Department of Psychology
The University of Hong Kong
香港大學心理學系

Department of Electrical and Electronic Engineering
電機電子工程系

Departmental Seminar

What is the Value of Magnetic Resonance Elastography (MRE) for Clinical and Cognitive Brain Science?

4:00p.m. – 5:00p.m. | October 09, 2024 (Wednesday)
Rm 1103, 11/F, The Jockey Club Tower | Centennial Campus | The University of Hong Kong

Professor Neil Roberts
Chair of Medical Physics and Imaging Science
University of Edinburgh, UK

Abstract

Magnetic Resonance Elastography (MRE) is a Magnetic Resonance Imaging (MRI) technique that receives close attention because it allows non-invasive measurement of a fundamental physical quantity, namely the mechanical properties (i.e. elasticity and viscosity) of tissues. The technique was first described in a publication in the journal Science in 1995 (Muthupillai et al., 1995). Mechanical vibrations are introduced in the organ of interest via an appropriate actuator and the acoustic waves that are produced are imaged by using a phase sensitive MRI technique. Tissue stiffness is related to the speed of the propagating waves and mathematical inversion techniques are applied to produce a parametric map that is referred to as an elastogram. The capability to perform MRE is now available on 1,000's of commercial MRI systems worldwide and application of MRE to grade the severity of fibrosis in patients with liver disease is replacing the need for invasive biopsy. Meanwhile a substantial body of research has been performed concerning the study of the brain and which will be reviewed. The MRE technique offers the possibility of exquisite sensitivity through an inherently large dynamic range and robust quantification, and of particular interest will be to consider the resources that are required to establish potential new research projects in clinical and cognitive neuroscience concerning brain MRE. The presentation will conclude with a glimpse into the future and consideration of what is state of the art in MRE research and how MRE is influencing clinical practice.

Reference

Muthupillai, R., Lomas, D., Rossman, P., Greenleaf, J., Manduca, A. and Ehman, R.L. Magnetic Resonance Elastography by direct visualization of propagating acoustic strain waves. Science, 269, 1854–1857 (1995).

About the Speaker

After graduating in Physics from the University of Liverpool, Neil was awarded a Personal Fellowship from the Natural Environment Research Council (NERC) and subsequently moved to the USA where he was Research Associate at University of California in Santa Barbara (UCSB). Returning to the UK, Neil was appointed Lecturer at the University of Liverpool, Magnetic Resonance and Image Analysis Research Centre (MARIARC), which was built to house the UK's first commercial Magnetic Resonance Imaging (MRI) system, to set up an Image Analysis Laboratory, and where he was subsequently appointed Director. In 2009 Neil was appointed Chair of Medical Physics and Imaging Science at the University of Edinburgh and is based in the Centre for Reproductive Health (CRH) in the Institute for Regeneration and Repair (IRR).

Neil's chosen research is quantitative Magnetic Resonance Imaging (qMRI) and he has published over 200 relevant peer-reviewed scientific articles concerning application of different MRI techniques (e.g. structural MRI, DTI, fMRI, MRS) in clinical research and especially in clinical and cognitive neuroscience. Most prominent is the technique of Magnetic Resonance Elastography (MRE) for non-invasive measurement of tissue mechanical properties, and in collaboration with Dr. Richard Ehman at the Mayo Clinic, Minnesota, USA this is being applied in studies of the uterus with Professor Hilary O.D. Critchley at the University of Edinburgh, of brain with Professor Meiyun Wang, Henan Academy of Science, ZhengZhou, China and Professor Yoshiyuki Watanabe, Shiga University of Medical Science (SUMS), Japan and of muscle with Dr. Uraiwan Chatchawan, Khon Kaen University (KKU), Thailand.

Zoom Meeting (For participants who couldn't attend the Seminar in person)
https://hku.zoom.us/j/6985555998?pwd=V05yTGJWNTlzazd2OFZ0Q3FReHVkdz09
Meeting ID: 698 555 5998 | Password: Psyc

~All are Welcome~

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