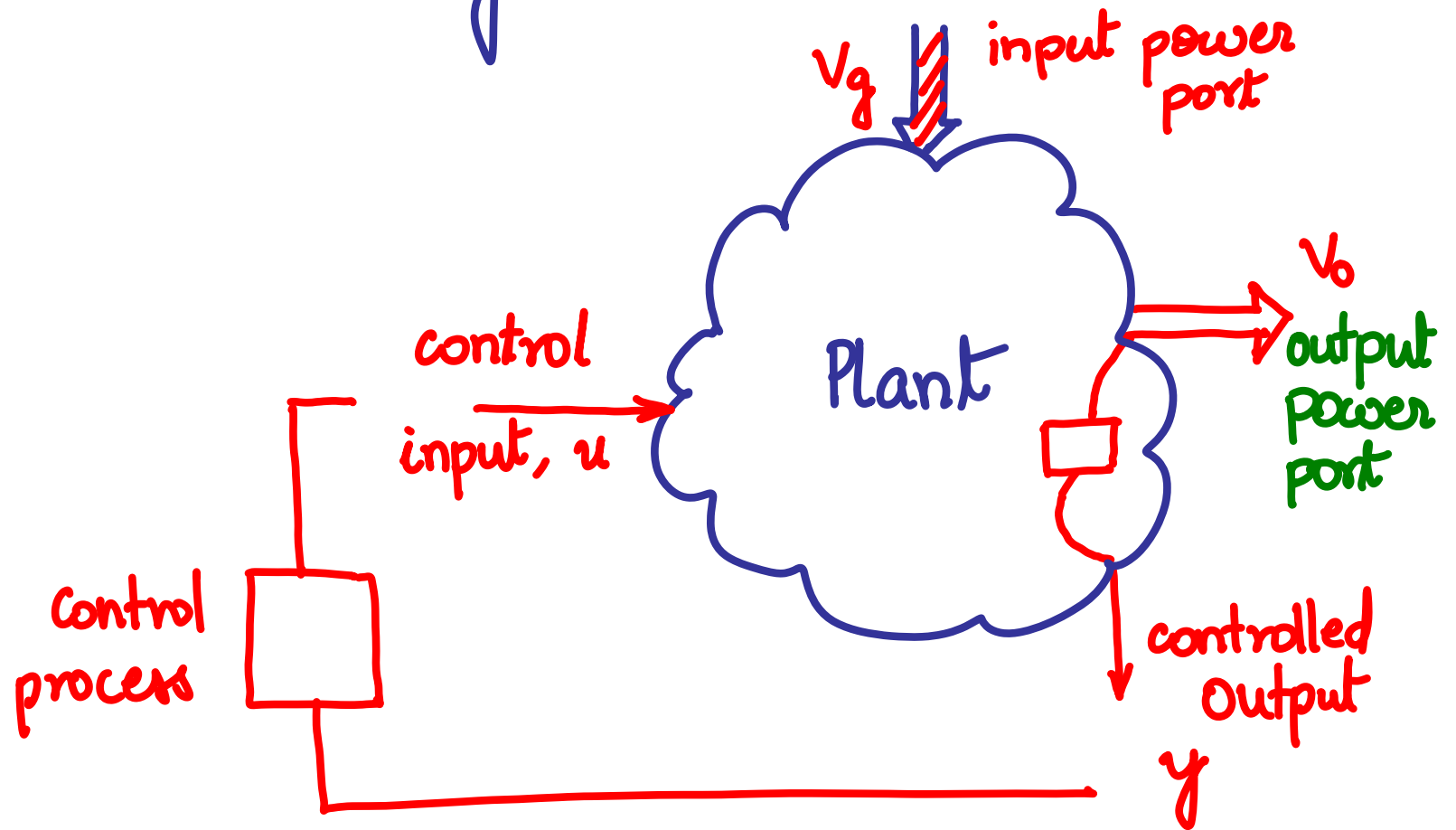
