Verification of DDSYS

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1 SDOF

1.1 Classic SDOF system

Equation of motion

$$m\ddot{u} + c\dot{u} + ku = -ma_g \tag{1}$$

Parameter definition

$$\omega = \sqrt{\frac{k}{m}} \qquad \zeta = \frac{c}{2\sqrt{mk}}$$

Parameter setting

$$m = 1 \quad k = 100 \quad c = 0.4$$

$$\omega = 10 \quad \zeta = 0.02$$

1.1.1 Case I: resonant exitation

$$a_g = \sin(\omega t) \tag{2}$$

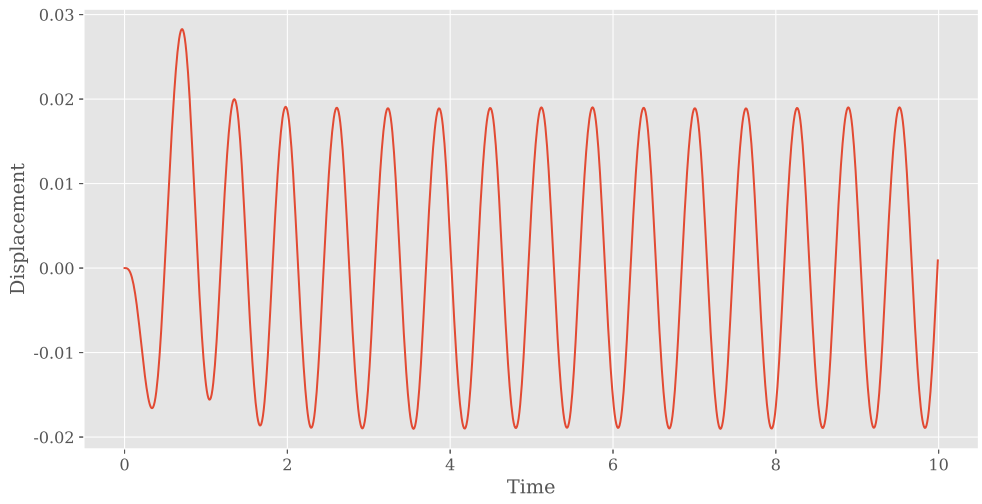

Figure 1. Response of SDOF system under resonant exitation

1.1.2 Case II: seismic exitation

