Sloshing on London Eye: videos data

— April 15, 2010—

1 Video 1

The input data for the video 1 are: $L = 1.0\,m$, $r = 1.2\,m$, $h_0 = 0.17\,m$, $\Delta x = 0.01\,m$, $\Delta t = 0.01\,sec$, $\omega = 1.1\omega_1 \approx 4.46\,rad/sec$, $\epsilon_r = 1^\circ$, $d_1 = -0.5\,m$, $d_2 = 0.0\,m$, $\theta_0 = 0.0\,rad$, $\mathrm{C} = 0.6\,rad/sec$.

The roll (or pitch) forcing function is

$$\theta \;=\; \epsilon_r \sin(\omega t)\;. \tag{1.1}$$

Surge and heave motions are

$$\begin{aligned} q_1 &= -r\left(\cos\theta_0 - \cos\theta_c\right)\;, \\ q_2 &= r\left(\sin\theta_c - \sin\theta_0\right)\;, \end{aligned} \tag{1.2}$$

where

$$\theta_c \;=\; \mathrm{C}t + \theta_0\,.$$

The initial conditions are

$$\begin{aligned} u(x,0) &= 0\,, \\ h(x,0) &= h_0\,. \end{aligned} \tag{1.3}$$

2 Video 2

The input data for the video 2 are: $L = 1.0\,m$, $r = 1.2\,m$, $h_0 = 0.17\,m$, $\Delta x = 0.01\,m$, $\Delta t = 0.01\,sec$, $\omega_1 \approx 4.057\,rad/sec$, $\epsilon_r = 0.0^\circ$, $d_1 = -0.5\,m$, $d_2 = 0.0\,m$, $\theta_0 = 0.0\,rad$, $\mathrm{C} = 1.2\,rad/sec$.

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

3 Video 3

The input data for the video 3 are: $L = 1.0\,m$, $r = 1.2\,m$, $h_0 = 0.17\,m$, $\Delta x = 0.01\,m$, $\Delta t = 0.01\,sec$, $\omega = 0.1\omega_1 \approx 0.4057\,rad/sec$, $\epsilon_r = 10^\circ$, $d_1 = -0.5\,m$, $d_2 = 0.0\,m$, $\theta_0 = 0.0\,rad$, $\mathrm{C} = 0.8\,rad/sec$.

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

4 Video 4

The input data for the video 3 are: $L = 1.0\,m,\ r = 1.2\,m,\ h_0 = 0.20\,m,\ \Delta x = 0.01\,m,\ \Delta t = 0.01\,sec,\ \omega = 1.6\omega_1 \approx 7.04\,rad/sec,\ \epsilon_r = 8^\circ,\ d_1 = -0.5\,m,\ d_2 = 0.0\,m,\ \theta_0 = 0.0\,rad,\ \mathrm{C} = 1.0\,rad/sec.$

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

5 Video 5

The input data for the video 3 are: $L = 1.0\,m,\ r = 2.0\,m,\ h_0 = 0.20\,m,\ \Delta x = 0.01\,m,\ \Delta t = 0.01\,sec,\ \omega = 2.0\omega_1 \approx 8.80\,rad/sec,\ \epsilon_r = 8^\circ,\ d_1 = -0.5\,m,\ d_2 = 0.0\,m,\ \theta_0 = 0.0\,rad,\ \mathrm{C} = 0.2\,rad/sec.$

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

6 Video 6

The input data for the video 3 are: $L = 1.0\,m,\ r = 1.5\,m,\ h_0 = 0.20\,m,\ \Delta x = 0.01\,m,\ \Delta t = 0.01\,sec,\ \omega = 0.5\omega_1 \approx 2.20\,rad/sec,\ \epsilon_r = 8^\circ,\ d_1 = -0.5\,m,\ d_2 = -0.6\,m,\ \theta_0 = 0.0\,rad,\ \mathrm{C} = 1.0\,rad/sec.$

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

7 Video 7

The input data for the video 3 are: $L = 1.0\,m,\ r = 1.7\,m,\ h_0 = 0.20\,m,\ \Delta x = 0.01\,m,\ \Delta t = 0.01\,sec,\ \omega = 0.95\omega_1 \approx 4.18\,rad/sec,\ \epsilon_r = 2^\circ,\ d_1 = -0.5\,m,\ d_2 = -0.75\,m,\ \theta_0 = 0.0\,rad,\ \mathrm{C} = 0.8\,rad/sec.$

