Python sdof_base_sine.py Example

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January 13, 2012

Consider the spring-mass system in Figure 1 which is subjected to initial base excitation.

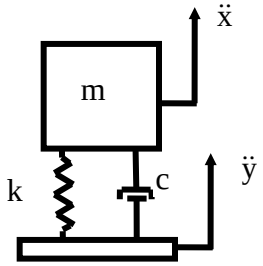

Figure 1.

The variables are:

m	=	mass
c	=	viscous damping coefficient
k	=	stiffness
$\ddot{x}$	=	acceleration of the mass
$\ddot{y}$	=	acceleration of the base

The governing equation of motion is derived in Reference 1. It can be solved exactly via a Laplace transformation as shown in the reference.

Now assume that the system has a natural frequency of fn=10 Hz and an amplification factor of Q=10. The system is subjected to a 0.2 G sinusoidal excitation at a frequency of 10 Hz. The system is thus excited into resonance.

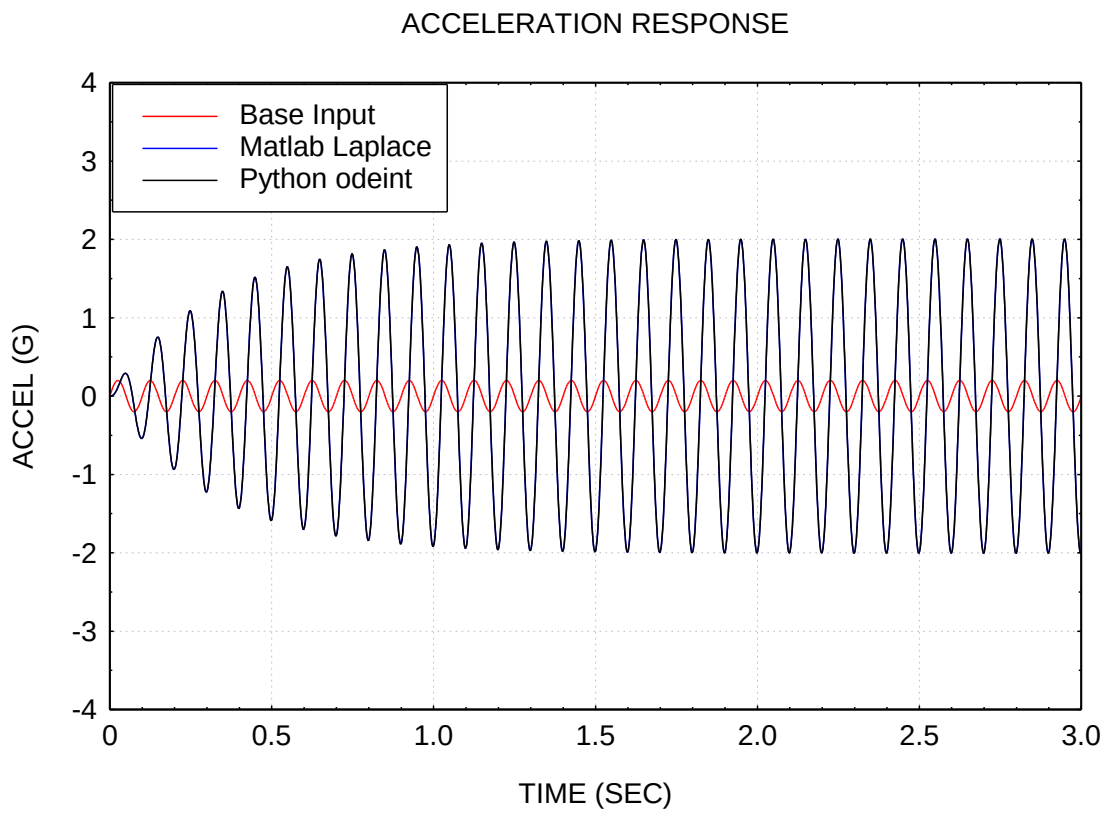

Figure 2.

The Laplace transform solution is performed using Matlab script: sine_base.m.

The problem is also solved using Python script sdof_initial.py which implements the odeint function.

The acceleration and relative displacement results are shown in Figures 2 and 3, respectively. The results are nearly identical in each case.

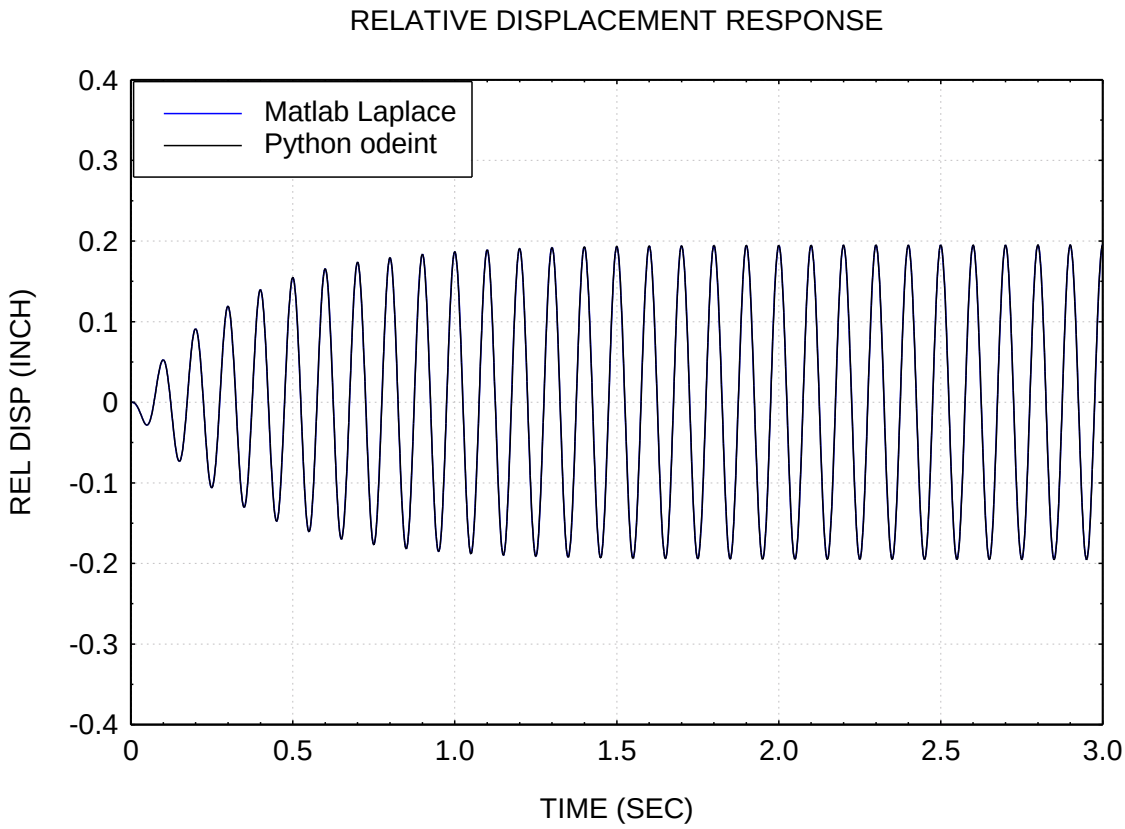

Figure 3.

<u>Reference</u>

1. T. Irvine, The Modal Transient Response of a Single-degree-of-freedom System Subjected to Harmonic Base Excitation, Vibrationdata, 2012.