Medical Core · Verified

rTMS Coil Navigation Software (NeuroPilot)

Turn optical tracking and 3D Slicer into a license-gated coil-navigation product that gives operators position and angle guidance they can rely on.

Period 2024.07 - present | Evidence state Verified · Ongoing | Portfolio tier Medical Core

Designed the 3D Slicer workflow from procedure setup to real-time coil navigation, the landmark-and-ICP registration engine, tracker, tablet, and robot integration, and a license-gated product structure.

Figure 1. Demonstration of the TMS coil-navigation robot system on an exhibition stand: robot arm, treatment chair, coil, and navigation displays in one setup.

Problem and system boundary

Medical images, a tracker, a tablet, and a robot each sit in their own coordinate frame and had to become one verifiable flow.

Owned decisions and implementation

My role

Led the 3D Slicer procedure-setup and navigation workflow, the registration engine combining landmarks and ICP with its coordinate-transform chain, the optical-tracker SDK migration with the tablet protocol and robot integration, and the product structure covering license verification and optional-feature gating.

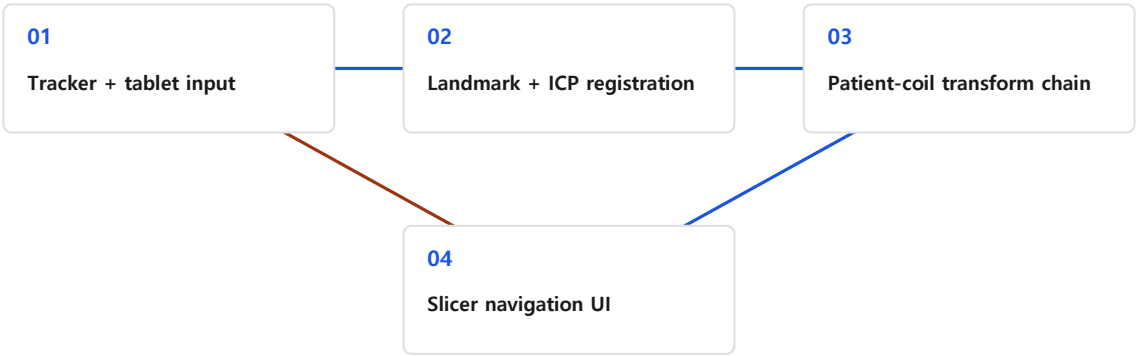
Navigation UI workflow

Six Home-screen menus gate the run from DICOM load through reconstruction, registration, and targets to the live session, with crosshair aiming.

Coordinate and registration engine

Image, patient, tracker, and coil transforms stay explicit; ICP offers three modes.

Coordinate loop from input to aiming guidance



Explanatory system relationship diagram; it is not photographic or experimental evidence.

Verification and evidence ledger

The evidence is the license-gated deployment build, a regression-test suite grown issue by issue, and coordinate-transform and registration logs.

Device and system integration

A major optical-tracker SDK migration, an in-house TCP binary protocol for the tablet, single tracker ownership, and contact-stop robot descent.

