# Homework 2

Course: 414.311A, Fall, 2007
Due Oct. 13

1. Prepare a rectangular container that you can shake (whatever size you have). Fill the container partially and record the filling depth. Shake the container and wait a few second for transient fluid motion to disappear. Then, you will find that only fundamental mode of standing waves. Measure the frequency of standing wave. Repeat this measurement for various filling depth.

   (1) Make a short report (no more than 1 page) for your experiment.

   (2) Calculate the theoretical values of wave frequency using dispersion relation.

   (3) Plot a graph for filling depth and frequency, and describe what you observed.

2. WIG (Wing-In-Ground) is of great recent interest in our field. Now consider a 2D wing flying closely above free surface with a certain speed. Pressure field below the wing is written to $P(x,y,t)$.
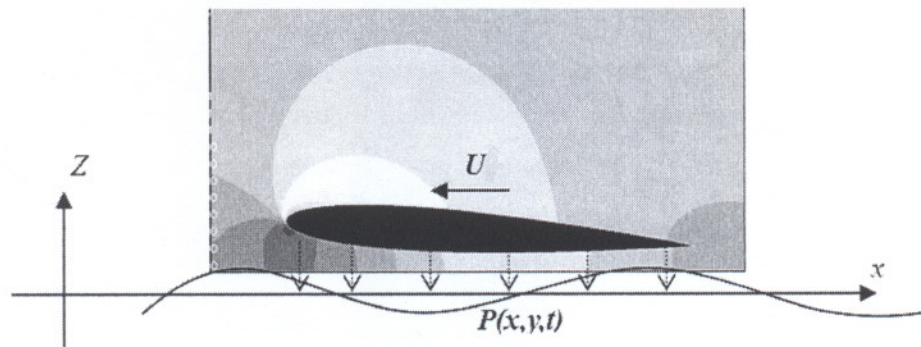
   Define an earth-fixed coordinate system, and derive the linear free surface boundary condition around the wing.

3. Consider standing waves of (i) length 1m and filling depth 0.5m, (ii) length 2m and filling depth 0.5m, and (iii) length 10m, depth 5m. Plot the followings in a fluid domain of two wave lengths:

   (1) Velocity potential

   (2) Velocity vector

   (3) Linear dynamic pressure

   (4) Linear dynamic + static pressure