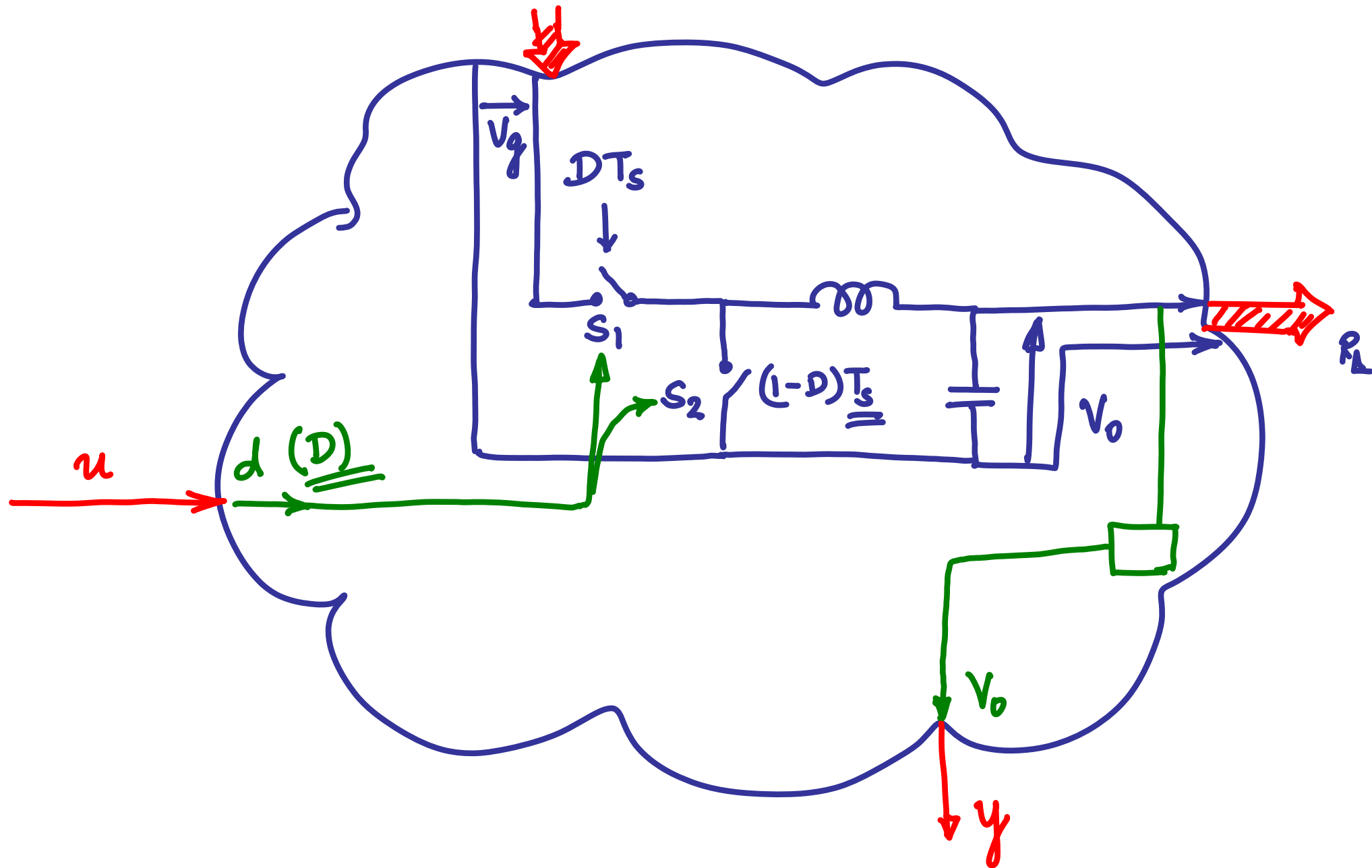
