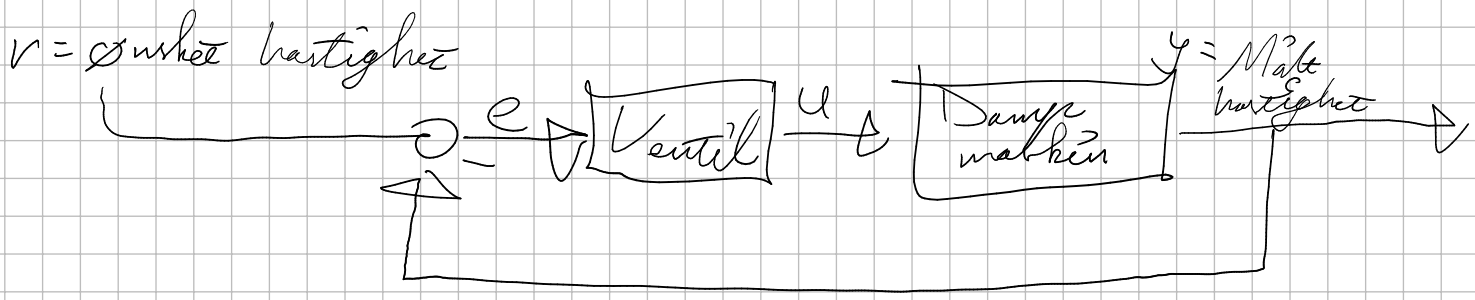
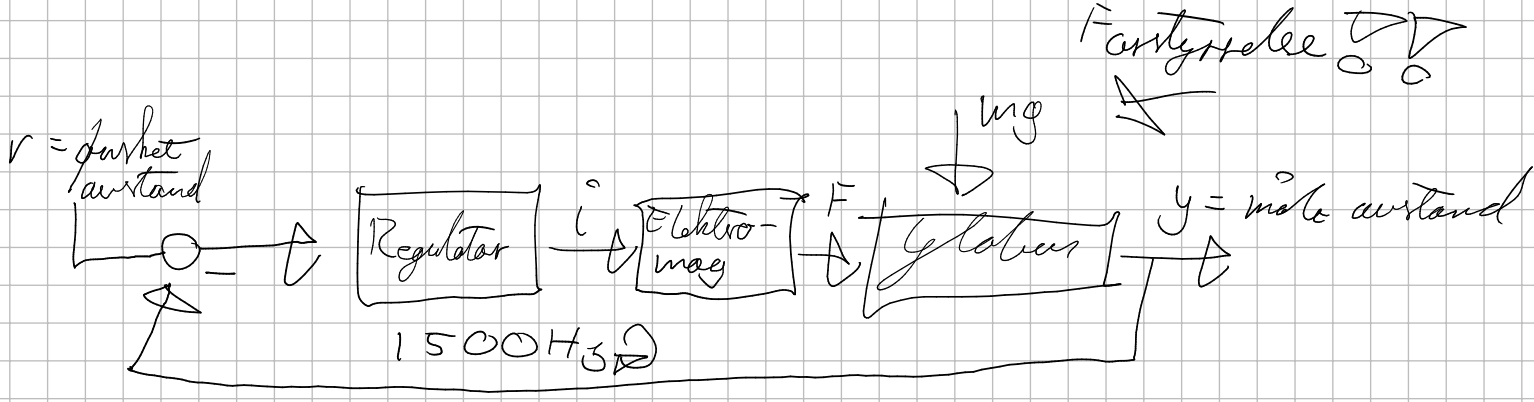
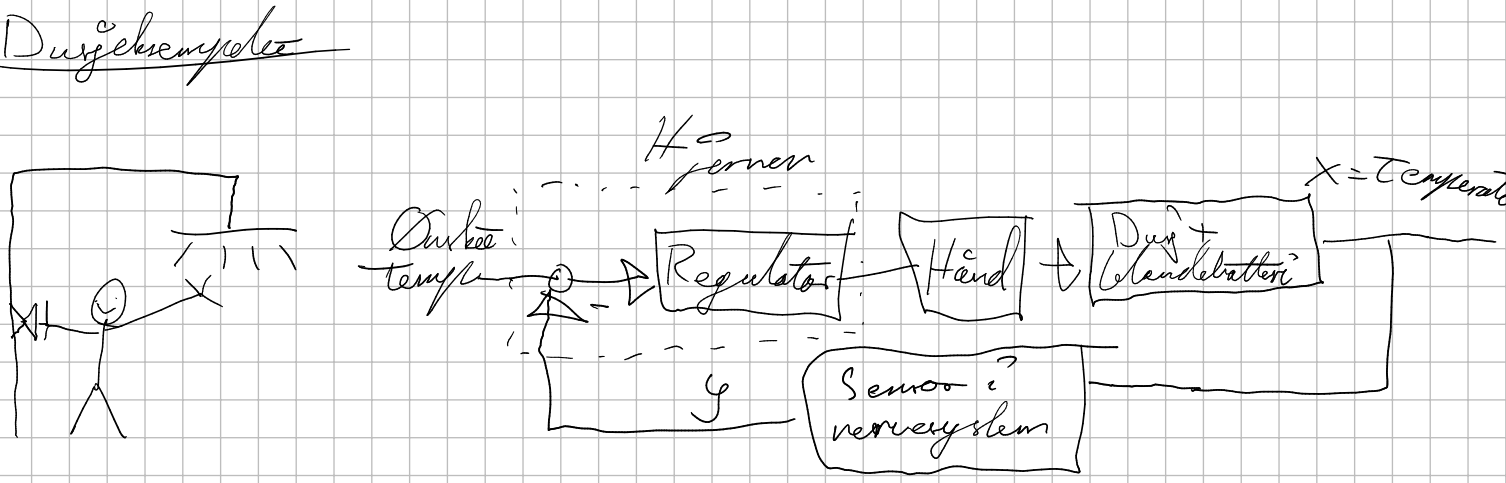
Watts hastighetsregulator

