Automatic Control Ders 3

1. $f(\bar{x},\bar{u})=0$ Olduğundan dolayı bize verilen x1hat ve x2hat fonksiyonlarını 0a eşitliyoruz
2. $$\dot{x}_1(t) = x_2(t)$$ $$\dot{x}_2(t) = -\frac{g}{l}\sin(x_1(t)) - \frac{\beta}{ml^2}x_2(t) + \frac{1}{ml^2}u(t)$$
3. İki denklemi de sıfıra eşitlediğimiz zaman bizde sorudan istenen değeri bu iki denklemi kullanarak buluyoruz (x1 isteyebilir x2 isteyebilir u isteyebilir)
4. Eğer stability propertylerini ölçmek istiyorsak eğer, matrislerini bulmamız gerekli
5. $$A = \left.\frac{\partial f(x,u)}{\partial x}\right|_{\substack{x=\bar{x}\\u=\bar{u}}} = \left.\begin{bmatrix} \partial f_1/\partial x_1 & \cdots & \partial f_1/\partial x_n \\ \vdots & \ddots & \vdots \\ \partial f_n/\partial x_1 & \cdots & \partial f_n/\partial x_n \end{bmatrix}\right|_{\substack{x=\bar{x}\\u=\bar{u}}} \in \mathbb{R}^{n\times n} : \text{Jacobian of } f \text{ wrt } x$$ $$C = \left.\frac{\partial g(x,u)}{\partial x}\right|_{\substack{x=\bar{x}\\u=\bar{u}}} = \left.\begin{bmatrix} \partial g_1/\partial x_1 & \cdots & \partial g_1/\partial x_n \\ \vdots & \ddots & \vdots \\ \partial g_q/\partial x_1 & \cdots & \partial g_q/\partial x_n \end{bmatrix}\right|_{\substack{x=\bar{x}\\u=\bar{u}}} \in \mathbb{R}^{q\times n} : \text{Jacobian of } g \text{ wrt } x$$ $$B = \left.\frac{\partial f(x,u)}{\partial u}\right|_{\substack{x=\bar{x}\\u=\bar{u}}} = \left.\begin{bmatrix} \partial f_1/\partial u_1 & \cdots & \partial f_1/\partial u_p \\ \vdots & \ddots & \vdots \\ \partial f_n/\partial u_1 & \cdots & \partial f_n/\partial u_p \end{bmatrix}\right|_{\substack{x=\bar{x}\\u=\bar{u}}} \in \mathbb{R}^{n\times p} : \text{Jacobian of } f \text{ wrt } u$$ $$D = \left.\frac{\partial g(x,u)}{\partial u}\right|_{\substack{x=\bar{x}\\u=\bar{u}}} = \left.\begin{bmatrix} \partial g_1/\partial u_1 & \cdots & \partial g_1/\partial u_p \\ \vdots & \ddots & \vdots \\ \partial g_q/\partial u_1 & \cdots & \partial g_q/\partial u_p \end{bmatrix}\right|_{\substack{x=\bar{x}\\u=\bar{u}}} \in \mathbb{R}^{q\times p} : \text{Jacobian of } g \text{ wrt } u$$
6. Cosine,siine türevlerinde içinin türevine gerek yok
7. Bu matrisleri bulduktan sonra internal stability istiyorsa roots(mnipoly(A))) daki değerlere bakıyoruz.
8.

Eigenvalues of the linearized system	Stability properties of the equilibrium
$\forall i : \mathbb{R}\mathrm{e}(\lambda_i(A)) < 0$	**Asymptotic stability**
$\exists i : \mathbb{R}\mathrm{e}(\lambda_i(A)) > 0$	**Instability**
$\forall i : \mathbb{R}\mathrm{e}(\lambda_i(A)) \leq 0$	**No conclusion can be drawn**