

Optical Flow - Basics

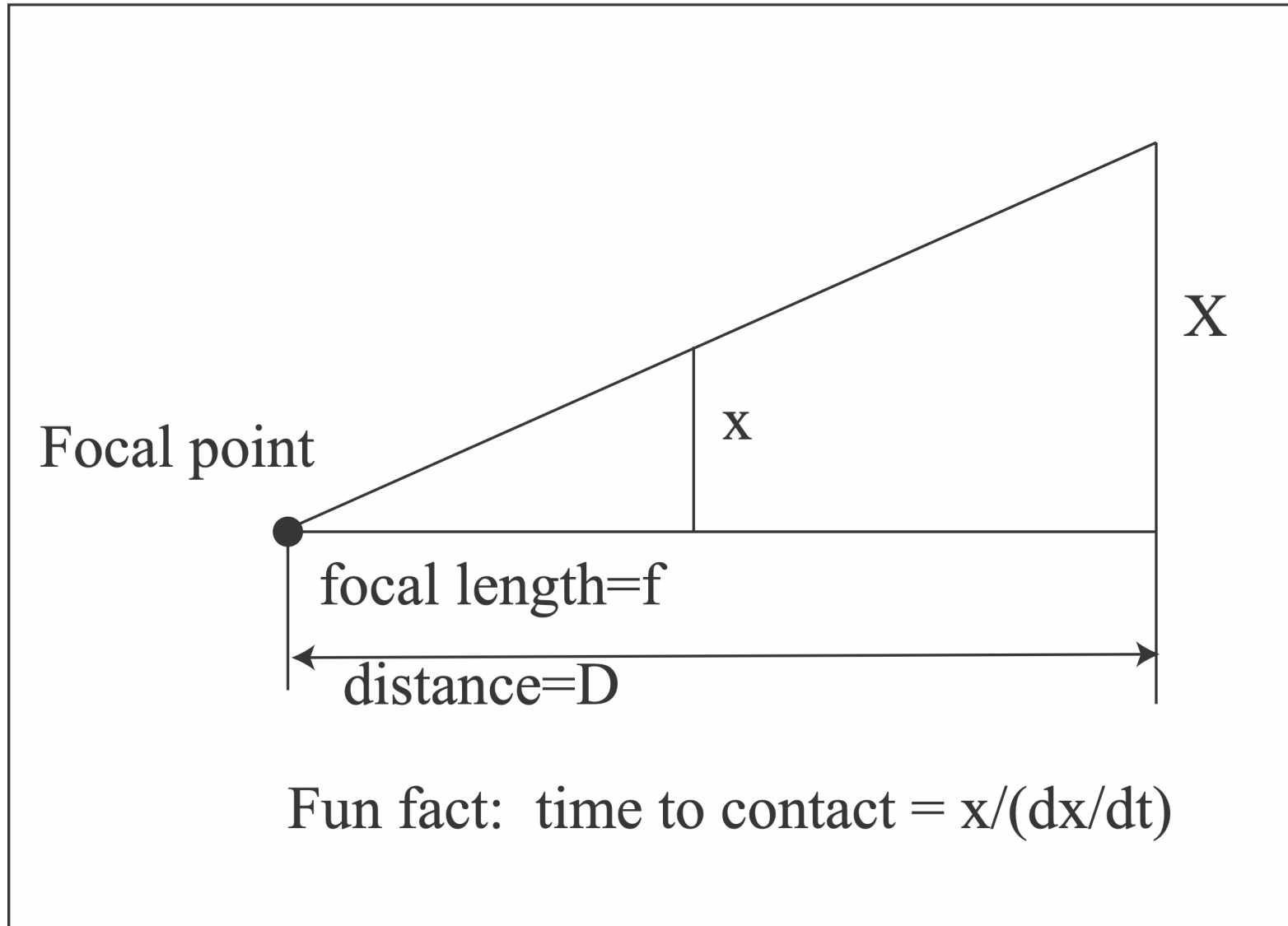
D.A. Forsyth

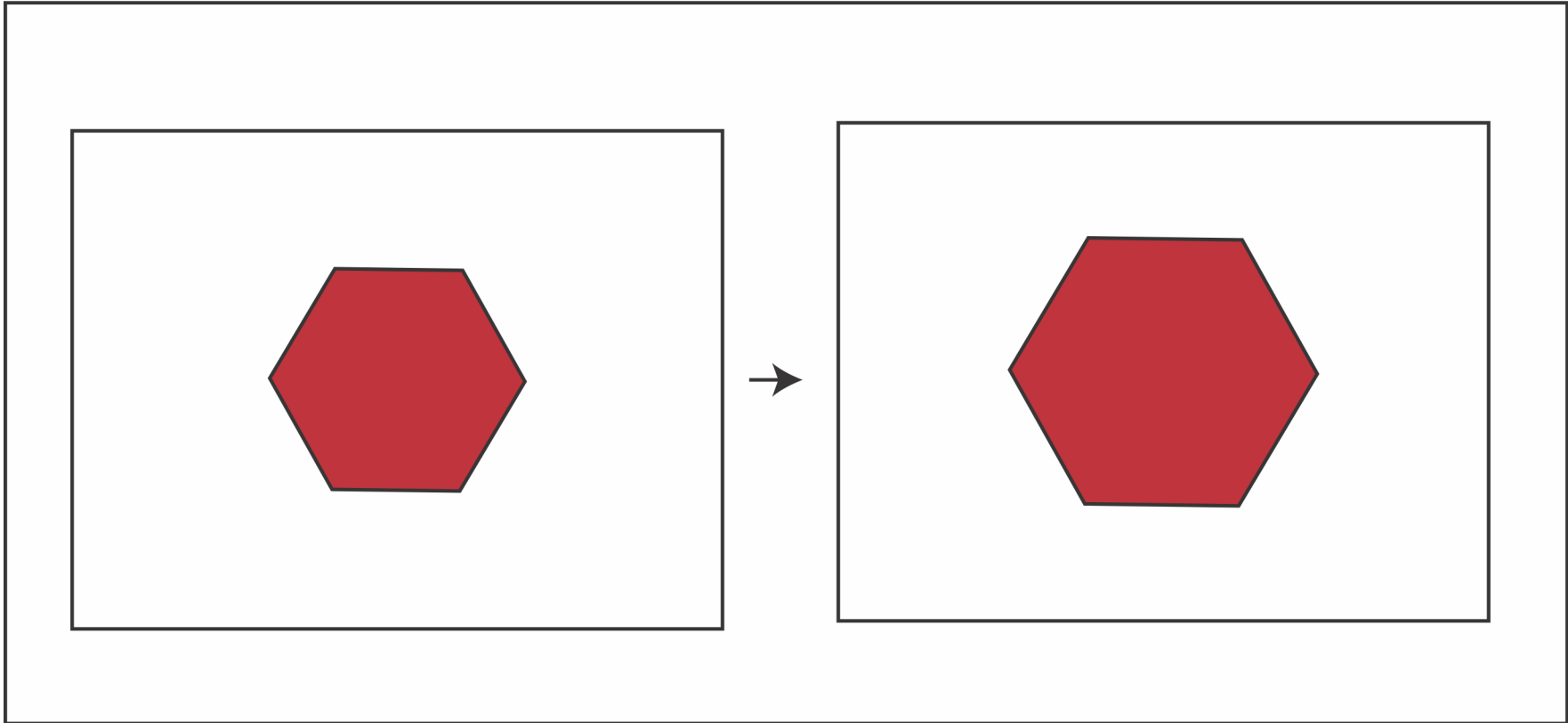
University of Illinois at Urbana Champaign

