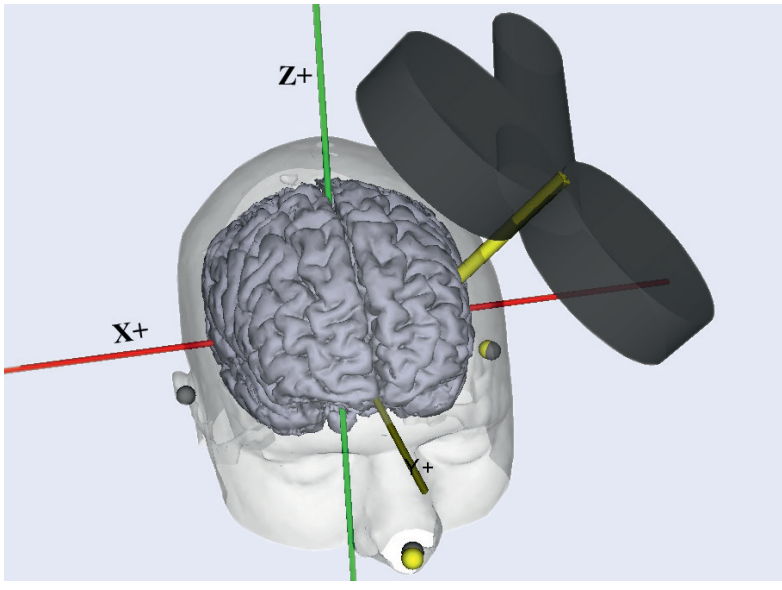
Neural Navigator

TMS Navigation System



Transcranial magnetic stimulation (TMS) allows performing painless focused stimulation of various brain regions. Specialist performing TMS can consider what brain region is stimulated only having sufficient knowledge of brain anatomy and the shape of magnetic field induced by a coil. Nevertheless, the stimulation remains “blind”. Neural Navigatortm overcomes this problem. It allows to SEE virtually the brain region targeted by TMS coil.

Neural Navigator is the Brain Science Tools BV Company product.

Neurosoft

Medical diagnostic equipment

System Components

Transmitter and Tracking Unit

The transmitter connected to tracking unit generates a pulsed DC magnetic field to measure 3D position and orientation of the sensor.

Tracking Sensor Attached to TMS Coil

The tracking sensor securely attached to TMS coil measures the magnetic field generated by transmitter and sends this information to the tracking unit. The closer the sensor to the transmitter, the stronger is the field. Thus the system can detect the sensor location relative to the transmitter with high accuracy.

Hand-held Pointer

The hand-held pointer is used to detect the position of any other objects. The system always knows the pointer location. If you touch any facial landmark with the pointer tip (for example, bridge of the nose or the tragus of the ears), the system will read 3D position of this landmark.

Lightweight Handband with 2 Sensors

These 2 sensors fixed to a head in a lightweight headband measure 3D position and orientation of the head. This way, navigation is accurate despite head movement, and the need for head fixation during navigation is less stringent.

Specialized Software

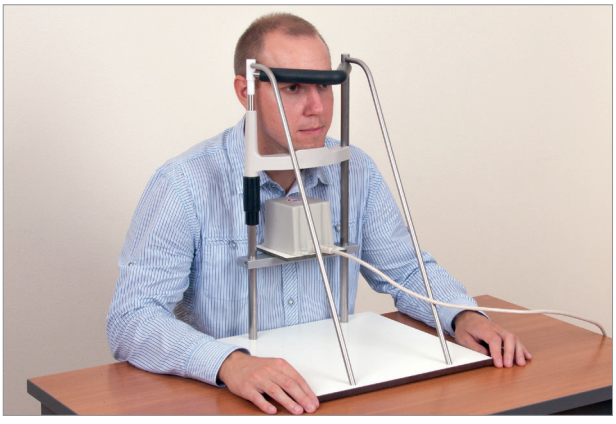
The software performs all necessary calculations and displays the real-time composite rendering of skin, brain and activation maps and shows the coil and beam orientation.

