Shape and topology optimal design problems in electromagnetic casting

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In this presentation the recent numerical techniques proposed to solve the forward and inverse problems concerning the electromagnetic casting and electromagnetic levitation techniques of the metallurgical industry are reviewed. In addition, a new topology optimization method to solve the inverse axisymmetric electromagnetic levitation problem is presented. The proposed method is based on an exact second-order topological expansion of a Kohn–Vogelius-like functional specially devised for this problem. Through some examples it is shown that the algorithm can find suitable solutions efficiently. This new method completes the set of efficient methods available to solve the inverse electromagnetic casting and the inverse axisymmetric electromagnetic levitation problems.