

# 9<sup>th</sup> Home Project

October 27, 2022

The equation of motion of Rössler's System:

$$\begin{aligned}\dot{x} &= -y - z + u_x \\ \dot{y} &= x + ay + u_y \\ \dot{z} &= b + z(x - c) + u_z\end{aligned}\tag{1}$$

Table 1: Model parameters for Rössler's System

Parameter	Exact	Approx
a	0.01	0.1
b	0.2	0.3
c	5.7	5.5

The simulation length: 2e4 Cycle time:1e-3

The Nominal trajectory:

$$q^N = A \sin(\omega t)\tag{2}$$

, where

Table 2: Nominal trajectory parameters for Rössler's System

$A_1$	5
$\omega_1$	1
$A_2$	3
$\omega_2$	0.7
$A_3$	1
$\omega_3$	1

Create a VS/SM controller for Duffing Oscillator, with initial condition  $q(0) = 0$ ,  $\dot{q}(0) = 0$  and an initial condition, which is close to the Nominal trajectory. The computations for "preparation" have to be calculated on paper,

then you have to typeset it into the documentation, and have to assign the paper computation to the documentation. (use "PID" type ErrorMetric)

Create the following plots for both cases.

- Nominal and Realized Trajectorys
- Tracking Errors
- Phase Spaces
- Control Signals

Explain the plots.

Document everything in L<sup>A</sup>T<sub>E</sub>X.