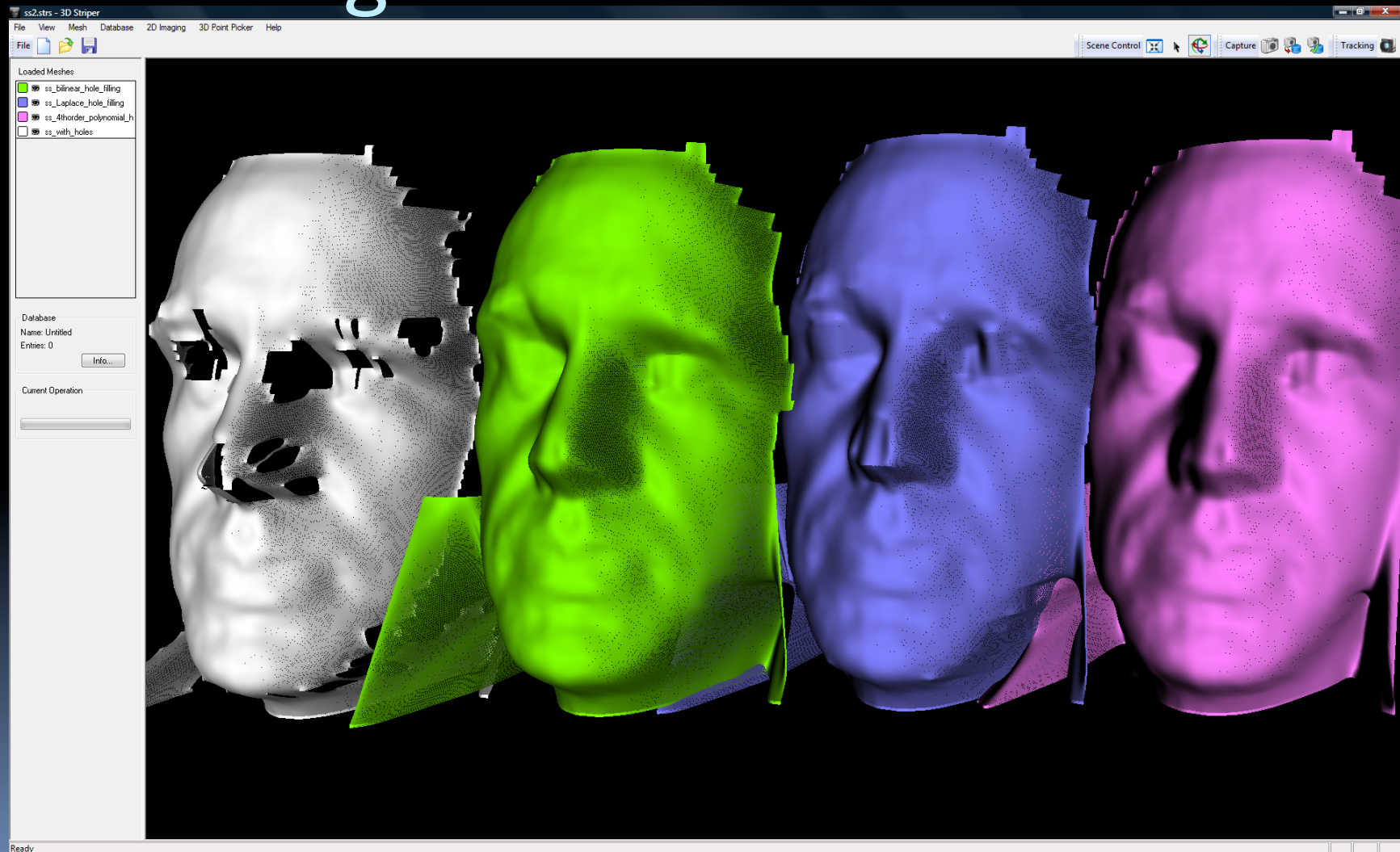
Pre-processing operations (2D):

- image acquisition (visible and NIR)
- image filtering
- stripe indexing/image correspondence

