IEEE/ICME CME 2011 Conference
Plenary Talk 1

From Minimal Input to Stable Network Modulation -

Transcranial Magnetic Stimulation in Neuropsychiatry

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Abstract:

Transcranial Magnetic Stimulation (TMS) is a key method for non-invasive stimulation of the human brain. Thus, there is a wide range of different applications from measuring excitability within the human motor system to experimentally or therapeutically modulating regional brain function by repetitive TMS (rTMS). Previously, rTMS has been used to investigate perceptive functions within the visual system as

well as higher cognitive functions or emotional regulation within prefrontal, parietal and other cortex regions (Grossheinrich et al. Biol. Psychiatry 2009). Methodologically, coil designs have been modified to specific stimulation demands and targeted focal stimulation has been achieved by neuronavigation based on magnetic resonance imaging. However, more recent interest has been focussing on the differential action of pulse shapes, state dependent variations of rTMS action related to homeostatic plasticity and the duration of post-stimulation effects. The latter may be particularly relevant for enhancing the action of rTMS in experimental as well as therapeutic interventions. The question how long post-stimulation effects last, when to apply a second or third rTMS session in order to produce longer-lasting or even stable effects and summation of such effects over time have been poorly studied so far. However, there is a large body of evidence supporting the role of stimulus summation and interference in long-term potentiation (LTP) or depression (LTD) research. In therapeutic applications, rTMS has to compete with invasive stimulation approaches like vagus nerve stimulation (VNS) or deep brain stimulation (DBS), where a more or less continuous stimulation is provided 24 hours a day. Different rTMS approaches have been developed in order to enhance post-stimulation effects: Burst protocols (e.g. theta burst stimulation -- TBS), coupled TMS (e.g. paired, tripled or quadripulse) or priming rTMS by transcranial direct current stimulation (tDCS). Beside an overview of rTMS methods, examples of neurocognitive experiments and therapeutic interventions will be presented in this review. As the largest body of evidence for therapeutic rTMS is available in major depression (Padberg and George Exp. Neurology 2009), the presentation will also focus on this application including recent data for TBS as antidepressant intervention (Holzer and Padberg Brain Stimulation 2010).

Frank Padberg is Associate Professor at the Ludwig-Maximilian University in Munich and Director of the Laboratory of Transcranial Brain Stimulation and Neuroplasticity, Dept. of Psychiatry and Psychotherapy. He is a leading expert in the application of non-invasive brain stimulation for the treatment of psychiatric disorders and holds the position of the Secretary of the Task Force on Brain Stimulation of the World Federation of Societies of Biological Psychiatry (WFSBP). He is the current President of the German Society of Brain Stimulation in Psychiatry. He has received research grants from various sponsors, e.g. the German Ministry of Education and Research, the German Research Foundation and industry grants. He has published over 100 papers in international peer-reviewed journals and a recent book on non-invasive brain stimulation in psychiatric disorders.

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Plenary Talk 2

Active medical devices: State-of-the-art and the challenges

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Abstract:

In the past centuries, endoscope evolved from rigid to flexible, from cabled to wireless, thanks to the development of new technologies and new materials. The self-contained wireless capsule endoscope represents the state-of-the-art of gastrointestinal endoscope by providing non-invasive, painless and

effective diagnosis of the diseases in the small intestine. Nevertheless, efforts to develop the next generation endoscopes still continue to this date. One anticipation is to embed the capsule with therapeutic tools and enable not only diagnosis but also treatment of the GI diseases as well. Prior to the accomplishment of this objective, controlled movement of the capsule should be achieved first. In this talk, we focused on the actuation and localization issues of the active capsule endoscope. After a survey on the related work, the challenges were presented and the possible solutions were discussed.

Max Q.-H. Meng received his Ph.D. degree in Electrical and Computer Engineering from the University of Victoria, Canada, in 1992, following his Master's degree from Beijing Institute of Technology in 1988. He has been a Professor of Electronic Engineering at the Chinese University of Hong Kong since 2002, after working for 10 years in the Department of Electrical and Computer Engineering at the University of Alberta in Canada as the Director of the ART (Advanced Robotics and Teleoperation) Lab, holding the positions of Assistant Professor (1994), Associate Professor (1998), and Professor (2000), respectively. He is jointly appointed as an Overseas Outstanding Scholar Chair Professor of the Chinese Academy of Sciences and the Dean of the School of Control Science and Engineering at Shandong University in China. His research interests include robotics and active medical devices, tele-medicine and healthcare, bio-sensors and sensor networks, network enabled systems and services, and adaptive and intelligent systems. He has published more than 350 journal and conference papers and book chapters and led more than 30 funded research projects to completion as Principal Investigator. He has served as an editor of the IEEE/ASME Transactions on Mechatronics and an associate editor of the IEEE Transactions on Fuzzy Systems, and is currently a technical editor of Advanced Robotics, Journal of Advanced Computational Intelligence and Intelligent Informatics, and International Journal of Information Acquisition. He served as an Associate VP for Conferences of the IEEE Robotics and Automation Society (2004-2007), an AdCom member of the IEEE Neural Network Council/Society (2003-2006), and a member of the IEEE/ASME Transactions on Mechatronics Management Committee (2001-2006). He was the General Chair of IEEE CIRA 2001, IROS 2005, AIM 2008, and WCICA 2010 conferences. He is a recipient of the IEEE Third Millennium Medal award and is a Fellow of IEEE.