INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

The dynamics of free surface flows have been of great interest to researchers for centuries because of its applications in a variety of industrial processes and due to the richness of the underlying physics. The present thesis is focused on the numerical study of free surface flows in context with formation and coalescence of drops. The numerical simulations have been performed by solving the complete Navier-Stokes equations and the interfaces have been captured using the coupled level set and volume of fluid (CLSVOF) method. The drop formation from an orifice has been studied with an emphasis on the resulting drop's shape after pinch-off. The oscillatory motion of the drop after pinch-off has been investigated. During the impact of a drop on a liquid pool a range of fluid dynamical phenomena can be observed including drop coalescence, drop splashing and bubble entrapment. Here, the large bubble entrapment phenomena has been thoroughly studied to unveil the mechanism of large bubble entrapment. The regime of large bubble entrapment has been identified on the on impact velocity (V) - drop diameter (D) map and on the Froude number (Fr)-Weber number (We) map. The satellite generation during the coalescence of two unequal sized drops has been studied. Furthermore, investigations are performed on the impact of a high-speed train of microdrops on a deep liquid pool which produces a deep tongue shaped cavity. The dynamics of this tongue shaped cavity has been investigated in detail and are reported in this thesis.