smartmove™

robotized TMS positioning solution

ant neuro

inspiring technology

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Robotized TMS is a novel approach to image guided transcranial magnetic stimulation (TMS). The smartmove system, in combination with visor2 navigated TMS solutions, allows the user to plan a stimulation session by defining the stimulation sites and the desired coil orientations. While executing the stimulation plan, the robotized TMS system smartmove places the coil at the predefined target positions and keeps the coil in position even if the head of the subject moves.

smartmove consists of a six-axis articulated arm and an optical tracking system. The devices are linked and controlled by a high performance PC which runs a software module for stimulation planning and execution. **smart**move is currently applied in a number of European research labs, in studies ranging from cognitive research to precise mapping of motor cortex locations in animal studies.

Key features

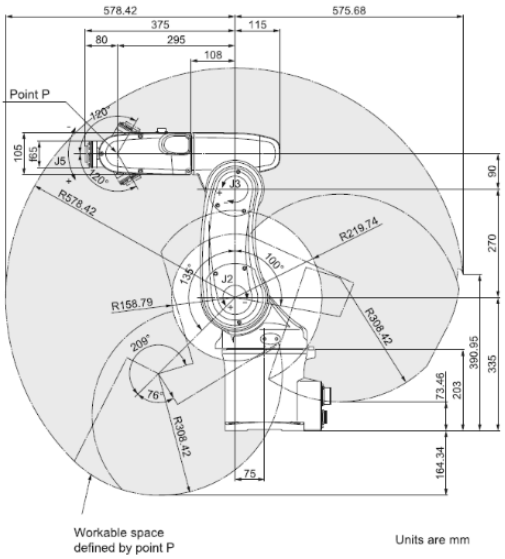
smartmove makes it easy for you to focus on your core activities. It overcomes well known major issues of image guided TMS.

- Placement of the coil tangentially to the head
- Compensation of the movements of the subject's head
- Repetition of previous stimulation target positions
- High accuracy
- Definition of entire stimulation protocols
- Online mapping of evoked motor responses
- Automatic segmentation of the scalp

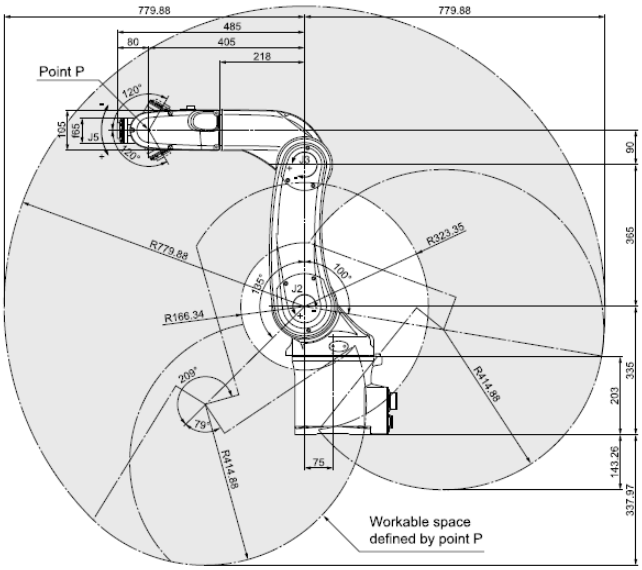
Benefits

smartmove allows you to do what you do best: research. It inspires and enables you to do your studies in the most efficient and effective way.

- Work more accurate
- Better and faster stimulation plan
- Run more sessions in a day
- Save time and money



Viper 650



Viper 850

smartmove software specifications

The robot arm and the optical tracking system are operated by the control unit. The software module, which is a main component of the control unit, allows the user to define stimulation targets and coil orientations and thus plan the stimulation. The defined target positions for magnetic stimulation are then forwarded to the robotic arm. During the session, any movement of the subject is registered by the optical tracking system, while the robot arm adapts to it. This procedure guarantees optimal positioning of the TMS coil over the pre-defined target.

