# How to Model and Simulate Moving Fronts?

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We can see moving fronts everywhere in our daily life. Examples include water front along the beach, bubble rising, formulation of a snowflake, drop spreading, and so on. Complicated examples include heart beating (moving back and forth), water inundating during a hurricane, electrical migration of voids in integrated circuits.

In this talk, I will introduce a number of such examples and their mathematical models using ordinary or partial differential equations (ODE/PDEs). Then I will explain how to solve and simulate those problems using computers. There are several approaches that can be used to track moving fronts such as the front tracking (Lagrangian particles) method, the level set method (Eulerian approach), volume of fluid (VOF) method, the phase field model and other approaches.

Peskin's Immersed Boundary (IB) Method is a popular mathematical model and numerical method for moving front problems. It is simple and robust. But in general, it is only first order accurate. The Immersed Interface Method (IIM) was motivated by the IB method with better accuracy and has been used to solve a number of moving front problems.

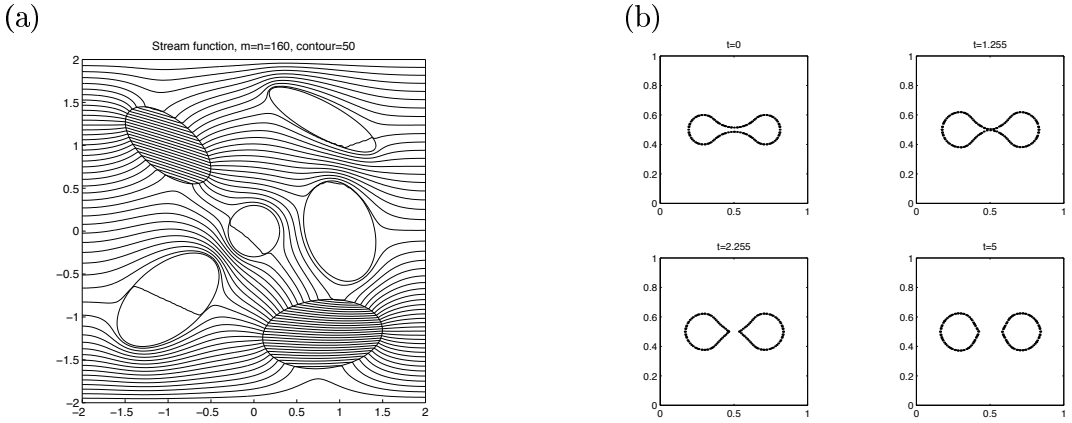


Figure 1: Applications of IIM from the ***the speaker***: (a) Ground water flow passing through objects. (b) Mean curvature flow.