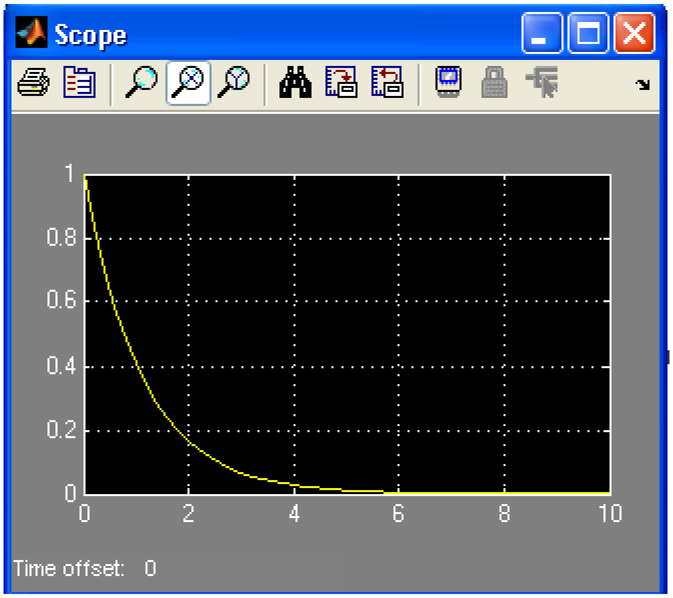
Thomas Boynton Lab 6 CET 346 3/25/2010

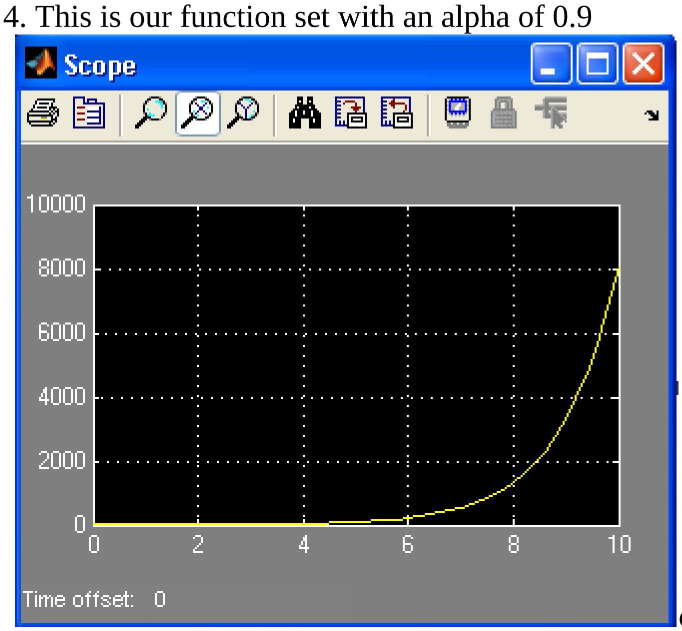
1. This gives us an alpha value of -0.9.

2. Our plot of this state response is shown below:



3. From the output it looks like a negative exponential or decaying exponential function. It would have the form z(t) = Ke^{at}. We can differentiate and we get $\frac{dz}{dt} = \alpha e^{at}$ and since alpha equals -0.9, it equals z(t) = e^{at}

