Electrical and Computer Engineering Seminar

Monday, Dec. 7, from 11 am to 12 noon, LSC 220

Speaker: Dr. Sonia Charleston-Villalobos
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Seminar Title: "From the Clinical Pulmonary Auscultation to the Thoracic Acoustic Imaging"

Abstract: Noninvasive imaging of the lung is important since few pulmonary functional imaging modalities exist as perfusory and ventilatory Scintigraphy, PET and MRI that are just available at higher levels of medical attention. New imaging modalities have been generated based on the sounds produced by the different mechanism underlying the human breathing process. The acoustical imaging overcomes the limitations of the classical clinical auscultation procedure that is based on the skill of the physician. A general strategy to avoid the subjectivity of the auscultation is to extract quantitative information through non-stationary processing of the acquired breathing sounds (BS) to help physiopathological interpretations of the lung function.

In this presentation, theoretical issues, methodological aspects, progress and challenges about the recent acoustic thoracic surface imaging and the respiratory acoustic inverse problem will be provided. The acoustic surface imaging could add useful information for detecting alterations of regional pulmonary ventilation considering that pathologies lead up to changes in lung structure and functional behaviour affecting sound production and transmission. Results about the intra-subject variability in healthy subjects as well as the acoustic image correlation to Scintigraphy and X-ray for patients will be provided. Localizing BS sources is a complex task and few efforts had been done, however the information that can be extracted from the solution of the respiratory inverse problem is crucial for the research of the pulmonary system as knowing the spatial distribution of the sources in healthy and ill conditions. The acoustic inverse problem is addressed using a data model representation and formulating a sparse solution for the underdetermined system. Preliminary results will be presented in simulated scenarios for the respiratory case.

Author’s Biography: Dr. Sonia Charleston obtained her Ph.D. degree jointly from the Electrical & Computer Engineering Department, Colorado State University and the Department of Electrical Engineering at the Metropolitan Autonomous University (UAM) in Mexico City in 1996. Currently, she is a full professor in the Department of Electrical Engineering, UAM working in Biomedical Engineering area. Her teaching/research areas involve digital signal and image processing, pattern recognition, and inverse problems with applications in biomedical engineering problems and in particular respiratory signal and image processing.

Please contact Prof. Mahmood Azimi, azimi@colostate.edu, with any questions.