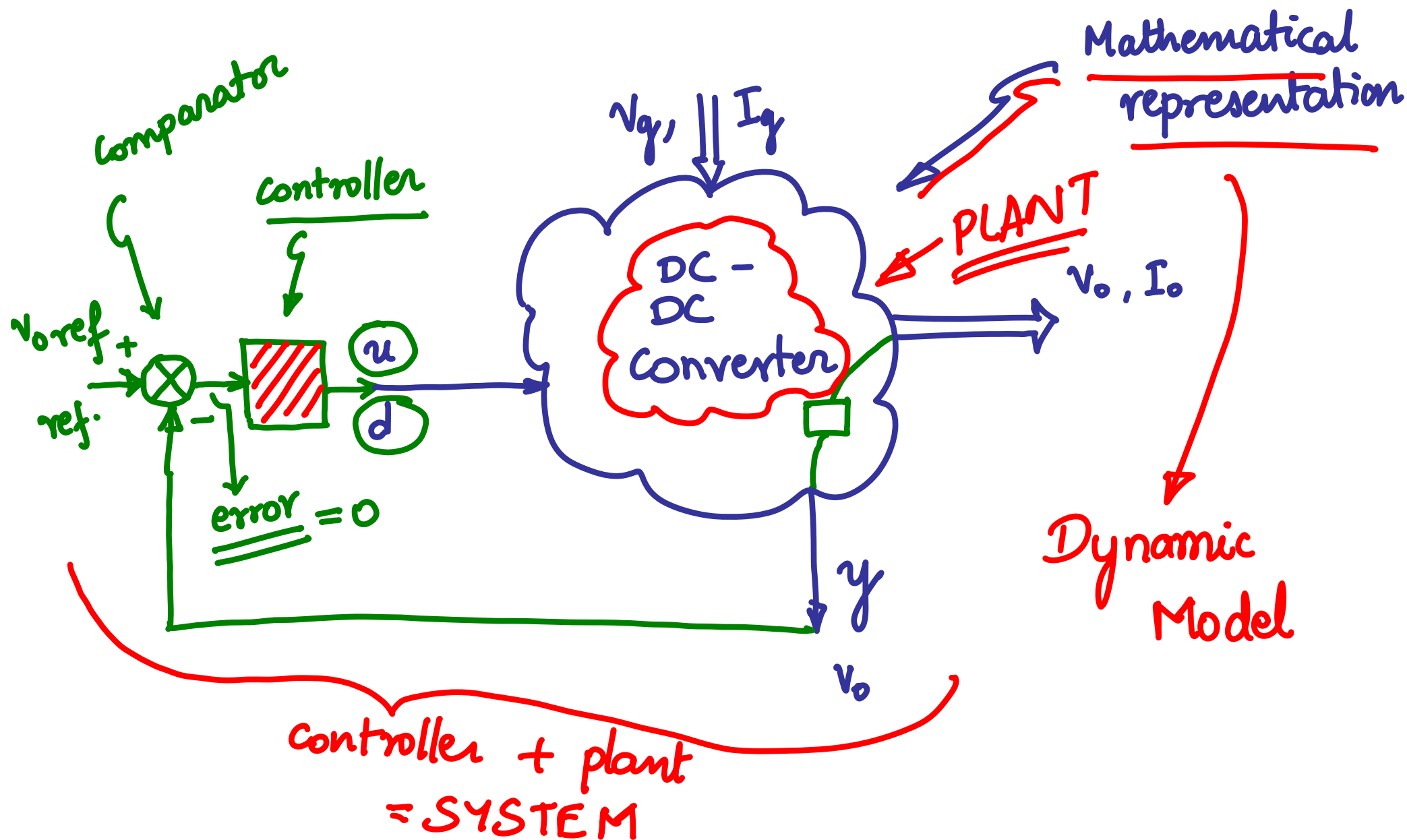


