HOW TO EVALUATE A MODEL BY COMPUTING ITS ENTROPY

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We introduce the concept of the *entropy of a model* as a form to evaluate the adequacy of a model in a physical problem. Namely, when it is possible to use a simplified model — the *coarse theory* — instead of a complex model — the *fine theory*.

Between the most general and complex model — the fine theory — and the simplest of the coarse theories a hierarchy of models exists.

As far as we know, the currently available methods for testing the adequacy of a model in a hierarchical modeling context are:

1. Asymptotic expansions in terms of a characteristic parameter of the problem, for example, the thickness of the domain [2].
2. Asymptotic expansions associated to projection methods [1].
3. Center manifold theory [3].
4. Methods based in a posteriori error estimators [4].

All these methods require the computation of a solution.

The entropy of a model circumvents the computation of a solution by making use of the symmetries of the problem [5]. Based on this concept we present an algorithm for identifying physical problems where several models coexist.

We exemplify the application of the algorithm with problems in Elasticity and Fluid Mechanics.

References

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