Optical flow

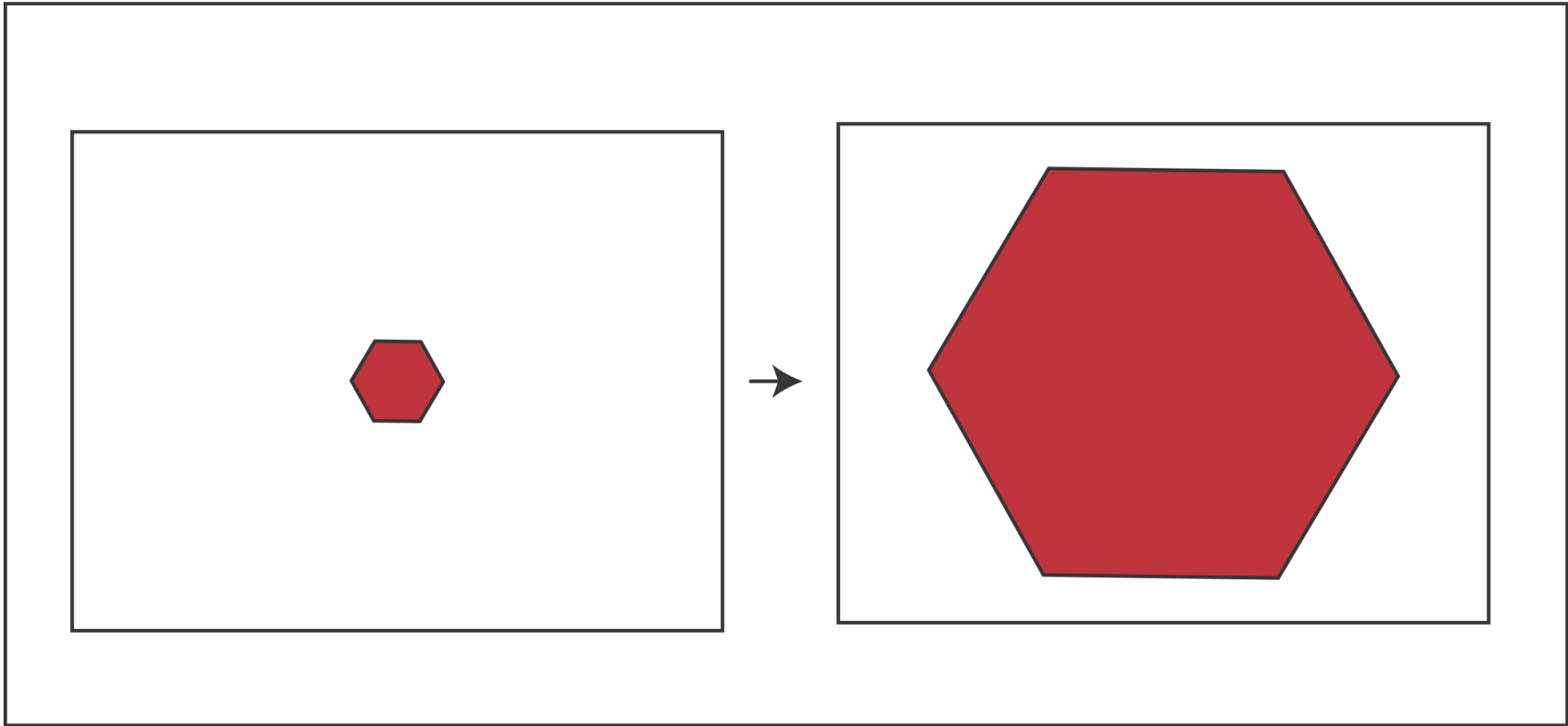
- Build a field of arrows
 - tail at pixel
 - head at new location of surface behind pixel
 - in next frame
- Uses
 - inference about your motion (egomotion)
 - inference about motion in the world
 - inference about depth
 - segmentation
 - compression

