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Classification of critical points in a converging-diverging turbulent channel flow RAÚL BAYOÁN CAL, Portland State University, MURAT TUTKUN, ØYVIND WAAGE HANSSEN-BAUER, ANDERS HELGELAND, ØYVIND ANDREASSEN, Norwegian Defence Research Establishment, JEAN-PHILIPPE LAVAL, Laboratoire de Mecanique de Lille — Based on Direct Numerical Simulations of a channel with a bump,[1] a critical point generation and classification is performed. Topological features of the flow are found relating critical point type with the distribution of Jacobian Determinants as well as the behavior of skin friction. Eight different types of points are found within the flow and these are visualized using different forms of the Line Integral Convolution visualization technique as described by Aasen and Furuheim (2008).[2] It is found that the determinant analysis can be a useful method for data reduction of critical points. Local minima and maxima of the skin friction coefficient, C_f, are reliable indicators of development of extreme determinants. Further explanation of the physics is done through the analysis of the velocity and pressure iso-surfaces.

[1]M. Marquillie et al. (2008), J. Turbulence, vol 9, no 1, pp. 1-23.
[2]M. Aasen and K. Furuheim (2008), M.Sc. thesis, Department of Informatics, University of Oslo, Oslo, Norway.

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