Abdulaziz Al Ghannami
www.ghannami.com

Developing Linear Models

One of the most effective means to do so is by using the Taylor series.

The general form of the taylor series expansion is the following:

$$f(x) = \sum_{n=0}^{\infty} \frac{f^{n'}(a)}{n!} \cdot (x-a)^n$$

When used to linearize non-linear functions, the taylor series expansion is reduced to the following:

$$f(\theta) = f(\theta_r) + \left(\frac{df}{d\theta}\right)_{\theta=\theta_r} (\theta - \theta_r), \;\; where\ r\ is\ the\ reference\ point$$

System Modelling

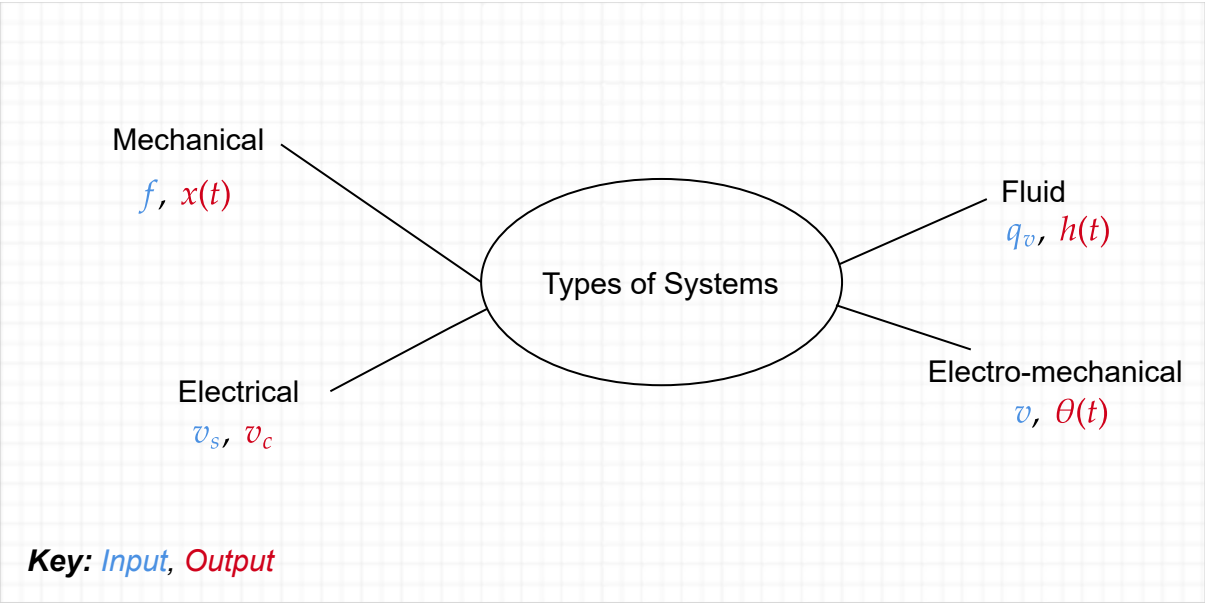
What is a System?

$$System \xrightarrow[of]{collection} Subsystems \xrightarrow[of]{collection} Components\ to\ perform\ a\ task$$

The way systems are modelled is by lumping their elements (eg. mass, spring, damper) into simpler systems.

Essentially what is then created is an approximation of reality, a model. Specifically, a mathematical model.

Types of Systems



- Mechanical systems: mass, damper, springs
- Electrical systems: electrical components (resistor, inductor, capacitor)
- Fluid systems: container
- Electro-mechanical systems: eg. rotational potentiometer