Time to contact example

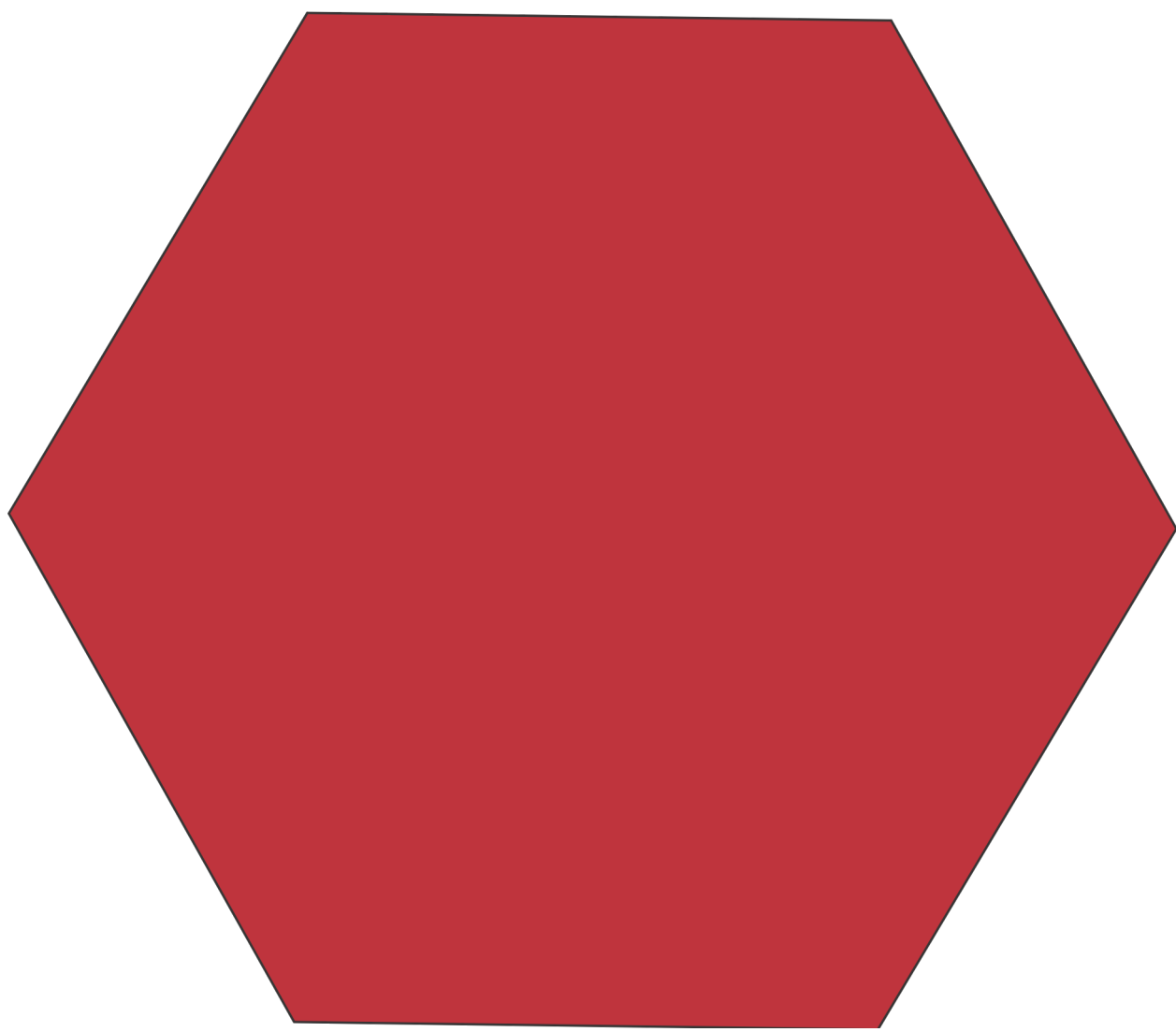


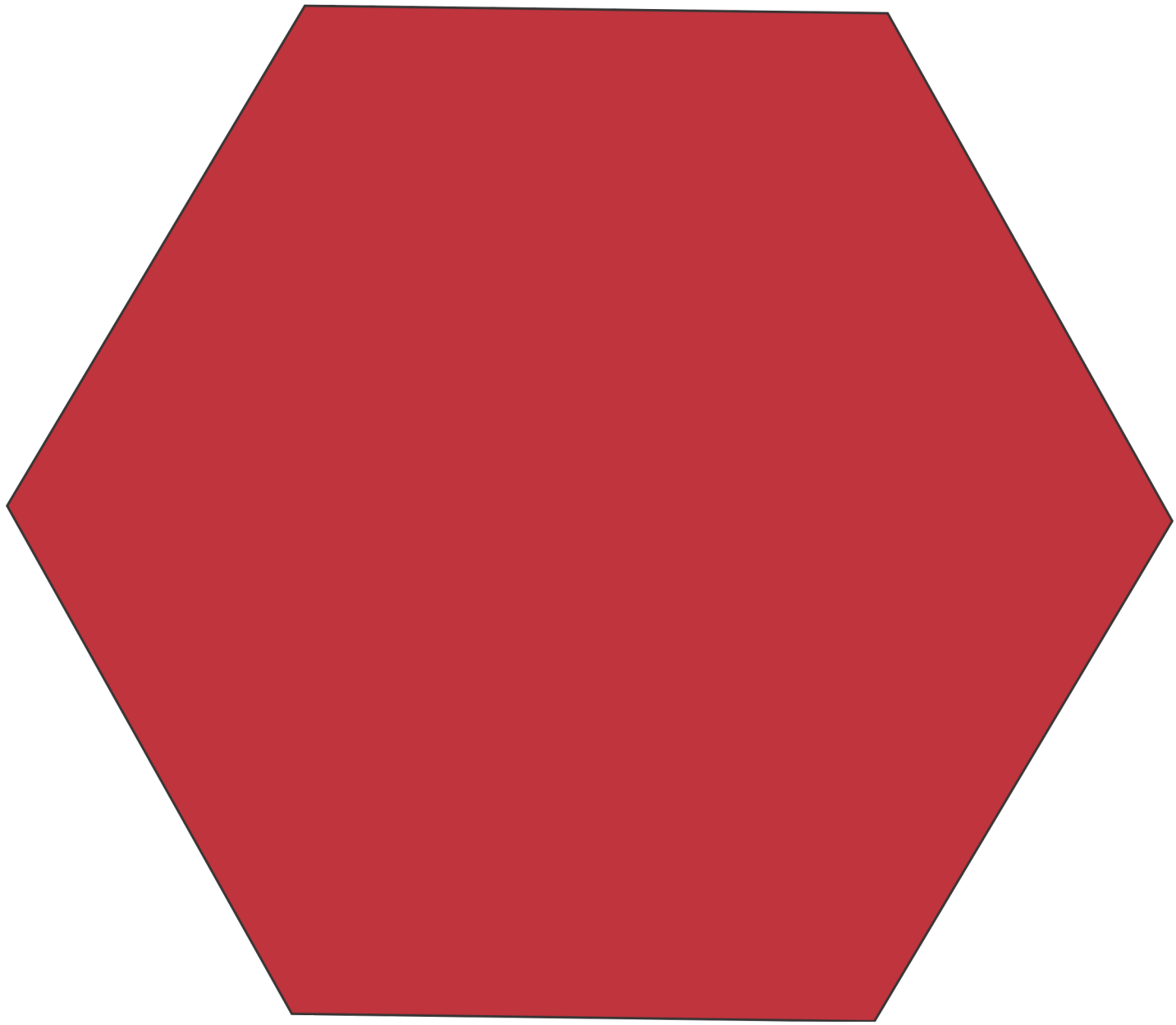


