**Contactless Magnetic Sensing in Condition Monitoring and Anomaly Detection for Smart Grid: New Possibilities and Alternatives**

**Abstract:**

Our physical and cyber environments are becoming increasingly intertwined with smarter sensing, communication, and data analytics. Our daily livings are indeed surrounded by a wide variety of sensors, IoT connectivity, and edge computing devices, constituting smart grid, smart city, smart transportation, and so on. The availability of sensing devices with measurement, communication, and processing capabilities is providing fine-grained data. Together with multimodal sensory data collection and sensor fusion can result in actionable insights and decisions. This synergy can lead to improved ways and quality of life in what we call smart living.

Magnetism is one of the six energy forms of measurands in sensing. Magnetic sensing plays a critical role in smart living due to various sources of magnetic fields such as magnetic fields from current-carrying wires and permanent magnets which are geometrically determined by Biot-Savart Law and Ampere's Law respectively. These magnetic fields can range from DC to AC, from low frequency to high frequency. Modern civilization heavily relies on electricity which are generated, transmitted, and utilized through various kinds of transmission medium and electrical machines that are composed of current-carrying conductors, electromagnets, and permanent magnets. As such, magnetic field sensing is an important source of data and thus information for condition monitoring of power generation, transmission, and distribution.

In this talk, we will discuss the various opportunities and alternatives magnetic field sensing can offer in condition monitoring and anomaly detection in smart grid and smart city. Since it is contactless sensing, its installation is easy and it can be easily retrofitted to the existing plant and equipment. This will minimize cost, avoid wear and tear, and meet stringent reliability requirement. Contactless magnetic sensing can complement the traditional contact measurement techniques and help to overcome the major obstacle towards pervasive sensing due to its scalability.

**Biography:**

Philip W. T. Pong received a B.Eng. from the University of Hong Kong (HKU) with 1st class honours. Then he obtained a PhD in engineering at the University of Cambridge. He was a postdoctoral researcher at the Magnetic Materials Group at the National Institute of Standards and Technology (NIST) for three years. Currently he is an Associate Professor in the Department of Electrical and Computer Engineering at New Jersey Institute of Technology (NJIT). His research interest focuses on the fault detection, predictive maintenance, and anomaly detection of power grid. He is the Founding Director of the Green Technology Research and Training Laboratory, leading the research and education activities of offshore wind energy at NJIT. Philip Pong is a Fellow of the Institution of Engineering and Technology (FIET), a Fellow of the Institute of Physics (FInstP), a Fellow of the Energy Institute (FEI), a Fellow of the Institute of Materials, Minerals and Mining (FIMMM), a Fellow of the Hong Kong Institution of Engineers (FHKIE), a Fellow of the NANOSMAT Society (FNS), a chartered physicist (CPhys), a chartered engineer (CEng), a chartered energy engineer, a registered professional engineer (R.P.E. in Electrical, Electronics, Energy), and a Senior Member of IEEE (SMIEEE). He serves on the editorial boards for several IEEE and SCI journals.

A person wearing glasses

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