Inverse approach for identification of the shrinkage gap thermal resistance in continuous casting of metals

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The inverse approach for identification of thermal resistance of the shrinkage gap between the ingot and the mould during continuous casting of metals is the subject of presented paper. The least square adjustment method with "a priori data" is applied for identification of thermal resistance as well as the phase change location and the temperature field within the ingot and the mould. The most important feature of the approach is that the unknown thermal resistance is obtained from the temperature measurements at the number of sensors located in the wall of the mould by solving appropriate inverse problem. The best location of the sensors is based on the results of sensitivity analysis for the steady-state heat conduction problem. Analysed problem belongs to the group of inverse problems. The influence of the location of the sensors on the results of identification is analysed. The results of temperature measurements at the number of sensors located in the wall of the mould are used to solve appropriate inverse problem and calculate the sough for thermal resistance. The front-tracking method with an automatic mesh generation finite element technique (so called deforming or moving finite-elements) for steady-state equation conduction-advection problems is developed to build the mathematical model of the temperature field in the ingot and the mould. Due to the strong convective nature of the boundary problem (casting velocity, thermal parameters) the special up-wind technique is applied. Validation of the solution of the inverse problem is checked by comparison with the results of direct problem. Several numerical examples are presented and analysed.