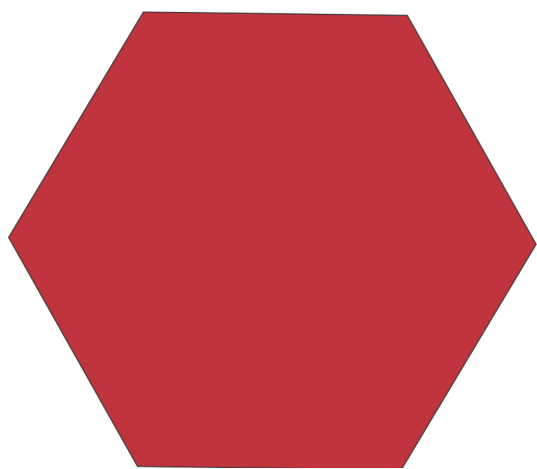
TTC - Long

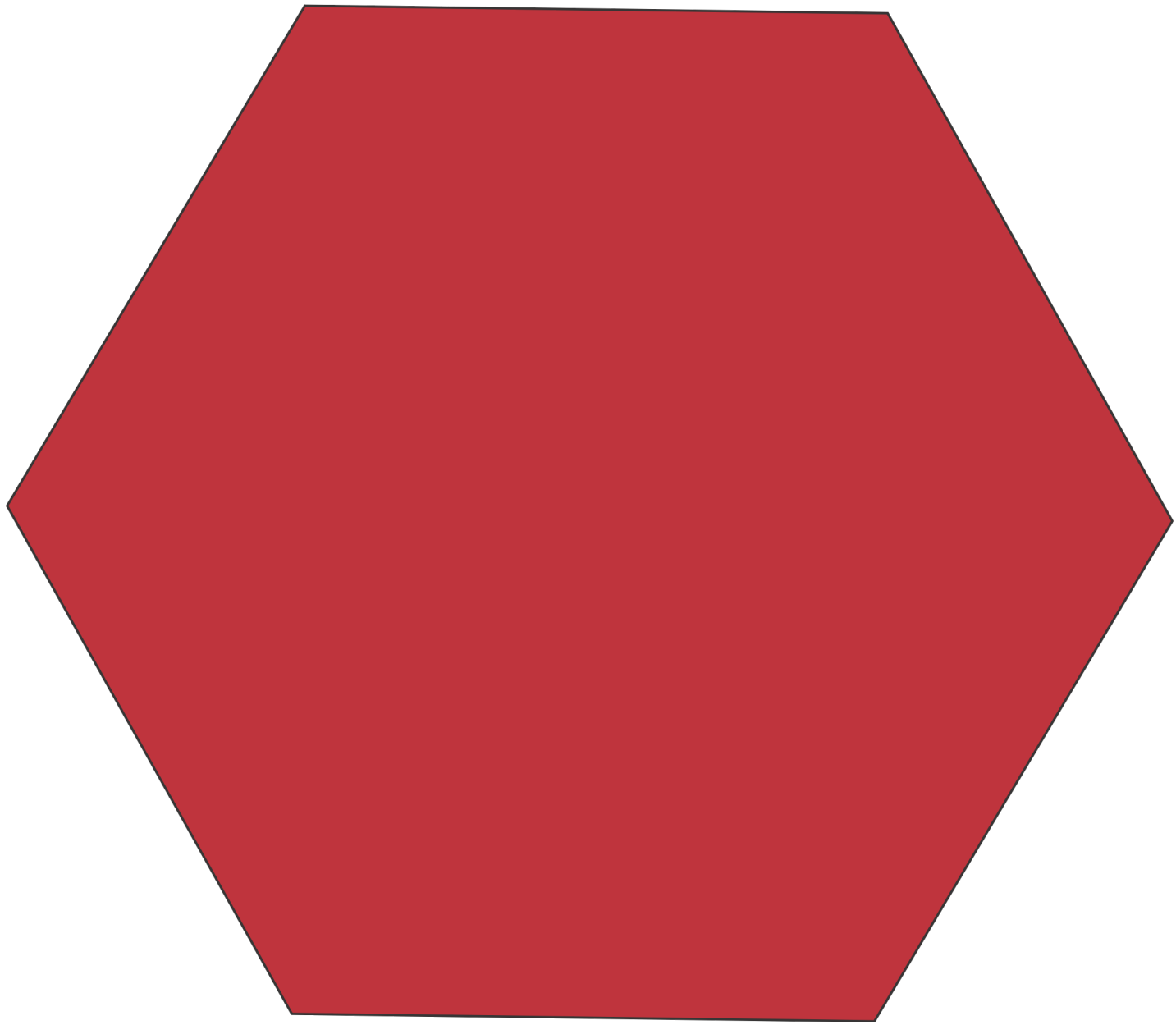


TTC - AAARGH!