Magnetic Stimulator

Neural Navigator system operates together with Neuro-MS/D magnetic stimulator.

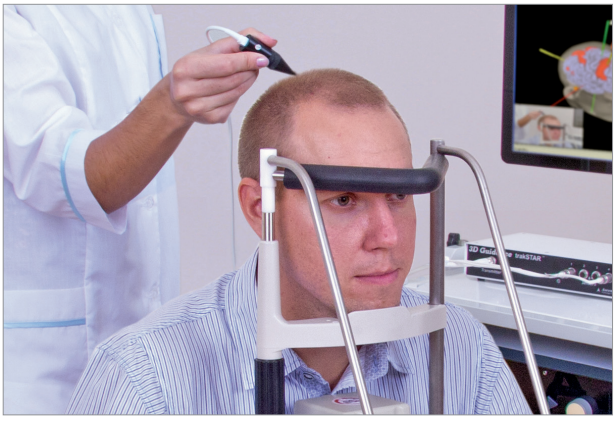
Head Support

The accurate navigation is ensured by the fixed positions of subject's head and transmitter. To ensure it, you can use head support.

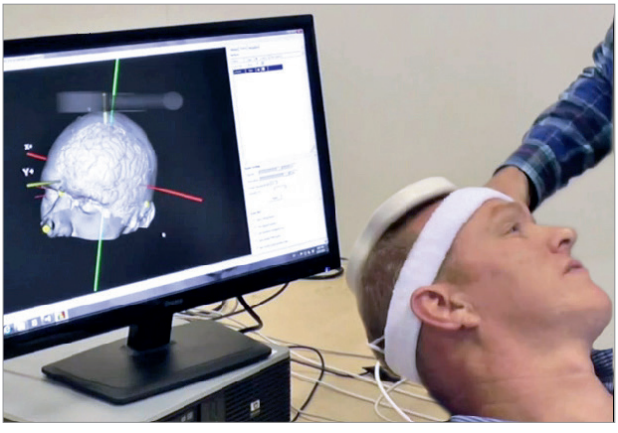


Transmitter and head support

Tracking sensor on TMS coil



Hand-help pointer



Handband with 2 sensors

Principle of Operation

Neural Navigator system operates the following way:

1. Organize your MRI-data. It is assumed that a patient has an individual MRI study results. If MRI data of patient is missing, the system will perform calculations basing on simplified model.

2. Load the data and create 3D skin and brain renderings. These images can be rotated around any axis, zoomed in/out, etc.

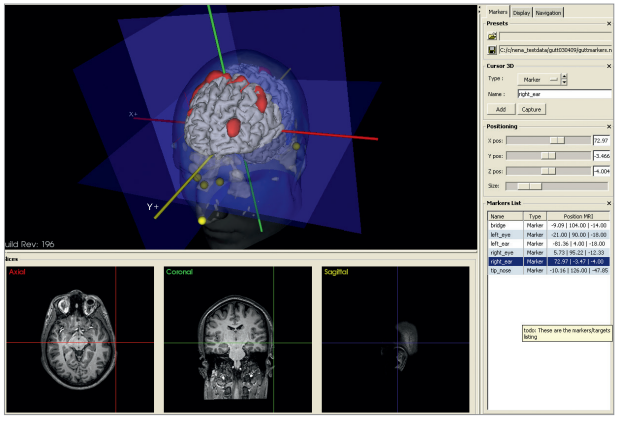
3. Set 3D markers to facial landmarks. A patient places his/her head to a head support. Using the hand-held pointer touch several facial landmarks: bridge of the nose, tip of the nose, the tragus of the ears, etc. Each time pointer touches the landmark the system recognizes the pointer location. This procedure aligns renderings in 3D space according to the real patients head position. This process is similar to orientation by geographic map. At the very beginning you do not know what to do. Then you start to search the references: street names, house numbers, bridges. Finally you can find yourself on the map and know how to turn the map for further orientation.

