

# ACOUSTIC BEAMFORMING IN COMPLEX DYNAMIC SYSTEMS

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Dynamic systems such as a shopping mall, conference auditorium, underwater operations, airport, seaport, warehouses, production yards, factories and process plants present different noise fields for sound detection and/or perception. Consequently, beamforming operations that perform signal processing deterministically have been investigated for sensor arrays including microphone arrays and sonar arrays. Microphone arrays have found tremendous applications in improving the quality of received audio signals. Uniform linear arrays of microphones have been deployed for spatial filtering targeting interference and/or noise rejection in order to enhance the quality and gain of the desired signal. Acoustic beamforming in complex dynamic systems is a non-trivial task given the time-variant nature of system variables. For a time-invariant system, the dynamics of the system can be modelled and utilised to estimate the system behaviour in real-time. In this presentation a new beamforming algorithm that improves the signal gain for acoustic characterisation of dynamic systems in real-time will be discussed. This beamformer utilizes an adaptive algorithm that selectively enhances the desired signal based on the noise conditions of the individual sensors thereby avoiding noisy signal leaks through the FIR filters of each sensor. The proposed technique, which can be implemented in both endfire and broadside array configurations, will be shown to require less sensors and filter taps for FPGA-based embedded real-time implementations. This holds a great promise for designing, developing and deploying a reliable, sustainable, cost-effective, compact and high fidelity acoustic sensor system for mobile engineering systems and applications.

Bamidele Adebisi obtained PhD in communication systems and master's degree in advanced mobile communication engineering, both from Lancaster University, United Kingdom, in 2003 and 2009, respectively. He had a bachelor degree in electrical engineering from Ahmadu Bello University, Zaria, Nigeria in 1999. He joined Manchester Metropolitan University in 2012 as lecturer in electrical and electronics engineering where he currently leads a research funded by a major automotive. He was a Senior Research Associate at Lancaster University for over 5 years where led a Workpackage within a European Union (EU) funded DLC+VIT4IP project. DLC+VIT4IP is a PLC project that developed an IPv6 based system for smart grid applications. He was a visiting professor at Federal University of Juiz de Fora (UFJF) in 2013. Between 2004 and 2005, he was a research & development engineer with HW Communications Ltd, Lancaster,

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