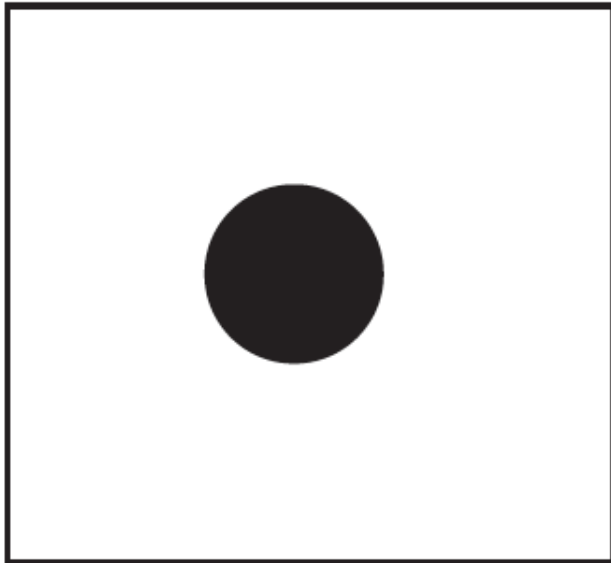




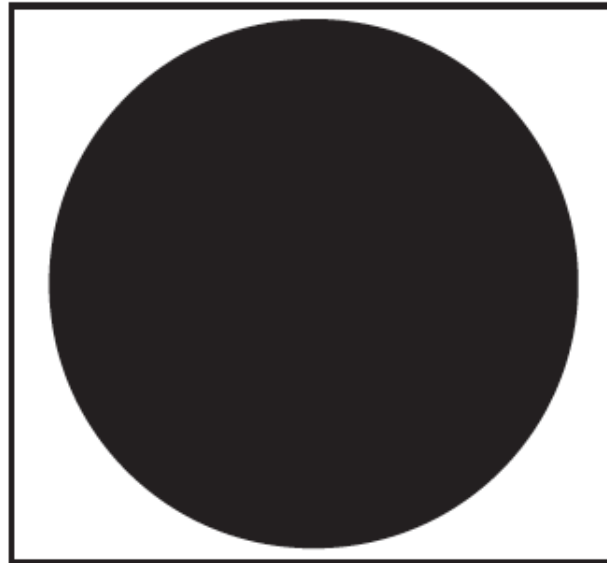




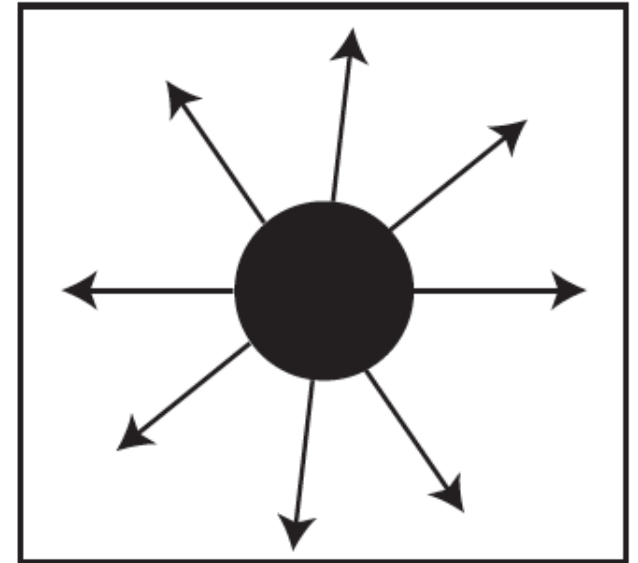
Flow fields reveal your motion



Frame 1

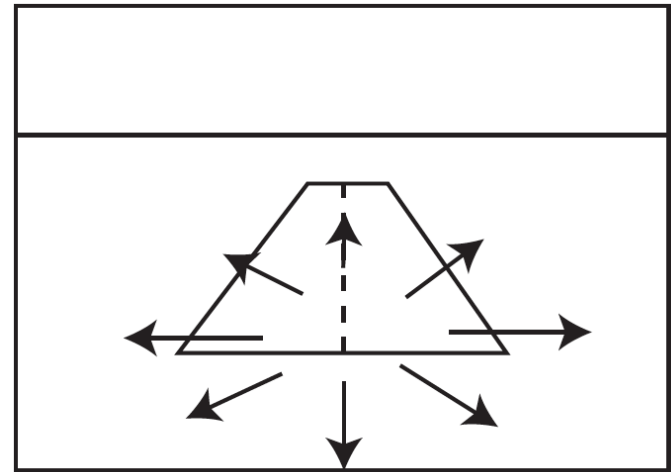
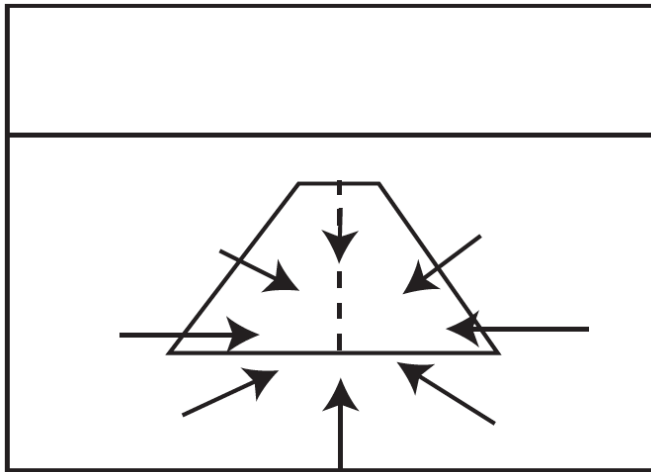
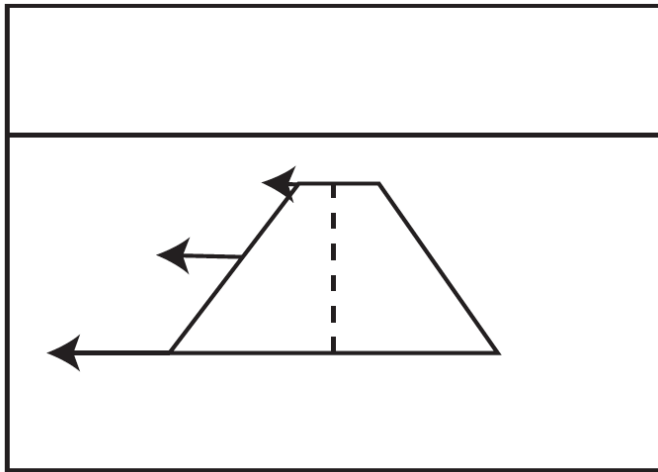


