# Weak regularity of the inverse under minimal assumptions

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By the classical inverse function theorem the inverse of a $C^1$ homeomorphism is again a $C^1$ homeomorphism when the Jacobian is strictly positive. It is natural to ask if similar results hold under milder regularity assumptions; natural candidates being Sobolev- and BV-homeomorphisms which are commonly used in the study of nonlinear elasticity. The problem of the weak regularity of the inverse has attracted much attention in the past decade, starting from the planar results of Hencl, Koskela and Onninen (2006, 2007) and extending to higher dimensions with the work of Csörnyei, Hencl and Maly (2010). These results show that for a Sobolev $(1, n-1)$ homeomorphism f the inverse is a BV-mapping, and belongs to $W^{1,n-1}$ when the mapping f is of finite distortion. In this talk we discuss our recent result, joint with Stanislav Hencl and Aapo Kauranen, which states that in dimension three the inverse of a BV-homeomorphism is BV if and only if the distributional adjoint of the mapping is a finite Radon measure. The distributional adjoint defined here is a new concept motivated both by our characterization and the success of the distributional Jacobian in the study of nonlinear elasticity.