Modeling Basics







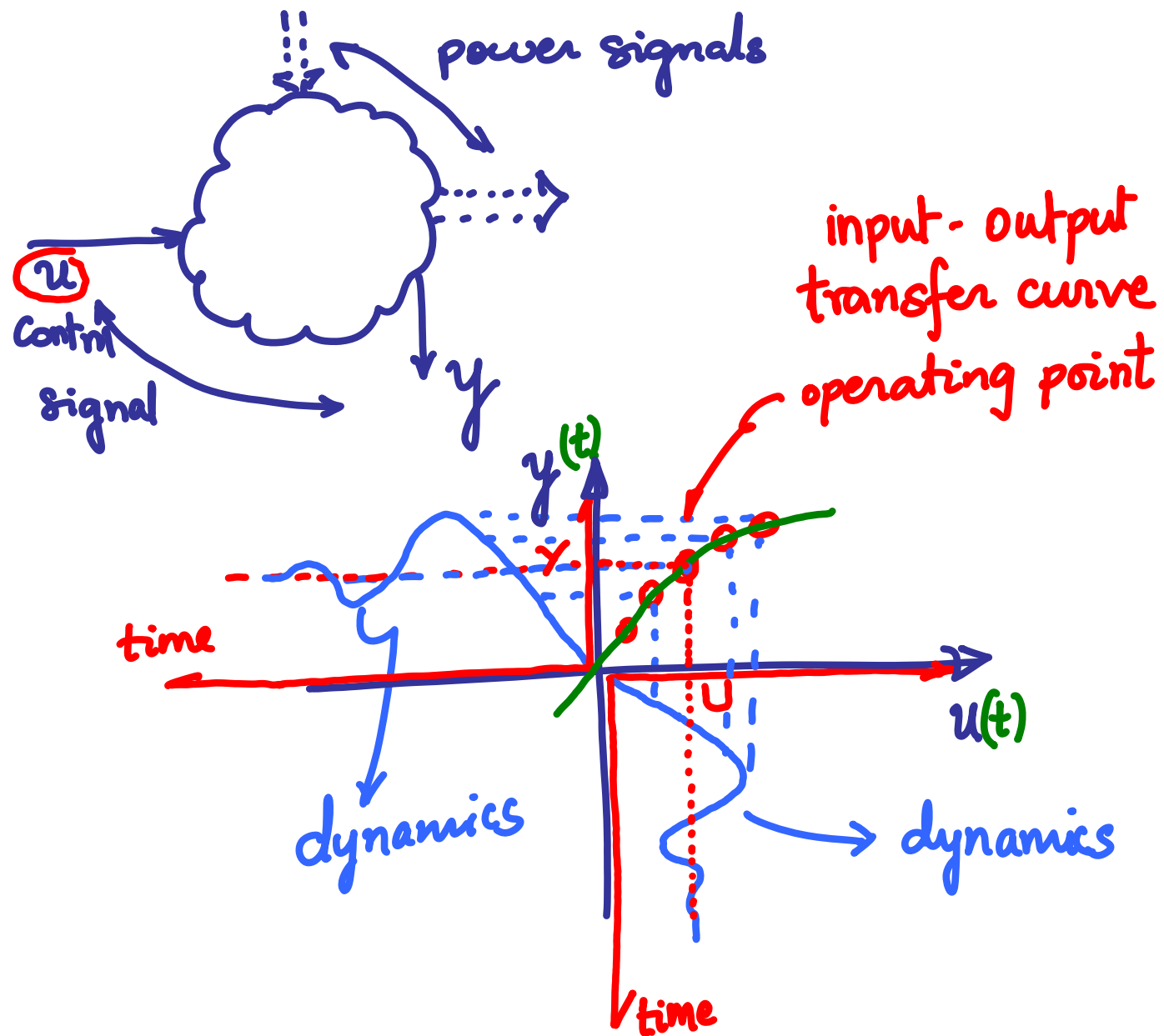
Dynamic Model

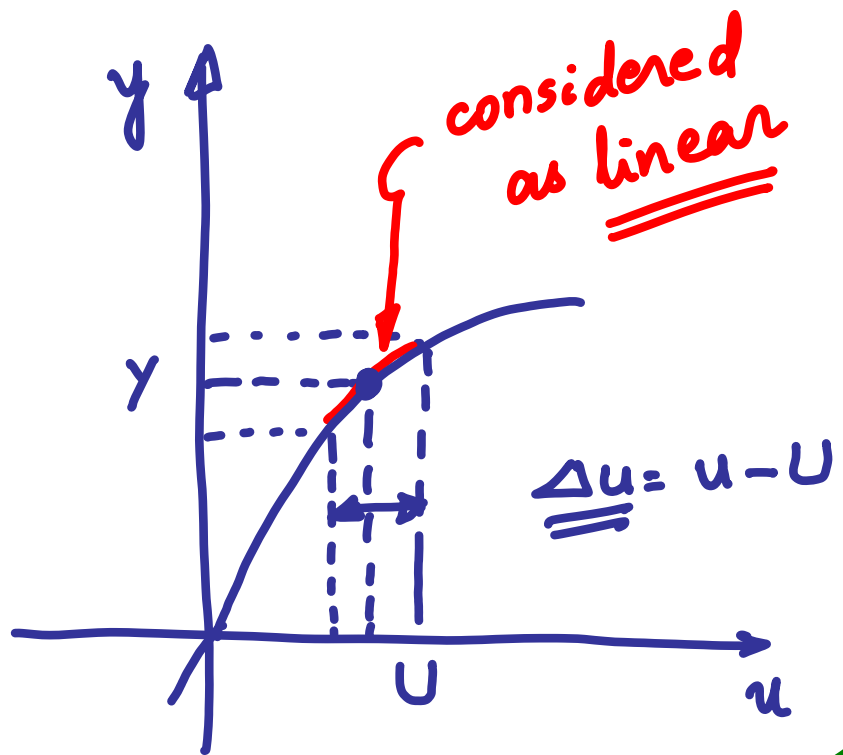
State space
representation

Transfer Function
representation

differential Equations

```
graph TD; DM[Dynamic Model] --> SSR(State space representation); DM --> TFR(Transfer Function representation); DE([differential Equations]) --> SSR; SSR --> TFR
```





$$y = f(u)$$

LARGE
SIGNAL
MODEL

$$\underline{y} = f(\underline{u})$$

STEADY
STATE MODEL

k

$$y = f(u) = \underline{y} + \left. \frac{df}{du} \right|_{u=\underline{u}} (u - \underline{u}) + \frac{1}{2!} \left. \frac{d^2f}{du^2} \right|_{u=\underline{u}} (u - \underline{u})^2 + \dots$$