Frame 2

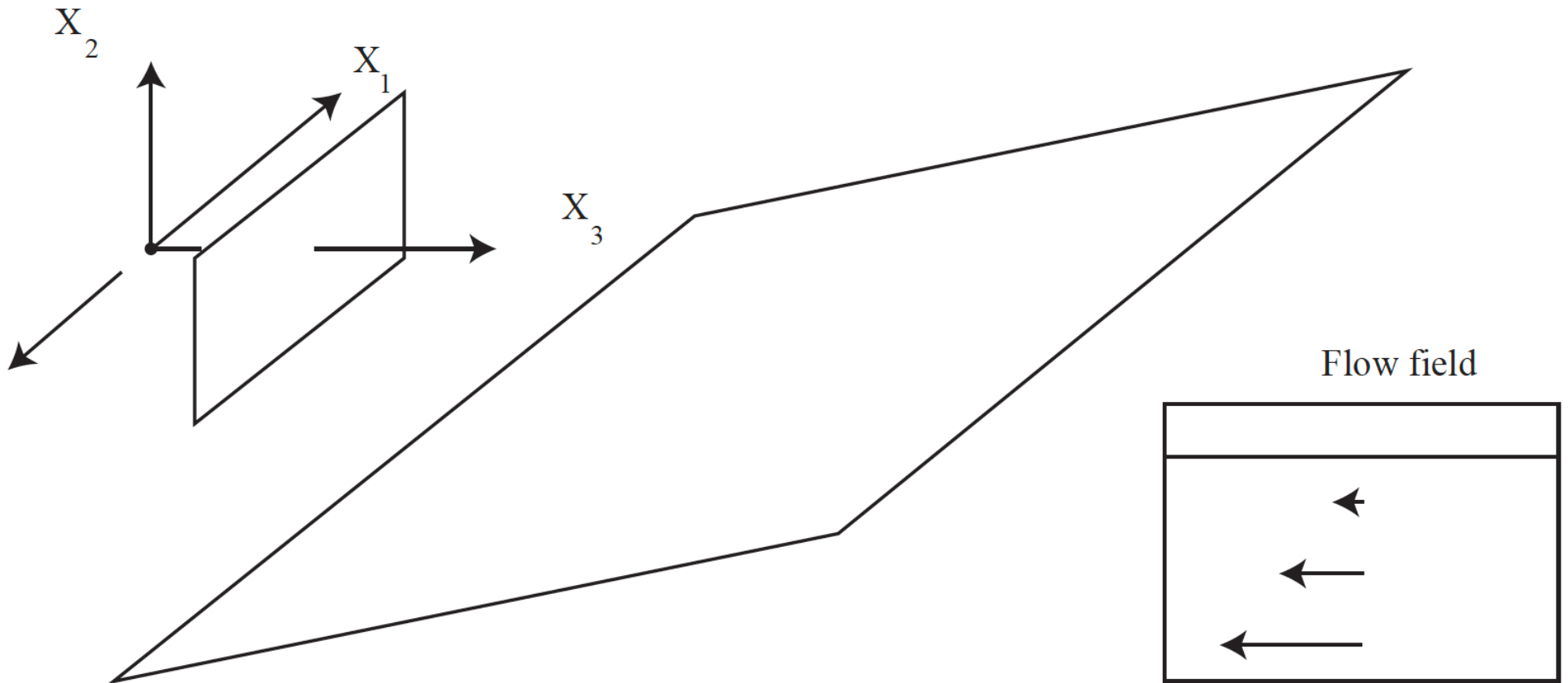


Flow field

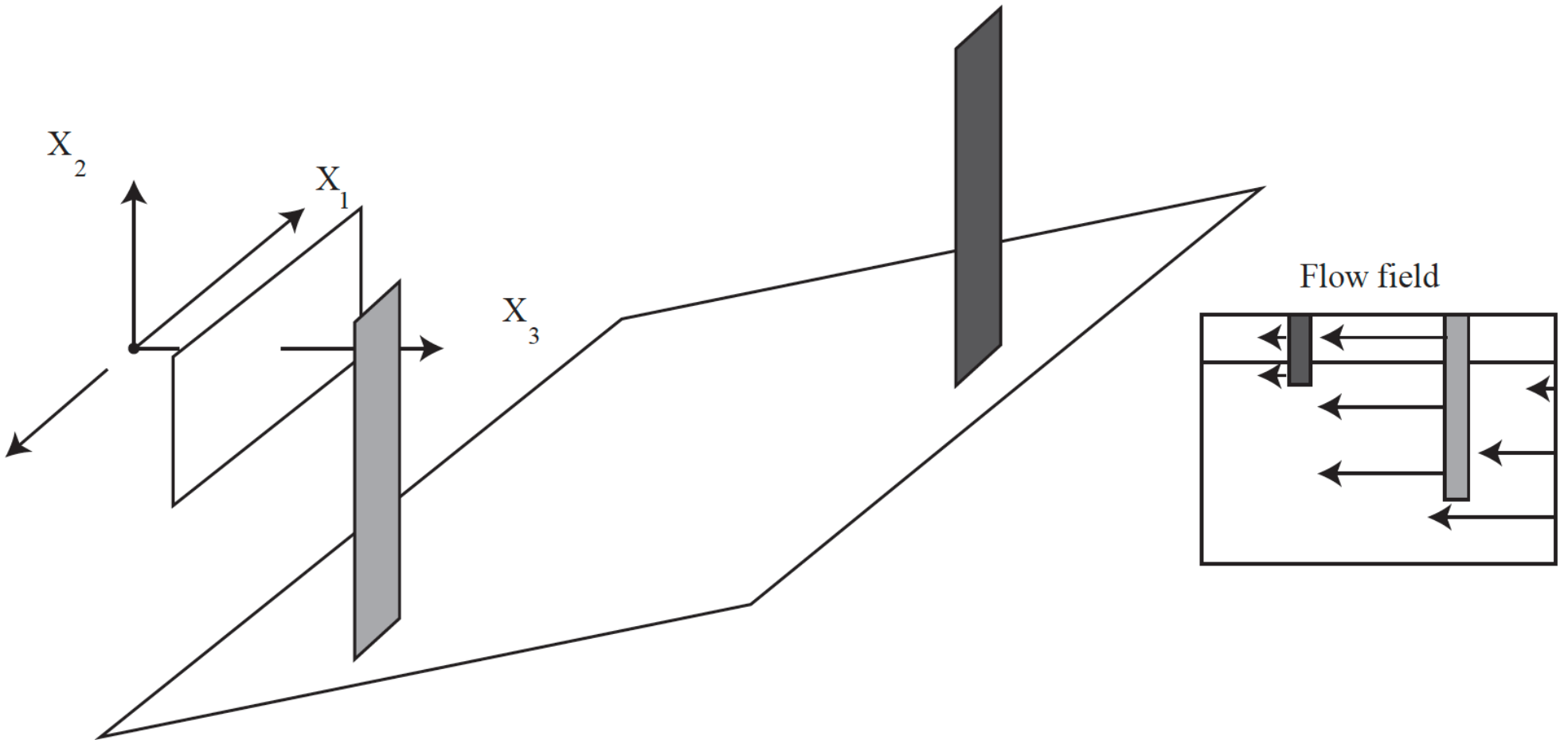
Flow fields reveal your motion



Flow fields reveal shape



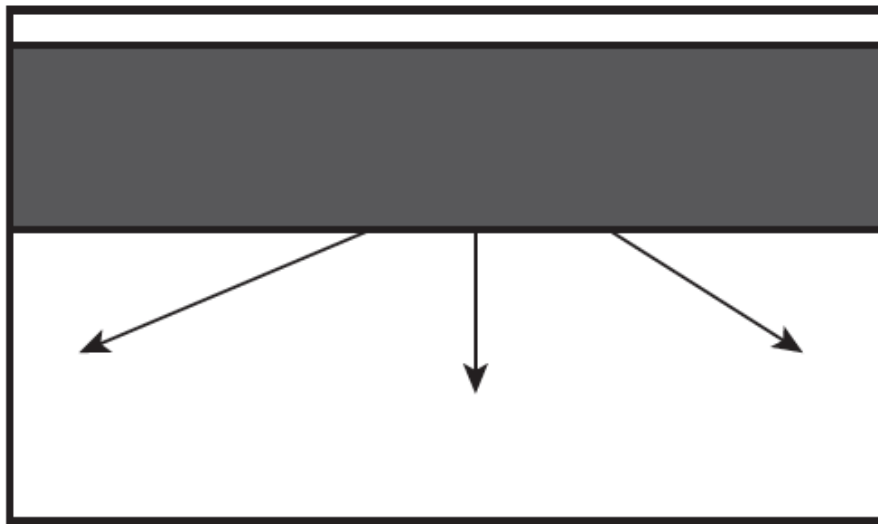
Flow fields reveal segmentation