4. This is our function set with an alpha of 0.9



ωω

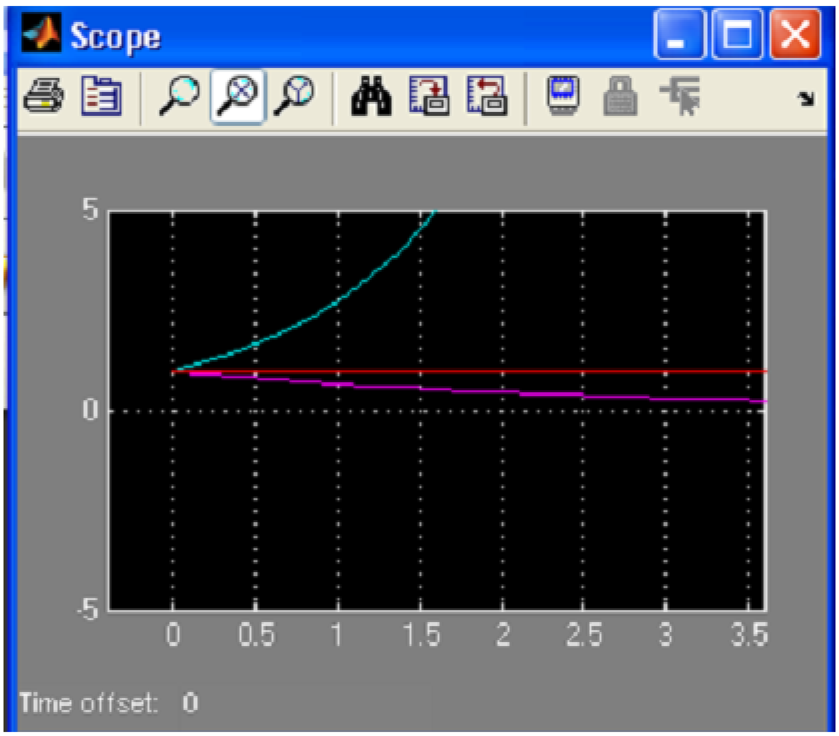
Not such a stable system, it grows without bound.

5. The values for this system which are stable are when a is less than or equal to zero

Independent Section

1. This matrix A is equal to [0 1; $-\omega^2_0$ 0].

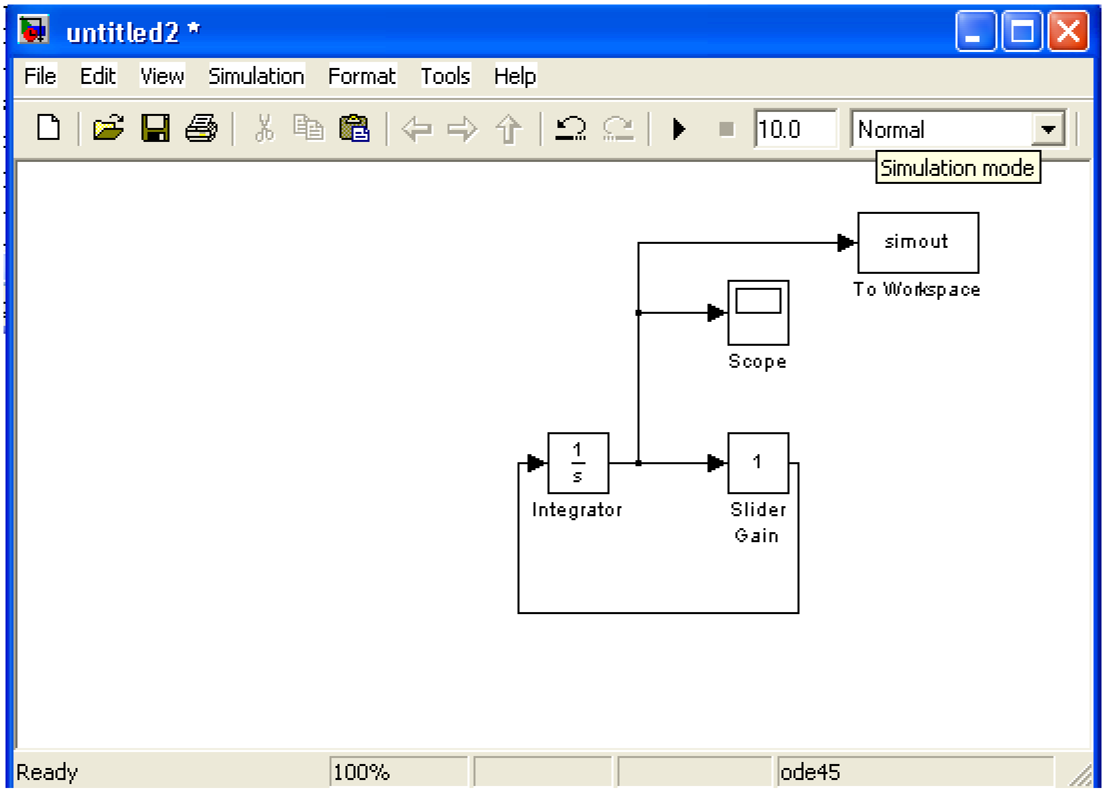
2. If we set our gain to [0, 1; -4*pi*pi/100, 0], we will get our period of 10 seconds. This will make our ω_0 = 2*pi/10. My plot looks a little strange, though. This is how it looks below:



3. If our ω_0 = 2*pi*440, our gain of our matrix block can be set to:
[0, 1; -4*pi*pi*440*440, 0]. We know this will do five cycles in 5/440 seconds, so this is when our stopping point is set.

