1152-35-138 **Ugur G. Abdulla*** (abdulla@fit.edu), 150 West Univ. Blvd., Melbourne, FL. *Cancer Detection through Electrical Impedance Tomography and Optimal Control Theory.*

The Inverse Electrical Impedance Tomography problem on recovering electrical conductivity tensor and potential in the body based on the measurement of the boundary voltages on the m electrodes for a given electrode current is analyzed. A PDE constrained optimal control framework in Besov space is developed, where the electrical conductivity tensor and boundary voltages are control parameters, and the cost functional is the norm declination of the boundary electrode current from the given current pattern and boundary electrode voltages from the measurements. The state vector is a solution of the second order elliptic PDE in divergence form under mixed Neumann/Robin type boundary condition. The novelty of the control theoretic model is its adaptation to clinical situation when additional "voltage-to-current" measurements can increase the size of the input data from m up to m! while keeping the size of the unknown parameters fixed. Existence of the optimal control and Fréchet differentiability in Besov space along with optimality condition is proved. The optimal control problem is discretized via the method of finite differences. Convergence of the sequence of finite-dimensional discrete optimal control problems both with respect to the cost functional and the control is proved. (Received August 29, 2019)