Design and evaluation of DSP algorithms for feedback cancellation in Public Address systems (Ontwerp en evaluatie van digitale signaalverwerkingsalgoritmen voor feedbackonderdrukking in 'Public Address'-systemen)

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Abstract

In a Public Address (P.A.) system the loudspeaker sound is often fed back into the microphone. This may result in system instability that is perceived as "howling". State-of-the-art solutions use notch filters in the forward path between microphone and loudspeaker. Our research will focus on another approach, inspired by a similar technique in hearing aids. This approach aims at feedback cancellation by estimating the feedback signal using an adaptive filter.

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Internal Normalisation in LA-ICP-MS & Non-Linear Growth Rates in Biota

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Abstract

1. Due to fluctuations in the laser intensity and differences in the density of the sampled material, the signal of an LA-ICP-MS instrument is not proportional to the concentration of a specific element. This effect is known as drift and is usually corrected by referring the analyte signal to the one of an internal standard. The latter is an element homogeneously distributed throughout the whole sample. Next, the drift pattern will be reflected in the measured pattern for this element and the signals of all other elements can be compensated for this estimated drift pattern. When this strategy was employed on measurements of a sclerosponge (a calcium carbonate secreting marine sponge), it was found that different internal standards (Ca, Sr, U, ...) led to different drift patterns. We developed a weighted least square estimation of the drift pattern, based on the measurements of multiple internal standards. Weighing emphasises the more precise measurements and thus estimates the most probable drift pattern from all internal standards at once. The use of more internal standards enabled us to have an internal quality check.

2. For specific biota the record of a feature (i.e. a proxy) along a growth axis can reflect (changing) environmental conditions experienced during lifetime of the organisms. For example, the density of vessels in trees, are related to ambient environmental conditions. For a mangrove tree it was attempted to partly reconstruct these environmental conditions by analyzing vessel density along the growth axis. When assuming linear growth rate (in this case 1.3mm/year) this led to a reasonable error in the matching of environmental conditions with vessel density. The second part of this poster describes an estimation of this non-linear growth rate based on methods used to characterize time base distortions in high frequency sampling scopes.

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Powell-Sabin splines

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Abstract

Piecewise polynomials on triangulations, and Powell-Sabin (PS) splines in particular, form an attractive alternative for the widely used tensor product splines.
In this poster we give an overview of the research on Powell-Sabin spline surfaces. We present a normalised B-spline representation for PS splines. With this representation we can form a set of control triangles which have a nice geometric interpretation. A subdivision scheme for PS splines is introduced both on uniform and general triangulations. New wavelets have been generated by using these subdivision schemes as the prediction step in the lifting scheme. We also show some algorithms for data fitting and surface interrogation. Finally we give some suggestions for further research.

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DDE-BIFTOOL, a software package for the bifurcation analysis of Delay Differential Equations

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Abstract

DDE-BIFTOOL is a Matlab-based software package for numerical bifurcation analysis of delay differential equations with fixed and/or state-dependent delays. The package contains procedures for stability analysis of steady state solutions of DDEs, computation of periodic solutions and their stability (using a collocation approach) and computation of homoclinic and heteroclinic orbits.

We illustrate the capabilities of DDE-BIFTOOL for the analysis of mathematical model from variuous application areas.

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Macroscopic analysis of microscopic evolution laws

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Abstract

Looking for models that capture the complexity of dynamical systems, the microscopic Lattice Boltzmann model can be considered as a viable alternative to the macroscopic description of the system by means of a set of partial differential equations. A macroscopic time integrator that uses the microscopic Lattice Boltzmann evolution law instead of a macroscopic one, is constructed. Our ultimate goal is the derivation of the important macroscopic properties of the dynamical system using this time integrator. For example, the stability of the system can be analyzed accurately by computing the largest eigenvalues from the spectrum of the macroscopic time integrator. Also, the macroscopic time integrator can be coupled to the Newton-Picard method to allow for the continuation of solution branches and a bifurcation analysis of the system. The one dimensional FitzHugh-Nagumo reaction-diffusion system is considered as an example. Other microscopic systems, like cellular automata, will be considered as well.