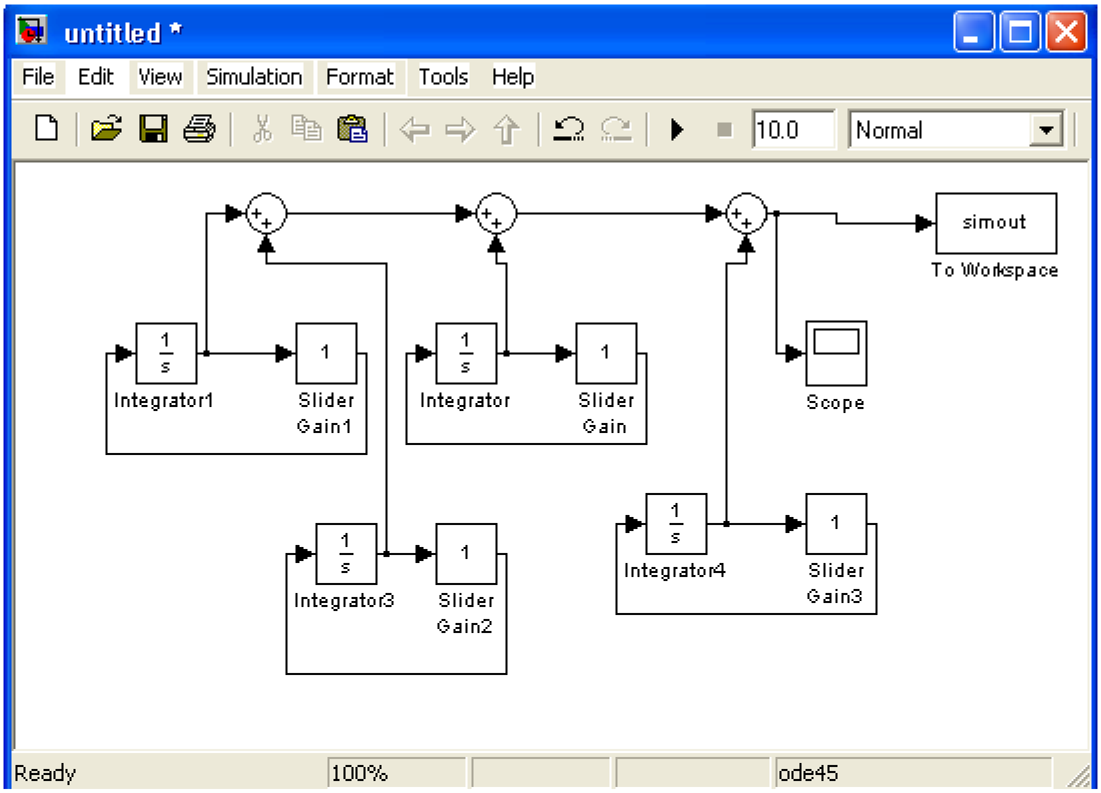
4. Our block diagram is shown below:

We can command this to listen with the code: soundsc (simout(:, 1))



5. There is an exponential decay of the sound, positive values of a2, 2, the result is exponential growth and larger negative values make it decay faster. It's stable with negative values.

6. We can show our block diagram below:



We can take and give the gain blocks the values below to give it a sound of a string that has been plucked:

[0, 1; -4*pi*pi*440*440, -5]
[0, 1; -4*pi*pi*440*440*4, -20]
[0, 1; -4*pi*pi*440*440*9, -30]
[0, 1; -4*pi*pi*440*440*16, -40]