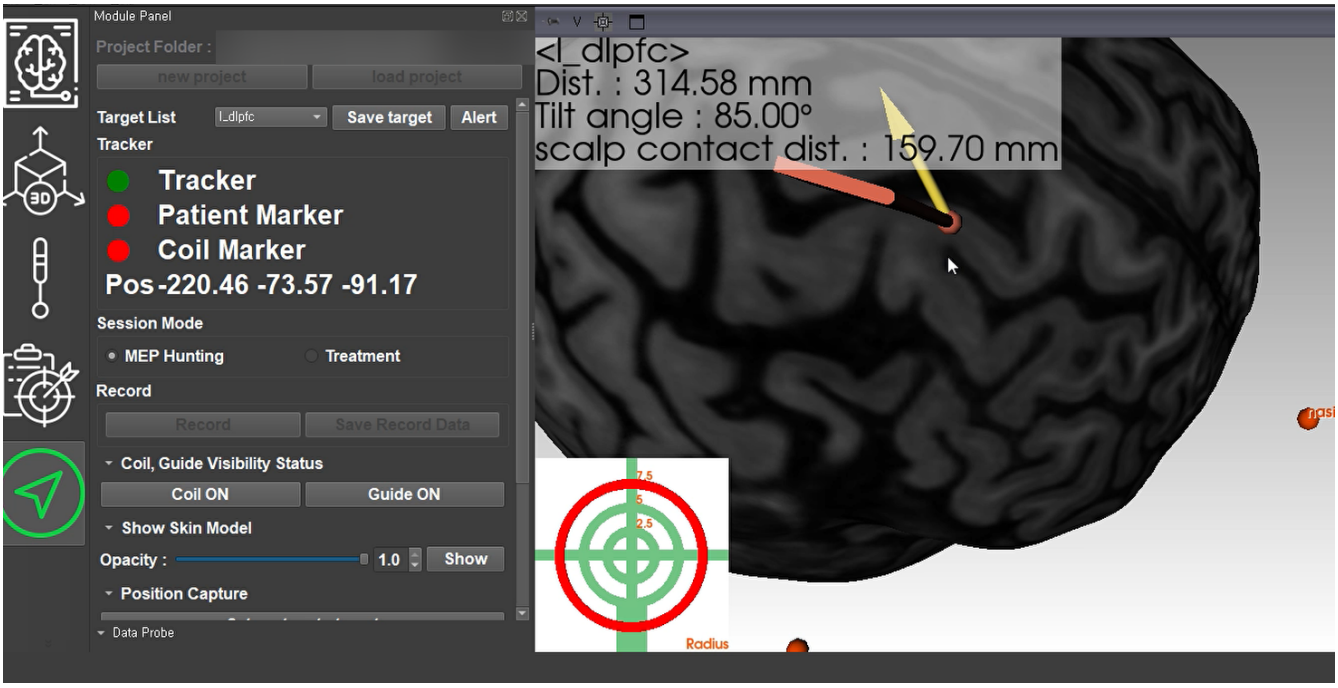


Figure 2. NeuroPilot navigation module: tracker, patient-marker and coil-marker status with distance and tilt guidance to the target

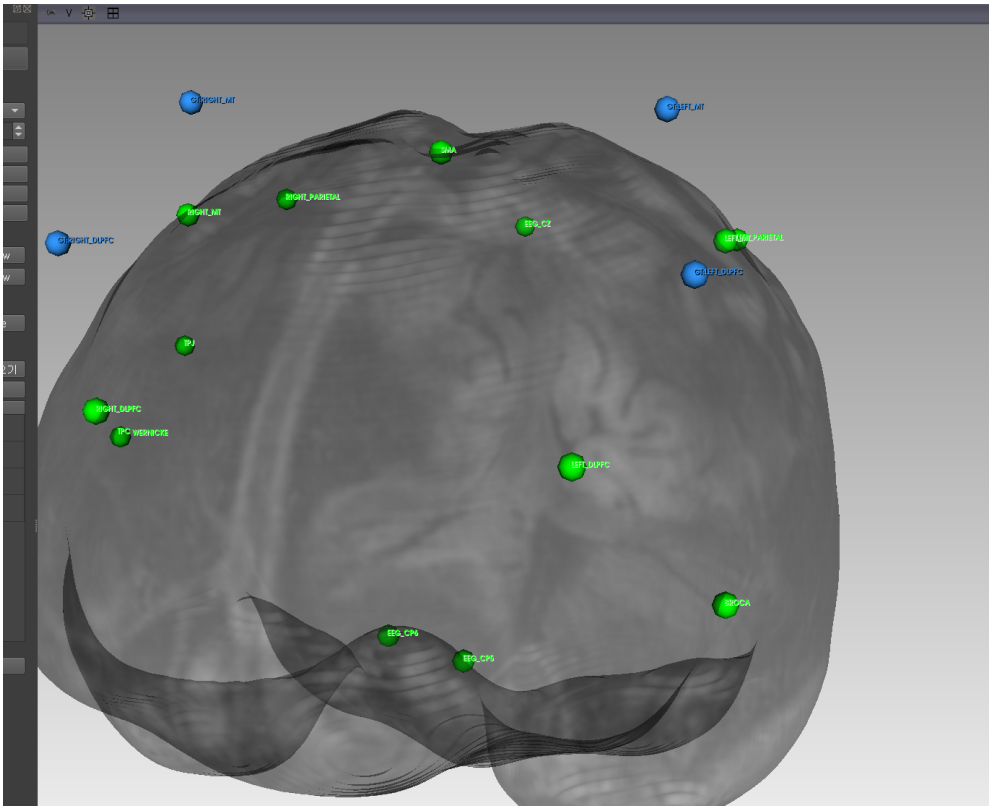


Figure 3. NeuroPilot target view: stimulation targets labelled on the cortical surface model