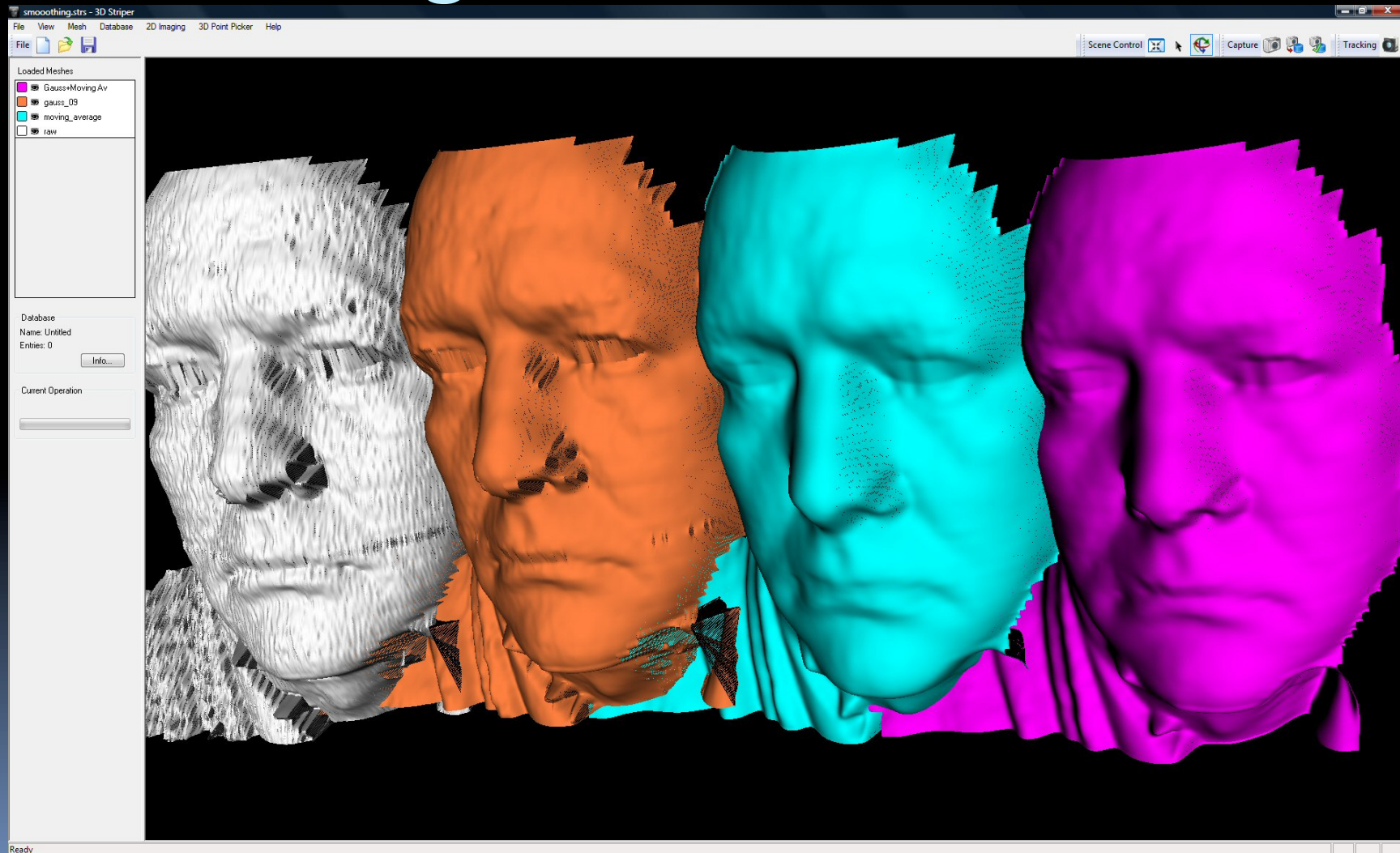
Post-processing operations (3D):

- generation of 3D point cloud and triangulation
- noise removal, hole filling, mesh smoothing
- mesh subdivision
- pose normalization / registration
- inclusion in an AR system

