

Equations set on time-dependent domains

We will address the problem of dealing with equations, or systems of equations, that are set in time-dependent domains. These models appear in a natural way, for example, in biological settings involving growing domains, or in dynamic fracture mechanics. Taking into account the evolution of the domain itself and not only of the processes occurring inside it, poses several new difficulties such as defining the appropriate functional spaces or which definition of solution to use. We present mainly two approaches, one relies on Lions compactness type results, and other on calculus of variations, and both can tackle either parabolic or hyperbolic problems. While the first involves a rather more intricate definition of evolving spaces of functions and technical existence results, the variational approach stumbles on very strong conditions towards uniqueness. We present the key ideas to each method applied to specific examples, together with its difficulties.

Some References:

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