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PREDICTION OF WELD LINE LOCATION FOR INJECTION MOLDED THERMOPLASTIC COMPONENTS

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Abstract. Weld lines in polymeric injection molded parts occur wherever two or more melt fronts meet. They cause reduced mechanical properties and visual defects due to the poor intermolecular entanglement, molecular orientation induced by the fountain flow and the stress concentration effect of surface V-notch. A challenge related to these defects is that they are hard to detect and monitor because they're usually not visible to the naked eye. Through this paper a numerical model for mold filling simulations has been developed aiming to predict the location of this defect and the initial meeting angle between the colliding flow fronts. A hybrid interface tracking technique was implemented in conjunction with a fix topology pseudo-quadratic mesh. Navier-Stokes equations were reduced to Hele-Shaw equations for thin plates. For validating purposes polypropylene plates injection moldings with weld lines were produced using a two-gated mold in a laboratory scale injector machine. Location of the defect was measure using an optical polariscope and then contrasted with simulation results. In order to establish the differences between 3D and Hele-Shaw models, predictions of weld line location were compared with the results provided by commercial injection molding simulation package Moldex3D.