Department of Mathematics

University of Houston

Amundson Lecture Series

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The fundamental theorem of numerical analysis

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4:00 PM- 5:00 PM
Conrad Ballroom, Hilton Hotel (UH Campus)

Abstract:

Computer simulation is a powerful and indispensable tool in most areas of science and engineering, exerting major impacts on many aspects of modern life. For a vast variety of natural and human-engineered systems, simulation entails the approximate solution of a system of differential equations through a discretization which can be effectively implemented on computers. The accuracy of the simulation depends on the consistency and the stability of the discretization. The paradigm that consistency and stability together lead to convergence is a recurring theme in numerical analysis of differential equations. However, consistency and, especially, stability, can be subtle and elusive. Even relatively simple examples can yield unexpected–sometimes catastrophic–results. Traditionally numerical analysis relied on elementary tools such as Taylor expansions, Fourier series, and matrix analysis to explore convergence and stability. In response to ever more challenging problems, numerical analysts are bringing a new array of techniques to bear, including tools from differential geometry and algebraic topology that have enabled recent breakthroughs.