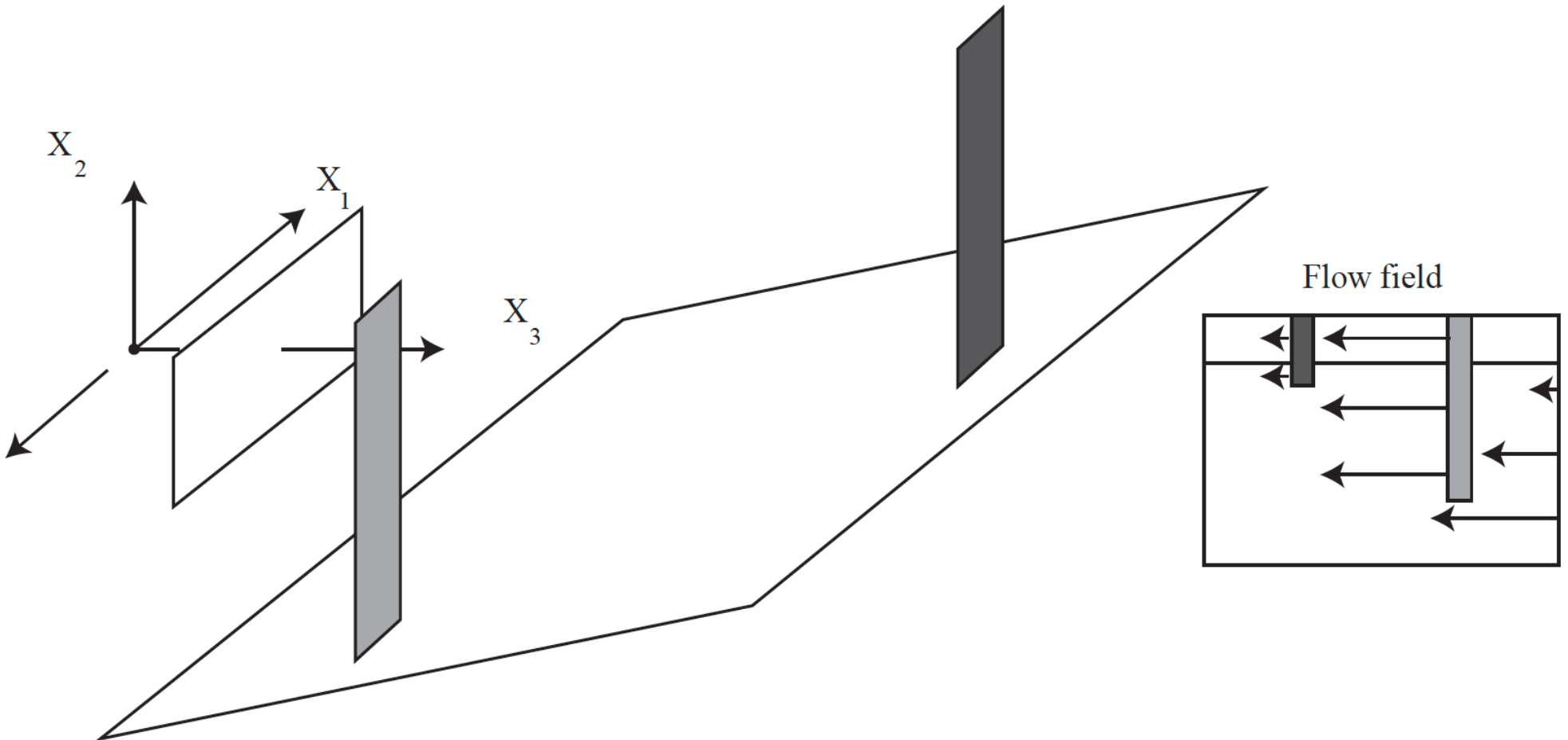
Why estimating flow is hard

- Flow is ambiguous at most points
 - the aperture problem
- You must interpolate
 - but there are discontinuities
- Flow is not defined everywhere
 - some things are visible only in one frame
