239b Computer-Aided Modelling> the Locality Principle

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When modelling processes, it is natural to make assumptions. These assumptions are all associated with choosing length scales, time scales and the nature of materials in-volved. The application of such assumptions leads frequently into mathematical prob-lems such as index problems. The index problems have been the subject of many re-search projects in various fields, both in the application domain as well as in the theo-retical developments. Little progress, though, has been made in the process engineer-ing environment since the 1980ties. Main reason possibly being as one focused on the resolution of the index problem as a mathematical problem and not on the reasons for which these index problems do occur. It turned out that new insights could be generated when looking at how the index problems are being generated. Combined with the compact representation as it was presented in last year's conference [PreisigSIMS:2004] it turns out that a surprisingly simple method can be used to resolve most of the index problems, particularly in simulation, less though in design. With the key ingredients being the superposition principle (linearity) of the conservation laws and the transfer being driven by gradient laws, it can readily be shown that the assumption's affect is very local and can be readily resolved through the reduction of the state space. The method is well-suited for a computer-based modelling tool. We shall look at three of the most common assumptions: 1. Negligible capacity effect 2. Event dynamics on flows 3. Event dynamics on transposition (phase changes and reactions)

Citation [PreisigSIMS:2004] Preisig, H A; A Topology Approach to Modelling, Proceedings of SIMS 2004, Ed Elmegaard, B Sporring, J Erleben, K Sørensen, K; Copenhagen, Denmark, September 23-24; 2004