Time-history curve of the ground motion is shown below

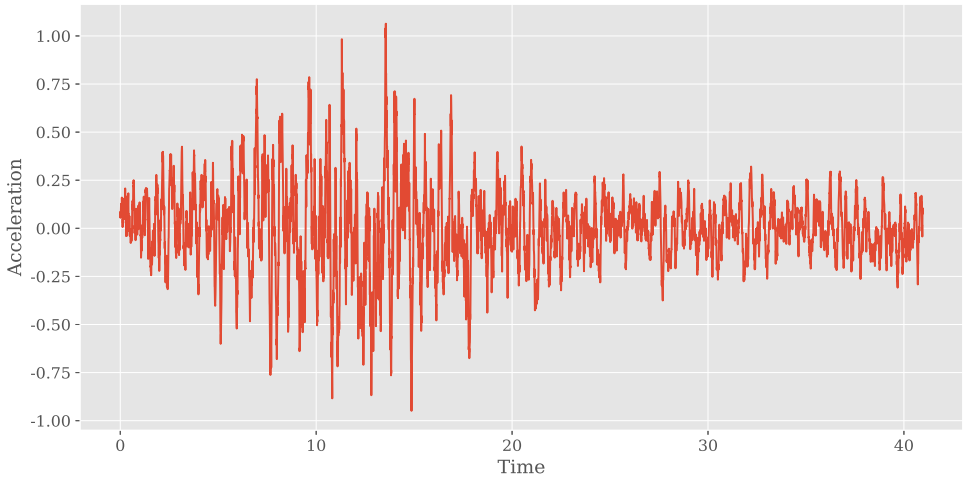

Figure 2. Ground motion

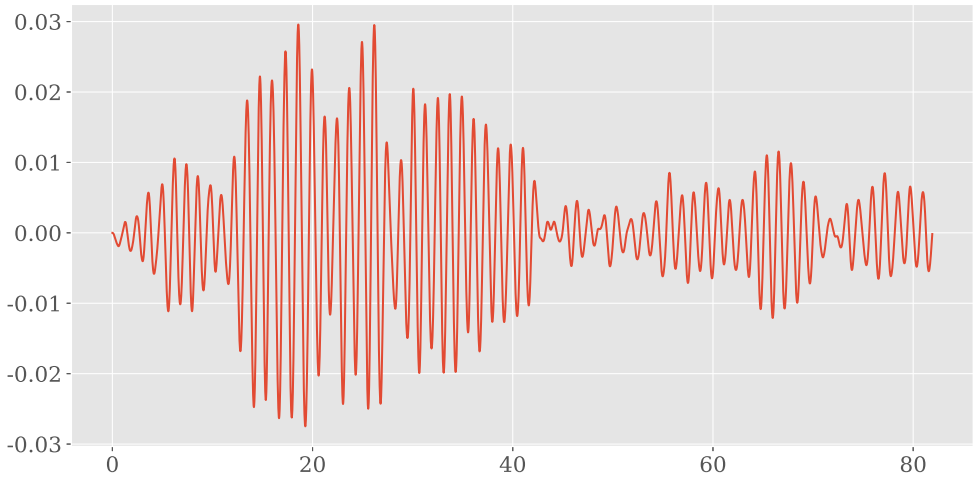

Figure 3. Seismic response

1.2 SDOF system with bilinear spring

Equation of motion

$$m\,\ddot{u} + c\,\dot{u} + f(u) = -m\,a_g \tag{3}$$

1.2.1 Case I: resonant exitation

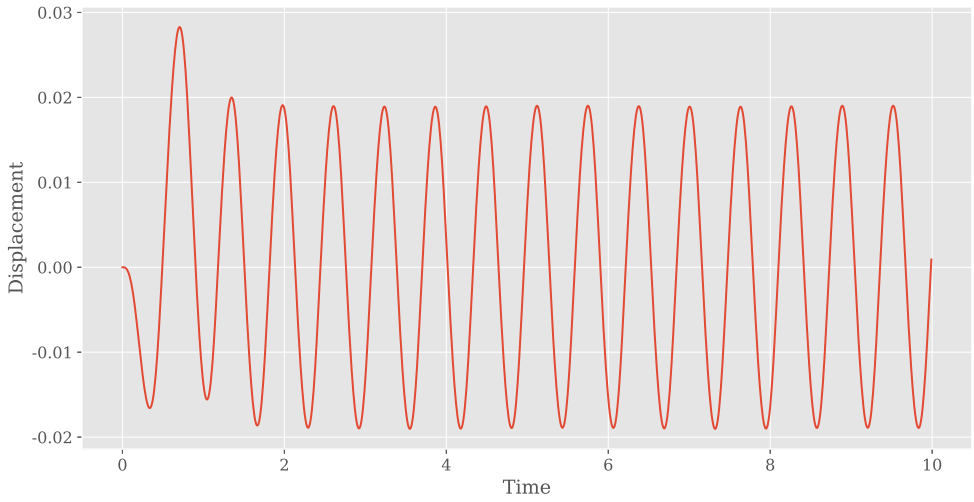

Figure 4.

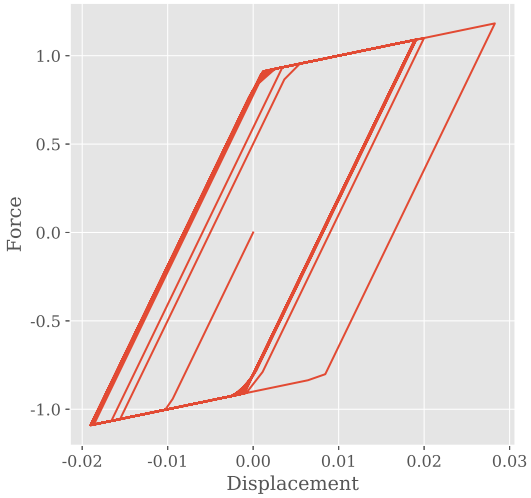

Figure 5.

1.2.2 Case II: seismic exitation

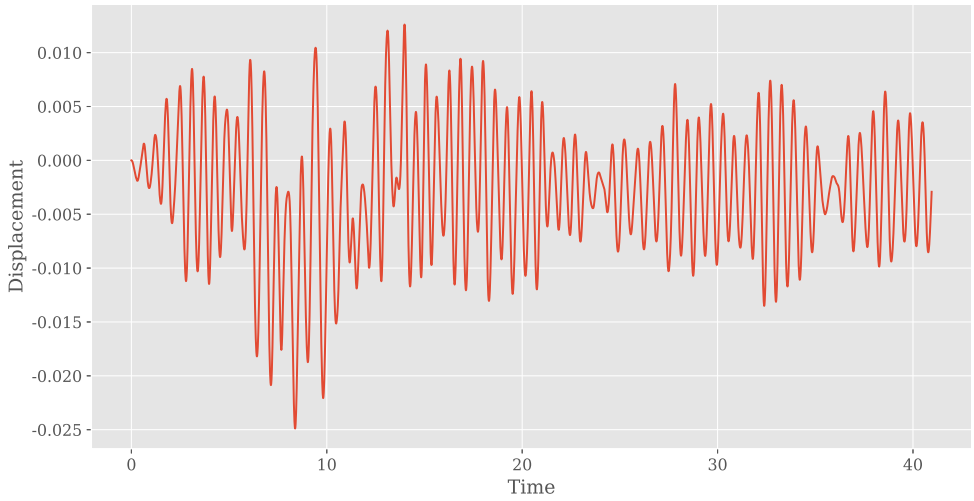

Figure 6.

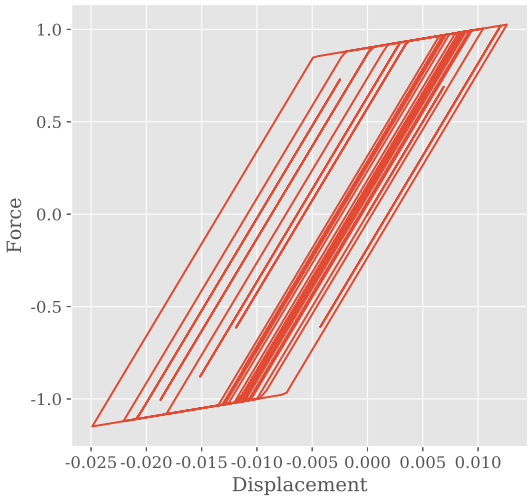

Figure 7.