- Some objects move by large amounts
- Motion blurring complicates estimation

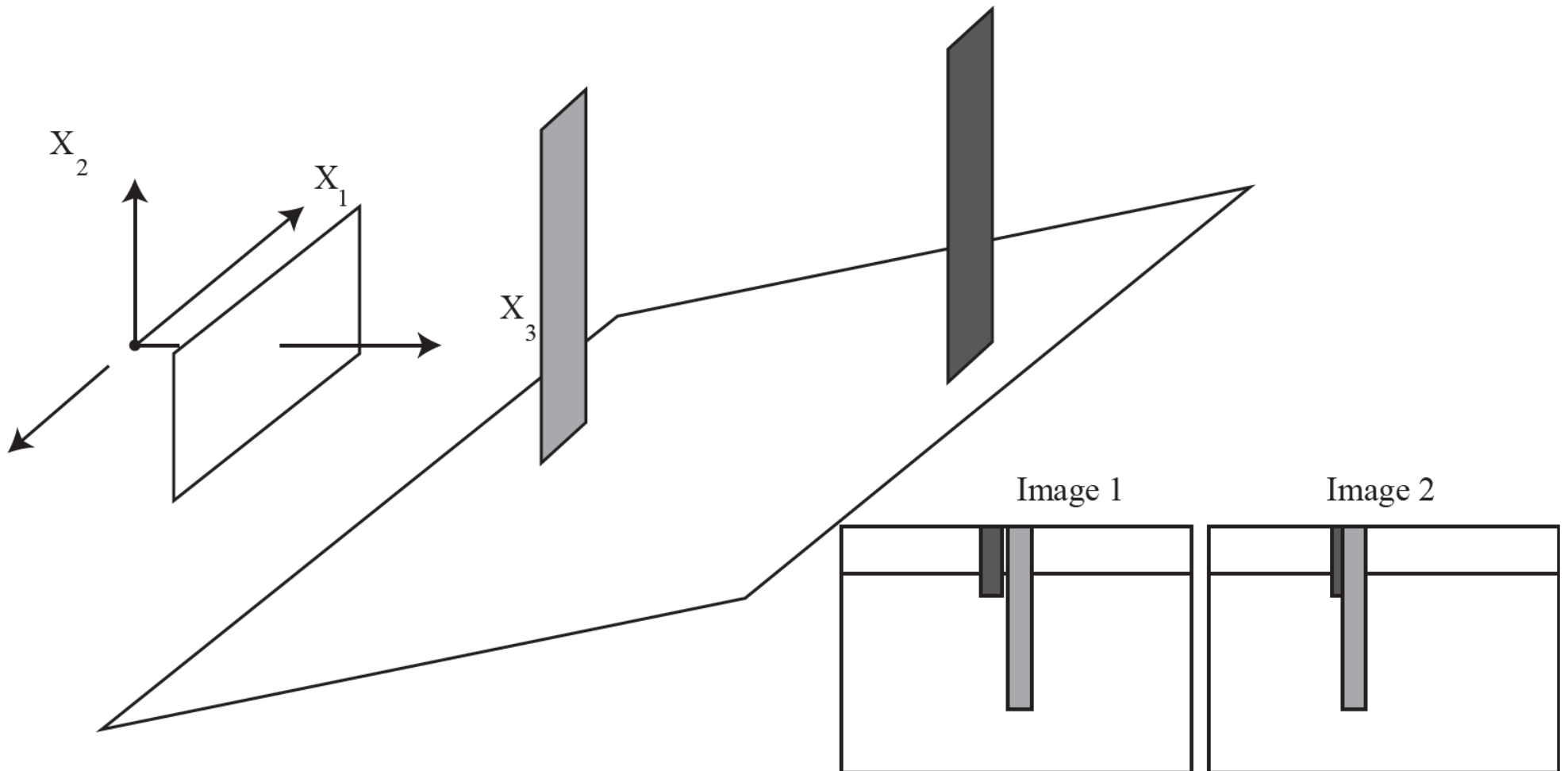
The aperture problem



Flow is often discontinuous



Flow is not defined everywhere



Large movements and motion blur