MRI import	DICOM, Nifti

Target definition	- Single Targets:
	  - Based on real scalp surface, by pointing at scalp with the pointer tool
	  - Based on computer rendered surface of subject and mouse clicks
	  - Based on MRI data and mouse clicks
	- Automatically generated target grids, width adjustable height, width and target spacing starting from a previously defined single target

Subject registration	Anatomical landmarks based and/or ICP based. The ICP is based on surface points automatically collected while moving the pointer over the head
Targeting mode	- Static (without movement compensation) - Dynamic (with movement compensation)

Stimulation mode	- Single target. Upon target selection, the robot arm places the coil at the defined position.
	- Multi target. The robot arm places the coil at all defined target positions:
	  - In the specified order
	  - Randomly

Export of stimulated positions	As xml file
Dynamic response latency	< 50 ms
Relative accuracy (static target)	< 0.05 mm
In-session-repeatability (static target)	0.03 mm
Inter-session-repeatability (static target)	- 0.03 mm (same fixation) - 1.0 mm (new subject / new chair-robot-arrangement / new coil attachment)

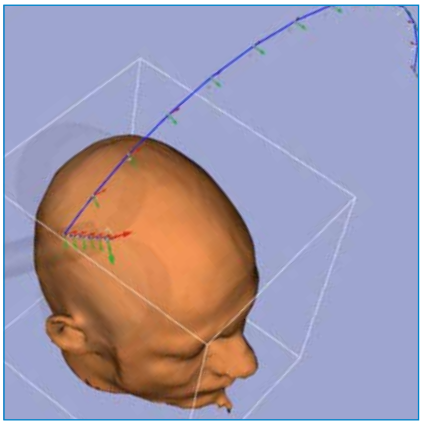
How to perform a stimulation session

- Plan the stimulation session by defining the target:
  1. Single points selected on the MRI or the virtual cranium
  2. Single points selected on the real cranium
  3. Automated target grid creation of desired dimensions and spacing, based on an initial site defined as above

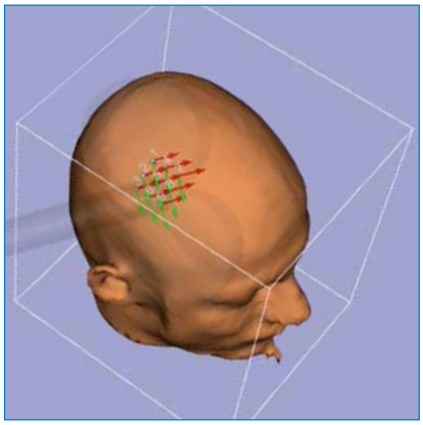
- Activate a target to allow the automatic placement of the coil at the desired location. The program calculates a safe trajectory from the current position to the target, displays it on the screen for user-approval and steers the coil exactly to the planned site for stimulation.

Compatibility with TMS stimulators

smartmove can be used with any TMS system and any planar coil. The templates of most circular and figure-of-eight shaped coils are already included. No additional hardware like markers or calibration boards are necessary to track and register new coils. They can be used straight away!



Creating a coil target



Coil in motion

smartmove Trolley

smartmove hardware specifications

Robotic arm

The Omron Adept Viper arm is a 6-axis robot designed for a multitude of applications. The precision and physical range of the robot makes it ideal for applications requiring flexible and accurate positioning of the coil and complete control.

smartmove robot type	Viper 650	Viper 850
Reach limit	Radius 653 mm	Radius 855 mm
Inner limit	Radius 166 mm	Radius 166 mm
Payload max.	5.0 kg	5.0 kg
Repeatability	± 0.020 mm	± 0.030 mm
Mounting	Trolley	Trolley
Weight (approx.)	28 kg (without trolley)	29 kg (without trolley)
Environmental requirements	Ambient temperature 5 - 40 °C Humidity range 5 - 90 % (non condensing)	Ambient temperature 5 - 40 °C Humidity range 5 - 90 % (non condensing)
Power Requirements	200 to 240VAC: 10A, single- phase	200 to 240VAC: 10A, single- phase

Camera system

smartmove is based on the NDI Spectra™ camera system. This tracking hardware uses infrared light to track the position of the pointer or other tools. Each tool is equipped with multiple passive markers. The position and the orientation of the tools are inferred from the infrared light reflected back to the position sensor. Accuracy is guaranteed to be in the sub-mm range.

Accuracy	0.25 mm RMS
AAK	0.35 mm RMS
95% Confidence interval	0.5 mm
Maximum update rate	60 Hz
Operating temperature	10°C to 40°C
Measurement volume	Pyramid
Data communication interface	USB
Power requirements	100/120/220/240 V AC, 50/60 Hz, 0.5 A
Mounting	Wall or ceiling

Control unit

The control unit operates the robot arm and the optical tracking system. It also runs the software module.

Monitor	24“ widescreen
Computer	High performance PC with 2GB RAM, fast graphics card, 2x Ethernet card, USB2-Port
Operating System	Windows

smartmove™ is intended to be used for research applications only. This products is not sold as Medical Device as defined in EU directive 93/42/EEC.
The product is not designed or intended to be used for diagnosis or treatment of disease. ANT Neuro is part of the neuromotion group.

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