Assume we have the following differential equations ($\dot{δ}=dδ/dt$)

$$\dot{δ}=ω$$

$$\frac{2H}{ω\_{s}}\dot{ω}=T\_{M}-\frac{E^{'}V\_{s}}{X\_{d}^{'}+X\_{ep}}\sin(\left(δ-θ\_{vs}\right))-D⋅ω$$

With the following data:

 $H=2$, $ω\_{s}=2π60$, $T\_{m}=1$, $E^{'}=1, V\_{s}=1$, $X\_{d}^{'}=0.1, X\_{ep}=0.1$, $θ\_{vs}=0$, $D=0.1$

1. Rewrite these differential equations just in terms of $δ$ and $ω$

2. What are the two equilibrium points of this system? (Hint: a set of differential equations will be at equilibrium when they are not changing with time, that is, all time derivatives are zero.)

3. Fill out the following table for this system starting at the given point, using Euler’s method with a time step of 0.01 seconds. Try it on a spreadsheet or with a script out to 2 seconds. Is the system stabilizing to an equilibrium point?

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| --- | --- | --- | --- | --- |
| t | $$δ$$ | $$ω$$ | $$\dot{δ}$$ | $$\dot{ω}$$ |
| 0 | 0.4 | 0 |  |  |
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