The Science Program Presents

MP3 for Weather Forecasts
aka Data Compression for Numerical Simulation Data

Dr. Rudolph Lorentz
Senior Professor of Mathematics, Texas A&M University at Qatar
Prof. apl., University of Duisburg-Essen, Germany

Thursday, February 12
12:00p.m. – 1:00p.m. Lunch will be served
Texas A&M Engineering Building
Lecture Hall 143 / 1st Floor

Data compression is a booming business in multimedia and as general purpose computer software, for example, the whole family of ZIP programs, JPEG, MPEG and MP3. Each of these programs is specialized for its purpose: ZIP for text documents, JPEG for graphics, MPEG for video and MP3 for audio. In this presentation, I will give a short introduction to data compression and what it is good for. Then I will show that mathematics plays a large role in the algorithms used for the compression of numerical data. This includes graphics, audio and video. An example is given. Finally, I will discuss new developments in data compression for data arising from the numerical simulation of physical phenomena such as car crash simulations, car vibration simulations (Noise, Vibration, Harshness – NVH), weather forecasting and Computational Fluid Dynamics (CFD). The techniques used are totally different because these simulations are generally three dimensional. A challenge yet unmet is the compression of the results of oil or gas reservoir simulators, a challenge which is of particular interest for the State of Qatar.

Dr. Lorentz has a wide range of interests ranging around numerical analysis. It includes approximation theory, multivariate interpolation, wavelets, the numerical solution of PDE’s with the multigrid method and radial basis functions, all of these both from the applied as well as the theoretical point of view. Currently he is concentrating on applying mathematical methods to the compression of data resulting from numerical simulations, such as automotive crash simulation, CFD and weather forecasting. He was involved in the production of software - FEMZip - now used by many automotive manufacturers (Daimler, Porsche, GM, etc.) as well as software - GRIBZip - used by the German Weather Service. For this work, a group of three researchers including him were awarded the prestigious Joseph-von-Fraunhofer Prize for Technological Innovation in the Computer Sciences, 2007. In addition, he has submitted a patent application concerning the algorithm used in GRIBZip and is preparing another patent application concerning the algorithms used in new CFD compression software.