The Chinese University of Hong Kong
Shun Hing Institute of Advanced Engineering

Distinguished Lecture Series 2011

EEG Signal Classification – A New Geometric Distance Measure

by

Professor Kon Max Wong

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Date: 31 October 2011 (Monday)
Time: 2:30 p.m. – 4:00 p.m.
Venue: Room 222, 2/F, Ho Sin Hang Engineering Building, CUHK

Abstract

We study the classification of EEG signals for the determination of the state of sleep of a patient. We employ the power spectral density (PSD) matrices as the feature for the distinction between different classes of EEG signals. This not only allows us to examine the power spectrum contents of each signal as well as the correlation between the multi-channel signals, but also complies with what clinical experts use in their visual judgement of EEG signals. To establish a metric facilitating the classification, we exploit the specific geometric properties, and develop, with the aid of fibre bundle theory, an appropriate metric in the Riemannian manifold described by the PSD matrices. To use this new metric effectively for the EEG signal classification, we further need to find a weighting for the PSD matrices so that the distances of similar features are minimized while those for dissimilar features are maximized. A closed form of this weighting matrix is obtained by solving a convex optimization problem. The effectiveness of using these new metrics is examined by applying them to a collection of recorded EEG signals for sleep pattern classification based on the k-nearest neighbour decision algorithm with excellent outcome.

Biography of the Speaker

Kon Max Wong received his BSc(Eng), DIC, PhD, and DSc(Eng) degrees, all in electrical engineering, from the University of London, England, in 1969, 1972, 1974 and 1995, respectively. He started working at the Transmission Division of Plessey Telecommunications Research Ltd., England, in 1969. In October 1970 he was on leave from Plessey pursuing postgraduate studies and research at Imperial College of Science and Technology, London. In 1972, he rejoined Plessey as a research engineer and worked on digital signal processing and signal transmission. In 1976, he joined the Department of Electrical Engineering at the Technical University of Nova Scotia, Canada, and in 1981, moved to McMaster University, Hamilton, Canada, where he has been a Professor since 1985 and served as Chairman of the Department of Electrical and Computer Engineering in 1986–87, 1988–94 and 2003−08. Professor Wong was on leave as Visiting Professor at the Department of Electronic Engineering of the Chinese University of Hong Kong from 1997 to 1999. At present, he holds the Canada Research Chair in Signal Processing at McMaster University. His research interest is in signal processing and communication theory and has published over 240 papers in the area.

Professor Wong was the recipient of the IEE Overseas Premium for the best paper in 1989, and is also the co-author of the papers that received the IEEE Signal Processing Society “Best Young Author” awards of 2006 and 2008. He is a Fellow of IEEE, a Fellow of the Institution of Electrical Engineers, a Fellow of the Royal Statistical Society, and a Fellow of the Institute of Physics. More recently, he has also been elected as Fellow of the Canadian Academy of Engineering as well as Fellow of the Royal Society of Canada. He was an Associate Editor of the IEEE Transaction on Signal Processing, 1996–98 and served as Chair of the Sensor Array and Multi-channel Signal Processing Technical Committee of the IEEE Signal Processing Society in 2002–04. Professor Wong was the recipient of the Alexander Von Humboldt International Research Award in 2010 and of the McMaster Engineering Research Achievement Award in 2011.

*** * * * *** **ALL ARE WELCOME** *** * * * *** **For ENQUIRIES: (852) 3943-4351**

** Light refreshment will be served at 2:15 p.m. before the lecture **