4. TMS coil is aligned to the renderings in the same way. At this step system knows all landmarks and coil orientation.

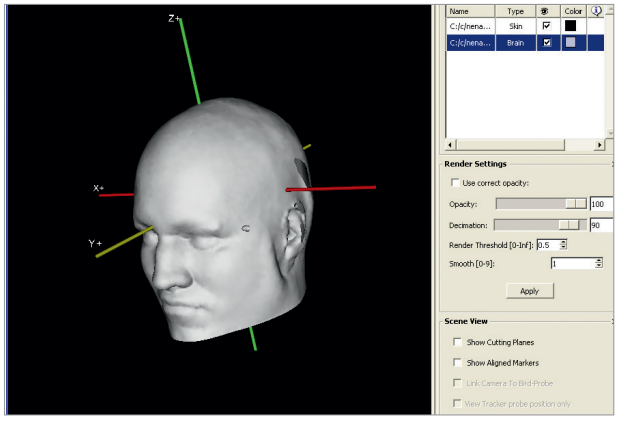
5. Set 3D target markers on the brain surface you wish to stimulate with TMS. 3D target locations appear as blue spheres to be distinguished from markers.

6. Now you can see a TMS coil moving on the screen exactly where you hold it near the head of your patient and you see beam visualizing the coil field. You can target it at any point on the brain you wish to stimulate.

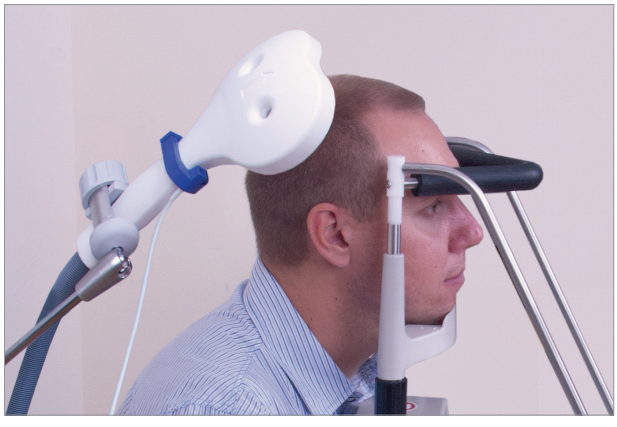
7. Press “Stimulus” button located on the coil. In this case you are completely sure that you stimulate the preselected point. This is navigation-guided TMS! If you performed the previous steps carefully, the accuracy can reach up to 4 mm or better.



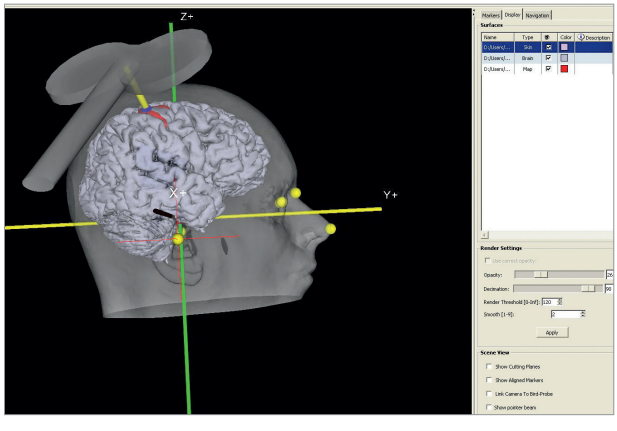
Load MRI to the program



Create 3D map



Navigation-guided TMS



Process visualization

Practical Application of TMS Navigation System

For researches:

- to study the magnetic stimulation impact to various brain areas;
- to study brain plasticity.

In practical medicine:

- to perform rTMS treatment with high accuracy;
- to map the motor cortex at brain tumors (tumor can displace the motor cortex at up to several centimeters distance and TMS with navigation allows to define its new location);
- to study brain plasticity after strokes.

Neuro-MS/D (Advanced Therapeutic)

transcranial magnetic stimulator

Main Advantages:

- pulse waveform: monophasic, biphasic, theta-burst (TBS), paired stimulation
- peak magnetic field — up to 4 Tesla
- number of pulses generated during one session — up to 10 000
- Neuro-MS.NET software for magnetic stimulator control
- application areas: psychiatry, neurology, neurophysiology

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