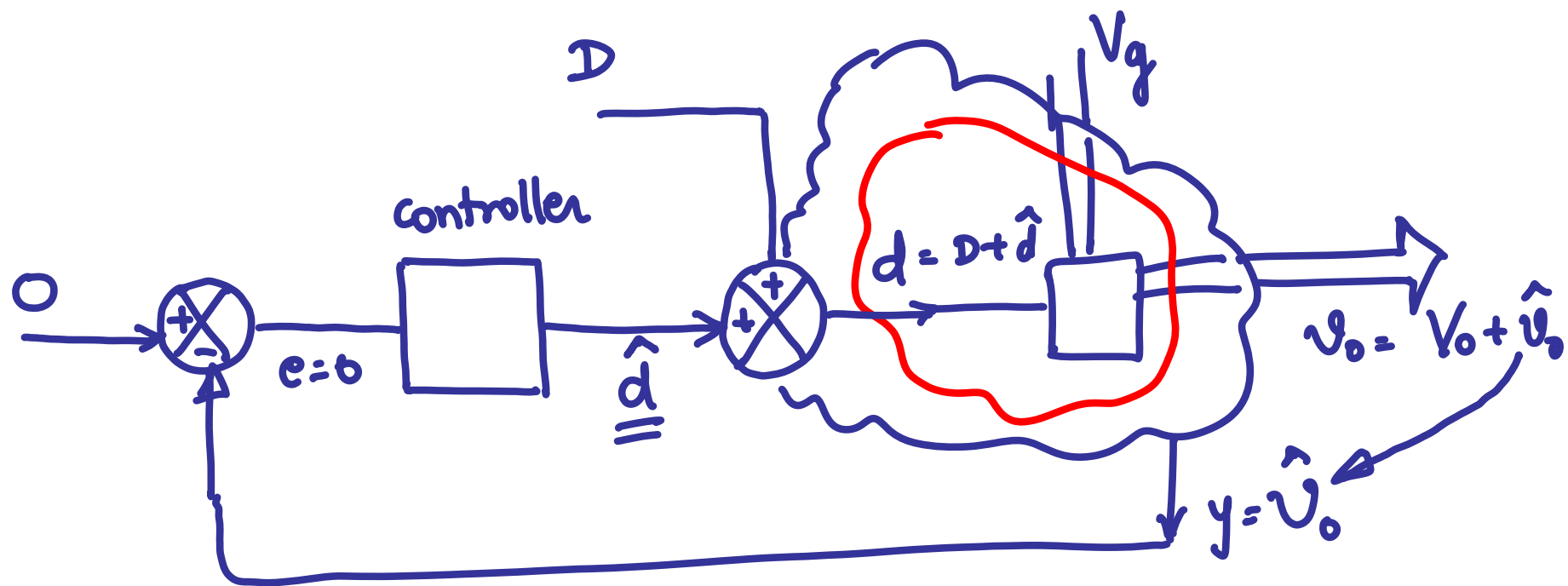
$$y = Y + k(u - U)$$

$$\underbrace{(y - Y)}_{\hat{y}} = k \underbrace{(u - U)}_{\hat{u}}$$

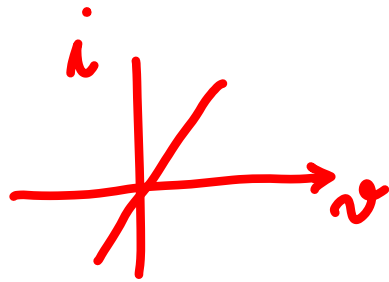
$$\boxed{\hat{y} = k \hat{u}}$$

linearized small signal
MODEL of
 $y = f(u)$

$$u \Rightarrow \underbrace{D} + \underbrace{\hat{d}}$$