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

8 Video 8

The input data for the video 3 are: $L = 1.0\,m,\ r = 1.7\,m,\ h_0 = 0.20\,m,\ \Delta x = 0.01\,m,\ \Delta t = 0.01\,sec,\ \omega = 0.99\omega_1 \approx 4.35\,rad/sec,\ \epsilon_r = 4^\circ,\ d_1 = -0.5\,m,\ d_2 = -0.75\,m,\ \theta_0 = 0.0\,rad,\ \mathrm{C} = 0.8\,rad/sec.$

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

9 Video 9

The input data for the video 3 are: $L = 1.0\,m,\ r = 1.7\,m,\ h_0 = 0.20\,m,\ \Delta x = 0.01\,m,\ \Delta t = 0.01\,sec,\ \omega = \omega_1 \approx 4.4004\,rad/sec,\ \epsilon_r = 8^\circ,\ d_1 = -0.5\,m,\ d_2 = -0.75\,m,\ \theta_0 = 0.0\,rad,\ \mathrm{C} = 0.8\,rad/sec.$

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

10 Video 10

The input data for the video 3 are: $L = 1.0\,m,\ r = 1.7\,m,\ h_0 = 0.20\,m,\ \Delta x = 0.01\,m,\ \Delta t = 0.01\,sec,\ \omega = \omega_1 \approx 4.4004\,rad/sec,\ \epsilon_r = 8^\circ,\ d_1 = 0.25\,m,\ d_2 = -0.30\,m,\ \theta_0 = 0.0\,rad,\ \mathrm{C} = 0.8\,rad/sec.$

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

11 Video 11

The input data for the video 3 are: $L = 1.0\,m,\ r = 1.7\,m,\ h_0 = 0.20\,m,\ \Delta x = 0.01\,m,\ \Delta t = 0.01\,sec,\ \omega = \omega_1 \approx 4.4004\,rad/sec,\ \epsilon_r = 15^\circ,\ d_1 = -0.5\,m,\ d_2 = -0.6\,m,\ \theta_0 = 0.0\,rad,\ \mathrm{C} = 0.8\,rad/sec.$

Surge and heave motions have the same form as (1.2). The initial conditions are the same as (1.3).

Figure (1) shows the rigid body motion with interior fluid sloshing at a sequence of times for input data of video 11.

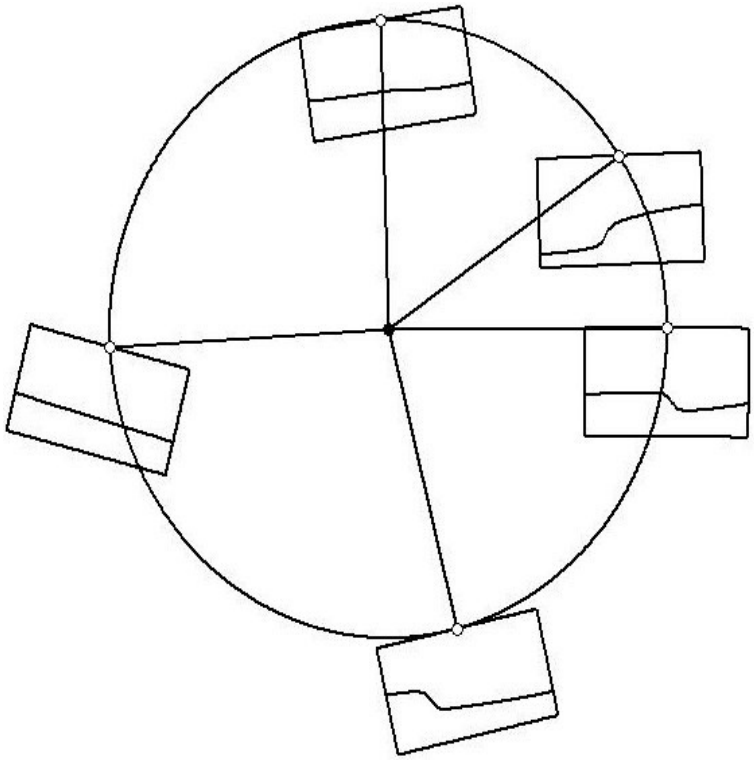

Figure 1: Rigid body motion with interior fluid sloshing at a sequence of times.