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Nonlocal Eshelby Entities: a One-Dimensional Example

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An important feature for the representation of global constitutive laws for a material body is obtained by adopting the point of view that although the material may exhibit a completely general global behavior, there is still a physical meaning to be attached to the contribution of each material point to the total energy of the body. In other words, the state of the body, at a material point, is influenced by the state of all points in the body – the so-called nonlocal effect. In this paper, a nonlocal formulation has been devised to express the energy functional in two phases: the first phase indicates what the contribution of each material point (including the boundary) is, and the second phase describes how all these contributions are to be added up to obtain the total energy of the body. We then apply this model to a number of examples emphasizing that the existence of point-wise contributions in no way contradicts the global behavior of the material.

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