香港浸會大學
HONG KONG BAPTIST UNIVERSITY

香港浸會大學理學院
HKBU Faculty of Science

The Institute of Computational and Theoretical Studies: Data Assimilation Program: Numerical Weather Prediction and Data Assimilation

Lecture 1: Survey about Global and Regional Numerical Weather Prediction

Lecture 2: Ensemble and Particle Filters for Large-Scale Data Assimilation

Speaker : Prof. Roland Potthast
Deutscher Wetterdienst DWD and BMVBS
Federal Ministry of Transport, Building and
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University of Reading, United Kingdom

Date : 29 June 2015 (Monday)

Time : 10:00 a.m. - 11:00 a.m. (Lecture 1)
11:15 a.m. - 12:15 p.m. (Lecture 2)

Venue : FSC1217
Fong Shu Chuen Library
HSH Campus
Hong Kong Baptist University

Abstract:

Lecture 1: Survey about Global and Regional Numerical Weather Prediction

We provide an introduction into data assimilation for numerical weather prediction. We will provide a survey about the current state of the art in terms of available data types and the general framework of operational centers such as Deutscher Wetterdienst or ECMWF. Today, our numerical schemes for modelling and data assimilation as well as boundary data for the high-resolution regional models are used by around 40 countries world-wide. Measurement data range form conventional direct measurements of temperature, pressure, humidity and wind to various remote sensing measurements with instruments which are ground- or satellite-based.

Further, we will describe the framework of operational work on data assimilation and the role of mathematical and meteorological research and development - describing a vision of an intense integration of research with operational developments as it is employed within the German research community.

Lecture 2: Ensemble and Particle Filters for Large-Scale Data Assimilation

In almost all operational centres for numerical weather prediction around the world ensemble data assimilation techniques are of rapidly growing importance. Ensemble techniques allow to describe and forecast uncertainty of the analysis, but they also improve the assimilation result itself, by allowing estimates of the covariance or, more general, the prior and posterior probability distribution of atmospheric states.

In our talk, we will first give a survey about methods for data assimilation from the viewpoint of mathematical analysis. In particular, we introduce cycled inversion schemes and use them to introduce the Kalman Filter and its ensemble-based variants such as the Local Ensemble Tranform Kalman Filter LETKF.

In the second part of the talk, we present recent work on the further development of the ensemble data assimilation towards a particle filter for large-scale atmospheric systems, which keeps the advantages of the LETKF, but overcomes some of its limitations. We describe a Localized Markov Chain Particle Filter (LMCPF), present its mathematical foundation and show some tests for simple systems. The implementation of the LMCPF in the KENDA framework of DWD is ongoing work.

– All interested are welcome –

For further information, please visit **http://www.math.hkbu.edu.hk/**, or call 3411-5056.