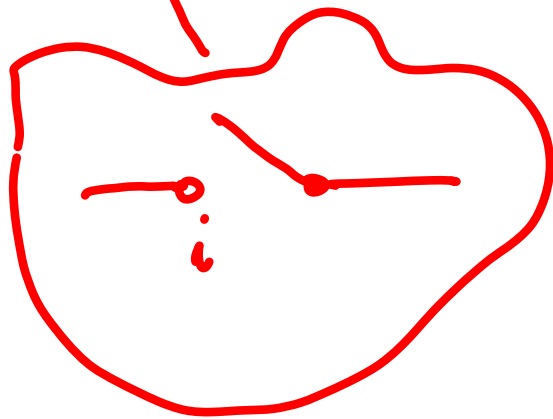


3 basic components



R

dissipative



L

kinetic
energy
storage

(current based
energy storage)

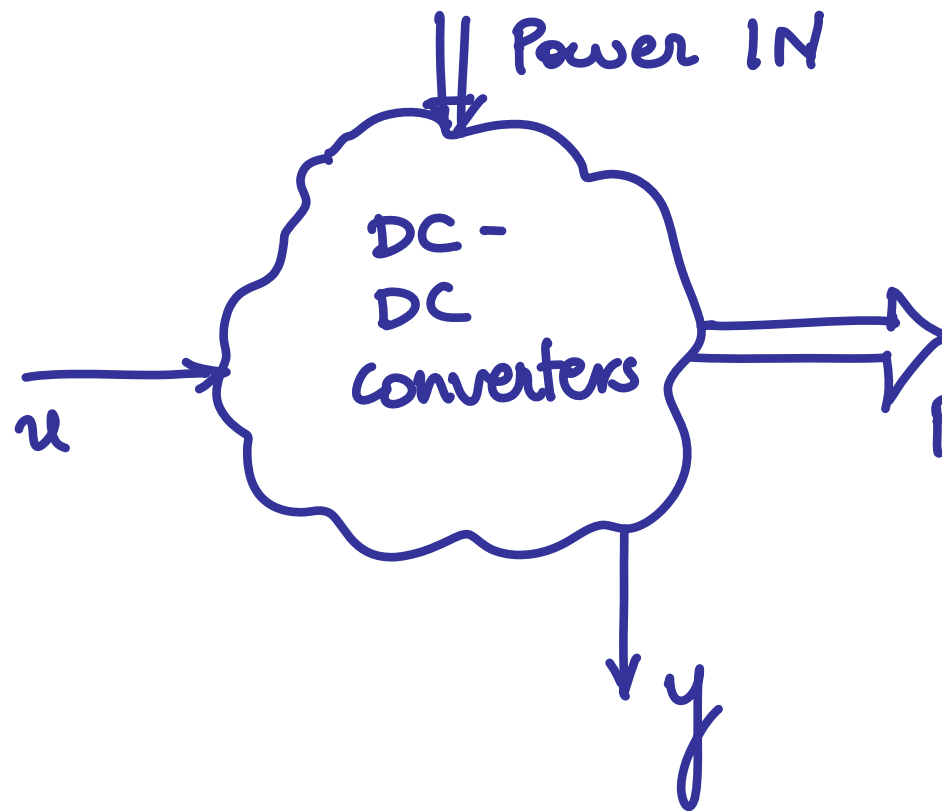
$$\frac{1}{2} Li^2$$

C

Potential
energy
storage
(voltage
based
energy
storage)

$$\frac{1}{2} C v^2$$

Practice



Buck
Boost
Buck-Boost
Forward
Flyback
Derived Forward