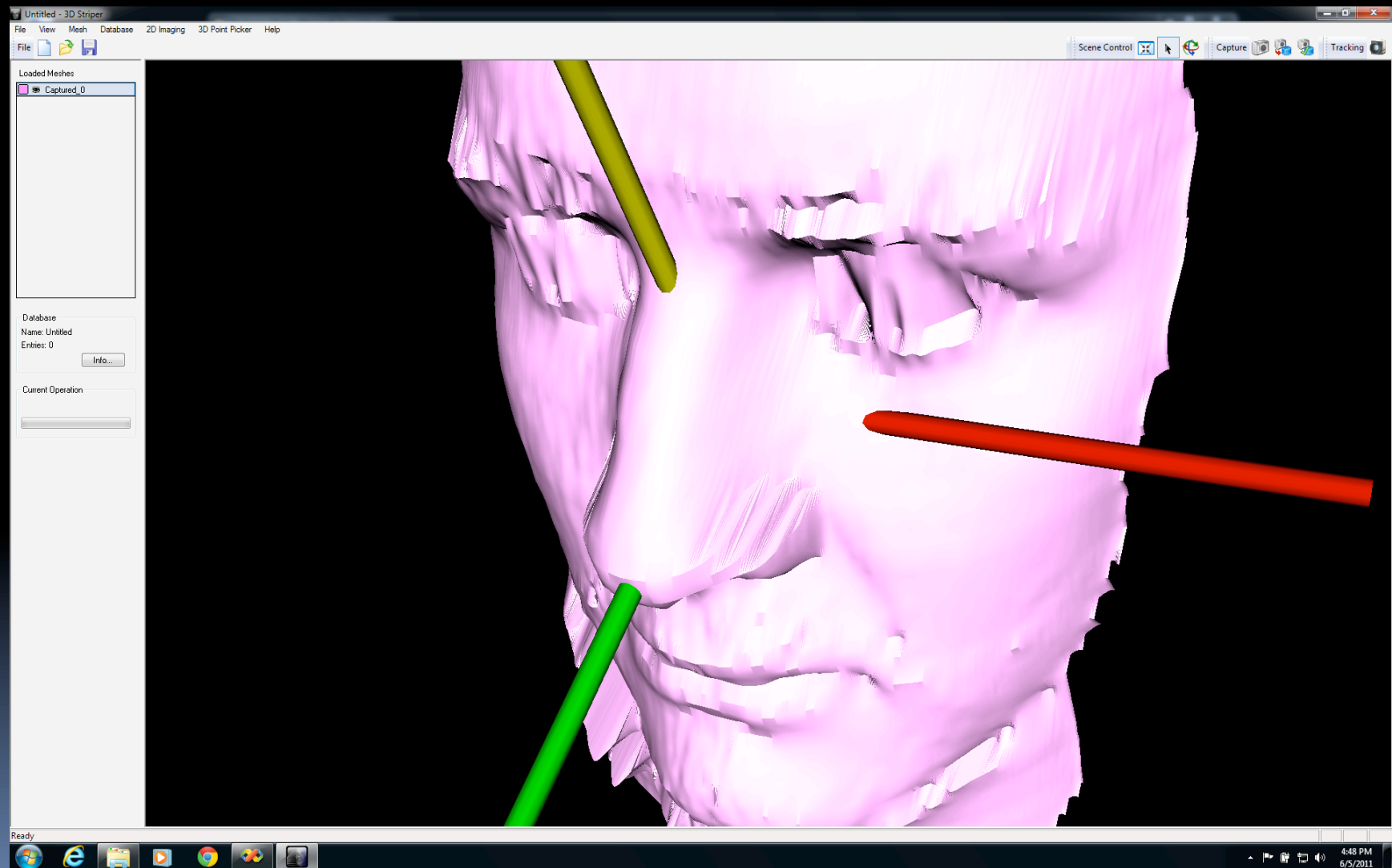
3D post-processing: hole filling



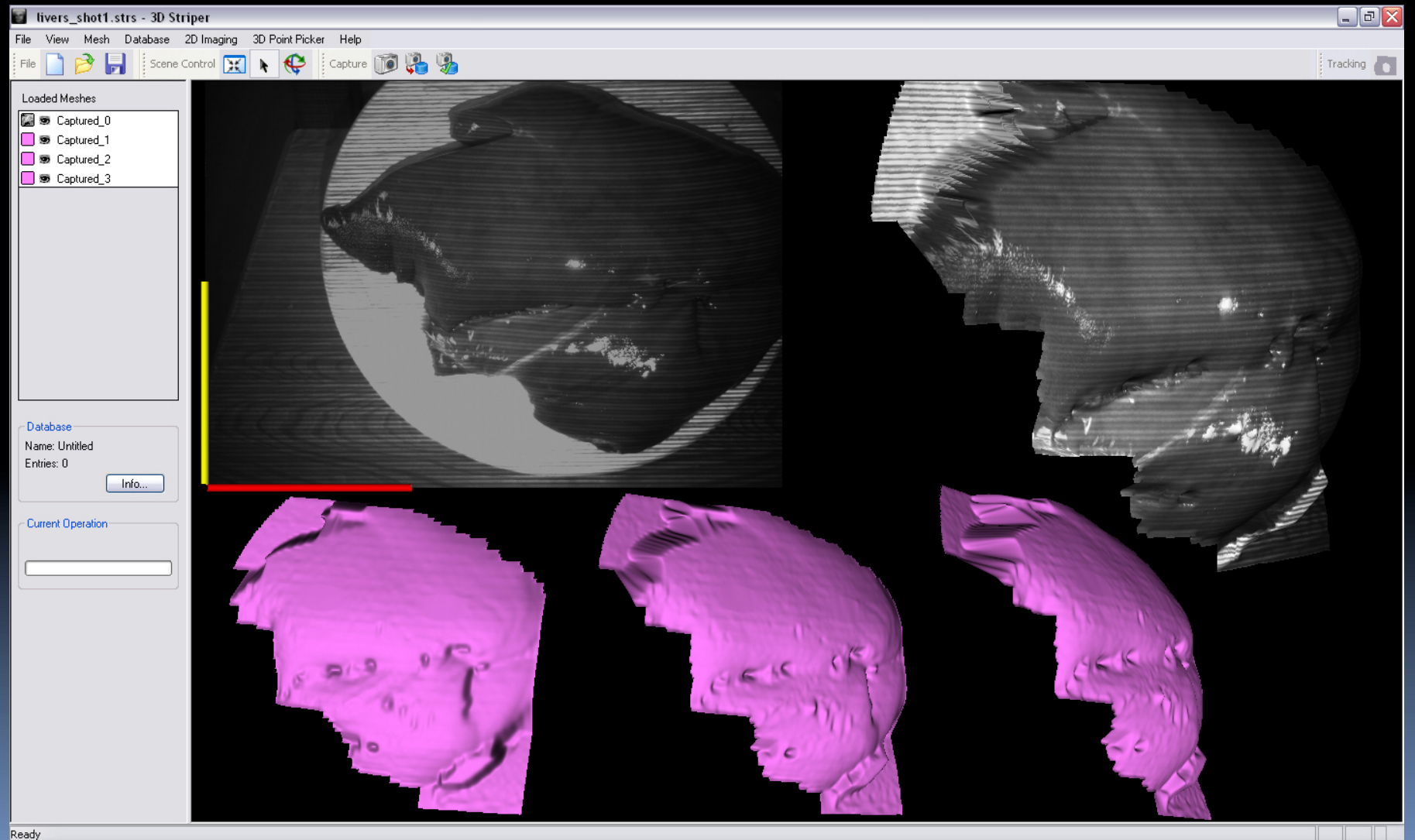
3D post-processing: smoothing



Pose registration



Need external markers for liver registration



Performance and the future

- Real-time performance
- Tracking features and registration to a standard pose
- Embed into AR systems

Future work:

- Embedding the design into DSPs
- New optics
- Develop methods for 3D image compression