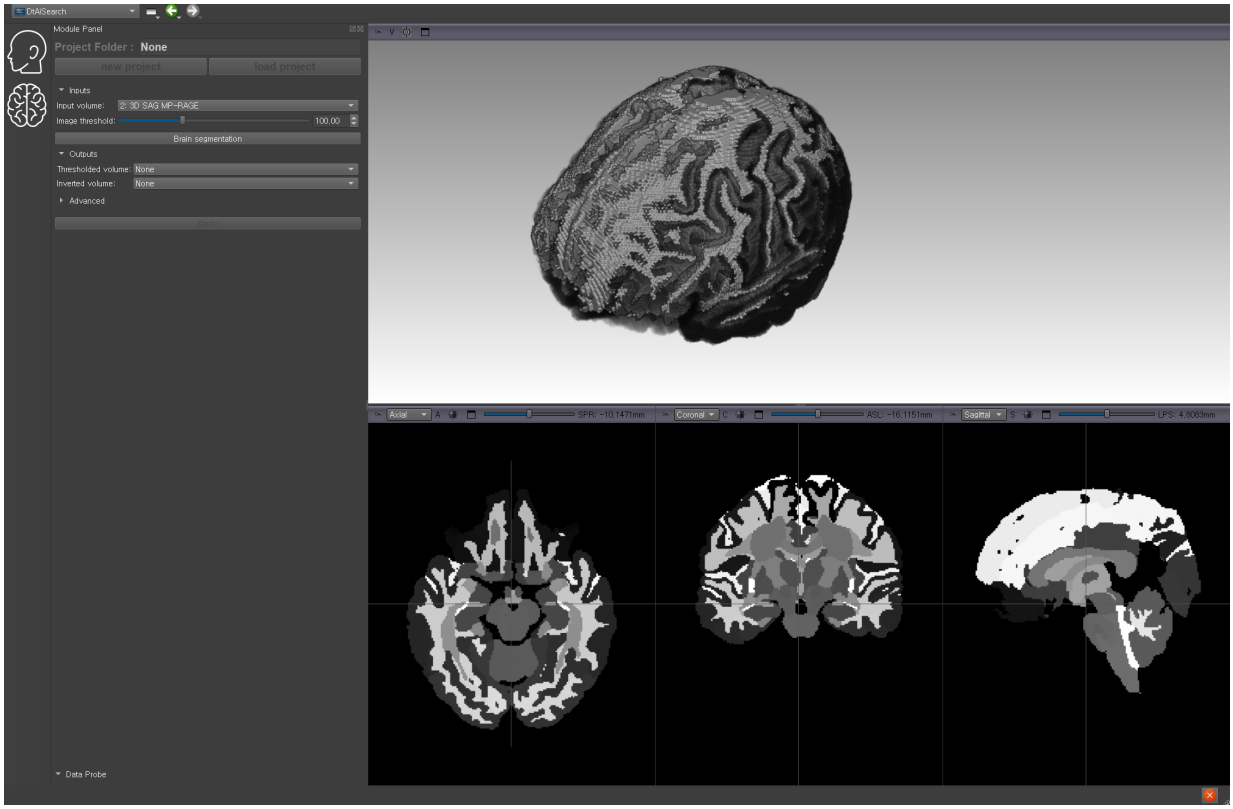


Figure 4. AI brain segmentation: a skull-stripped 3D brain model with tissue segmentation on the axial, coronal, and sagittal slices

