Estimation of Forces between Objects in the Cheerios Effect KHOI
NGUYEN, MICHAEL MILLER, SHREYAS MANDRE, Brown University — We
develop an analysis and method to estimate the attractive forces due to the capillary
interactions between nearby interfacial objects, often dubbed as the Cheerios effect.
The method involve mapping the 3-dimensional surface deformation surrounding a
floating object and estimating the force directly from the gradient field. The surface
deformation is obtained by correlating the image of a random dot background with
its refraction from the liquid surface. The scaling of attractive force as a function of
distance for objects of arbitrary shape is directly obtainable from a series of gradient
fields. We specialize to the case of objects with sharp corners and observe that force
scales exponentially with distance on the order of a capillary length. Furthermore,
this optical method is potentially instrumental in studying colloidal self-assembly
because it can be implemented in real time in a dynamically changing array of
floating objects.

Khoi Nguyen
Brown University