

## **Seminar Talk**

**Salim Chemlal  
PhD Candidate,  
Electrical and Computer Engineering  
Old Dominion University**

**Friday, March 20, 2015  
3:00 p.m. KH 224**

**Title:** Engineering Collaborations in Medical Modeling and Simulation

**Abstract:**

Medical modeling and simulation is a broad area involving anatomical modeling, planning and training simulations, and image-guided procedures, to name a few. Medical simulation can directly apply to patients improving disease control and contributing to healthier lifestyle management; it can also serve as a training tool for physicians as well as medical students. In this talk, I will cover three interdisciplinary projects I have worked on during my PhD, which illustrate the application of engineering aspects within medical simulation.

First, we will cover an individualized tracking system to monitor and predict blood glucose in Type 2 Diabetes. Type 2 Diabetes is the most prevalent form of diabetes and has become increasingly common amongst children. The predictive model provides relevant feedback to patients for each glucose input reading and incorporates physical activity recognition, which improves self-management of the disease. Second, we will discuss an ECG-based virtual pathology stethoscope tracking for varied diaphragm orientations in standardized patient heart auscultation. Recorded ECG signals of standardized patients (SPs), healthy individuals trained to portray real patients, are processed and analyzed to accurately distinguish different auscultation areas. The proposed system is a novel tracking method for placing virtual symptoms in correct auscultation areas extending the capabilities of SPs and allowing the trainee to hear abnormal heart and lung sounds. In the third part of this talk, we will examine the development of a Nuss Procedure Surgical Simulator (NPSS) to provide a platform for adequate training for the procedure. The Nuss procedure is a minimally invasive technique for the repair of Pectus Exacuvatum (PE), which has been proven to have a high success rate.

Furthermore, we will investigate challenges in modeling general-purpose haptic device simulations for minimally invasive surgeries, namely pivoting around the insertion point, collisions with surrounding objects during procedure, and the ability to augment haptic interfaces to achieve a natural representation of forces.

These simulations and simulators are good examples of machine learning application potential and engineering aspects within medical simulation to improve patient health, enhance training of medical and health professionals and, ultimately, to improve patient safety.

**Bio:**

Salim Chemlal received his B.S. degree in Electrical and Computer Engineering and M.S. degree in Modeling, Simulation, and Visualization Engineering at Old Dominion University in 2009 and 2011 respectively. He was a research assistant at the Applied Research Center in Newport News, VA and is currently a PhD candidate and instructor in the Electrical and Computer engineering department at Old Dominion University. His research interests include machine learning, medical simulation, haptic devices, and computer vision. To date, Mr. Chemlal has authored over a dozen papers published in international peer-reviewed journals and conference proceedings. He is also a reviewer and part of the organizing committee of several simulation conferences, such as WinterSim, SpringSim, and SummerSim.