Barkin Sarigol <bsarigol@uw.edu>

The DLM Code - Test Case Results

Eli Livne <eli@aa.washington.edu> Sun, Jan 19, 2025 at 1:36 AM
To: Barkin Sarigol <bsarigol@uw.edu>

Dear Barkin,

I revisited the code, reminded myself what was in it, and then re-created the Cornell wing test case as the test case to pursue again.

I added a lot of notes in the body of the source code. Please, see my notes at the beginning of the source code and then in the sections that define mode shapes, calculate lift force distributions, and generalized forces.

The case I used: Just two rigid modes.
Mode 1: a 1 (unit) plunge (heave mode) positive z up
Mode 2: a pitch mode, rigid, about the midchord of the root of the fwd wing (at x=0).

I ran two cases that were studied by Nissim and Lottati.

If h denota mode 1 and a denotes mode 2, then the resulting gen. force matrix is 2x2 with elements as follows:

lift due to h, lift due 2 a
moment due to h, moment due to a

If we normalize forces by Sref and moments by Sref*refChord, we get:

cLh, cLa
cMh, cMa

I ran the unsteady cases, where the reduced frequence (corresponding to a unit ref chord)
omega/U=2.623

There are two cases: Mach 0.0 and Mach 0.7.

Each element (complex) has a magnitude and a phase angle (deg.).

The Lottati & Nissim results (approximately. They compare different numbers of boxes or polynomials):

For Mach = 0

7.9(-49.21) 6.21(-88.52)
4.41(-35.67) 4.24(-74.8)

Mach = 0.7

8.73(-61.5) 6.6(--103)
5.17(-48) 4.78(-88)

My code plots the force distributions and prints the results.

The Match with Lottati & Nissim is quite good.

Best

Eli

Eli Livne

DLM_Main.m
42K