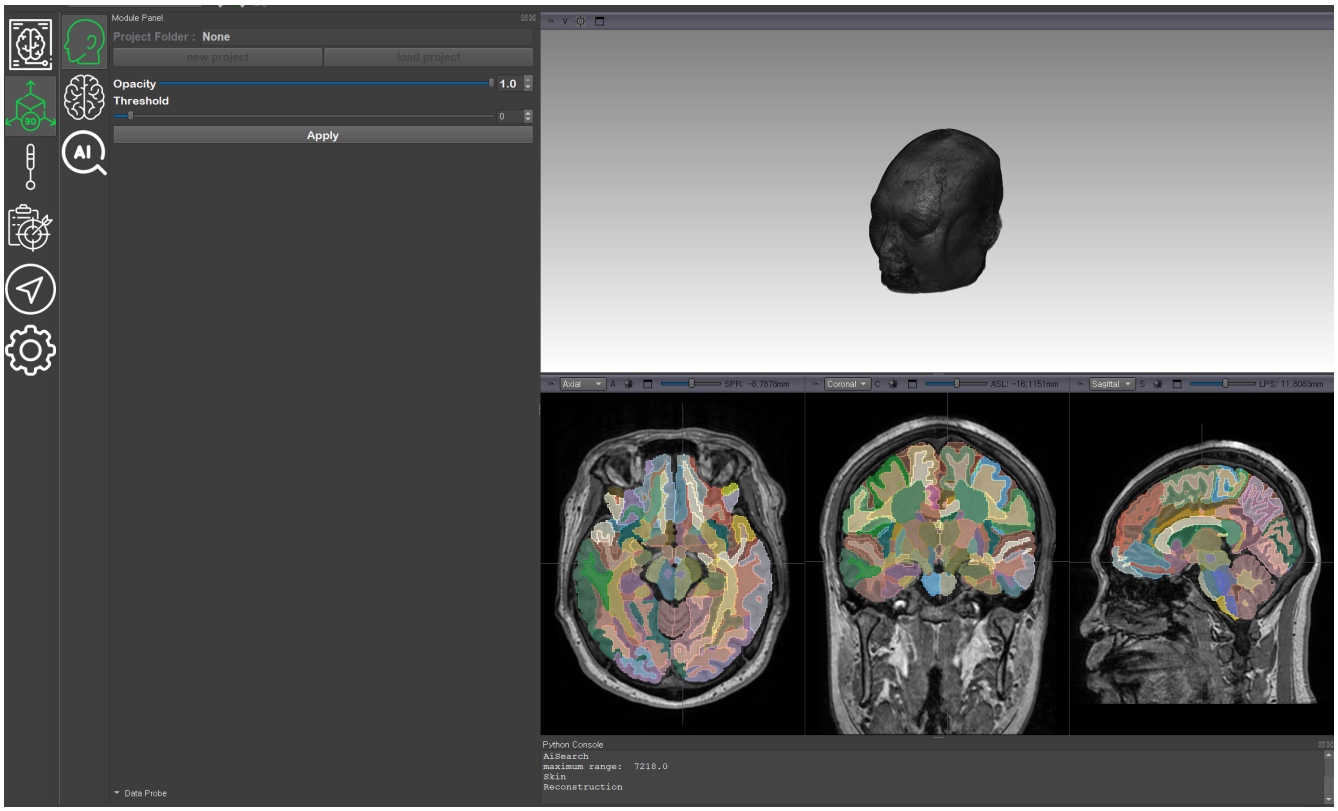


Figure 5. Cortical parcellation: region-coded segmentation overlaid on the slice views, with the reconstructed head surface

Role, team result, and limits

Team result

AT&C owns license operations and adoption. I designed the core structure; a colleague built specific screens.

Limitations

No clinical efficacy, quantitative accuracy, or regulatory status is claimed, and patient data stays out of this case.

Clinical and product boundary

No clinical efficacy, quantitative accuracy, or regulatory status is claimed.

Collaboration boundary

The segmentation and landmark models were supplied externally and integrated behind an adapter boundary. I own that boundary, the post-processing, the license gating, and the UI integration.

Implementation technologies

3D Slicer · VTK · PyQt5 · Python · PyTorch · Optical tracking · TCP/IP binary protocol · License gating

Primary capability

Medical Navigation & Visualization · 3D Geometry & Registration

Registered public evidence

No external public link is currently registered.

What to bring

Share the problem, data or sensors, target validation, and schedule. We can define coordinate and evidence boundaries together.

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