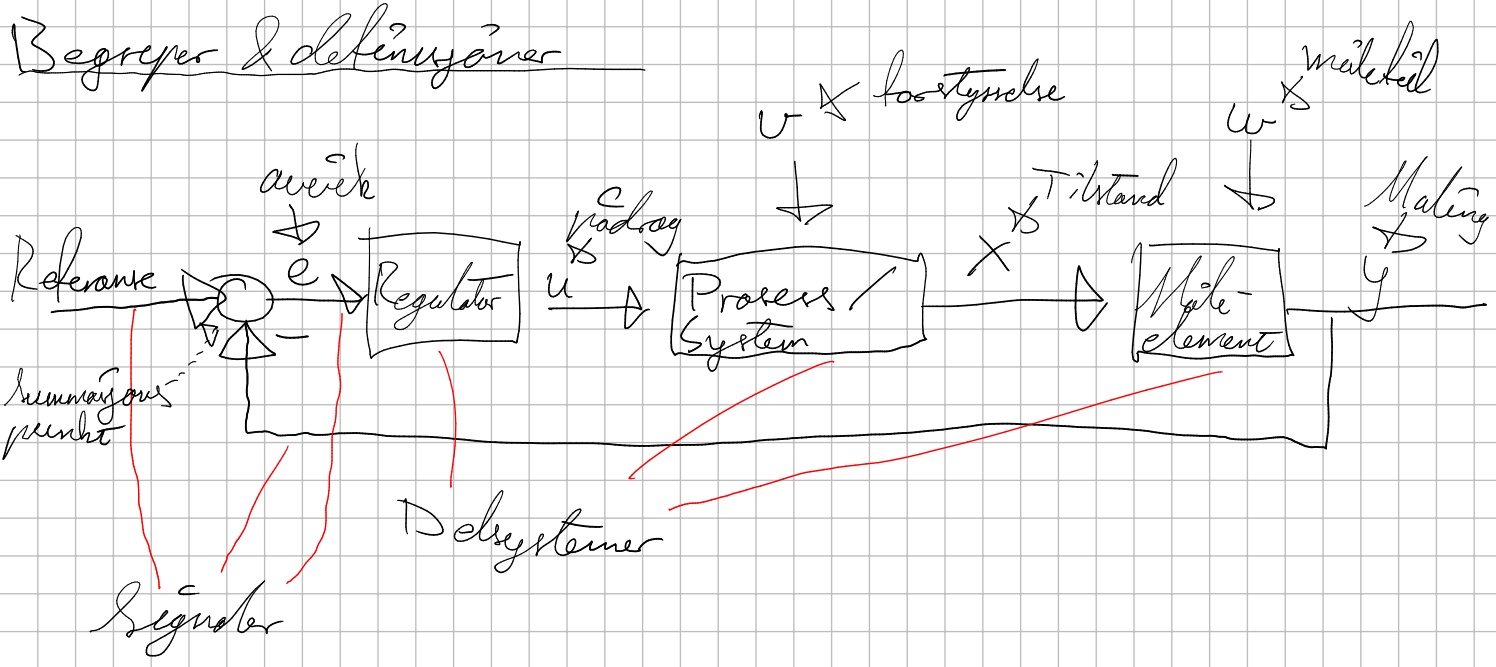




Duschreglage



Begrepp & definitioner



Signaler

avvik: $e(t) = r(t) - y(t)$

pådrag: $u(t)$

tillstånd: $x(t)$

referens: $r(t)$

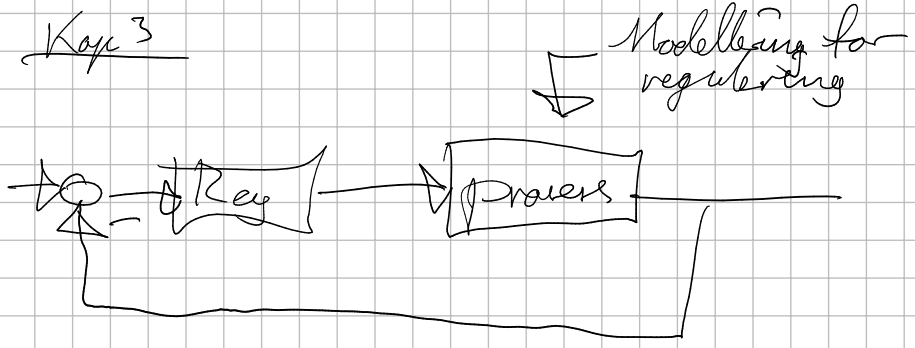
Systemer

Regulator: algoritmer

Process

Mätenheter

Kap 3



Differensialligninger

$\frac{dx}{dt} = f(x,u)$ ← dynamikk

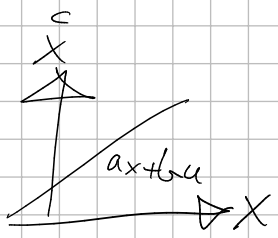
En løsning vil være på formen $x(t)$

$\frac{dx}{dt} = x' = \dot{x}$

$\frac{d^2x}{dt^2} = x'' = \ddot{x}$

Lineære 1. ordens diff likn

$\dot{x} = f(x,u) = ax + bu$ ← konst



Likning på tilstandsromform

X er tilstand

u er pådrag

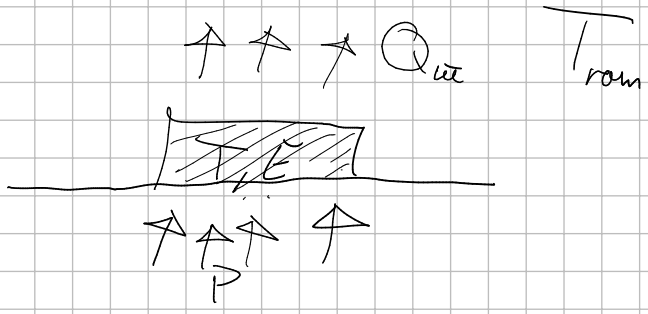
Exempel 3

Matematisk modell av temp i en kokplatta

Energibalans

Ändring av energi per tid = Tillfört effekt - Avgiven effekt

$[J/s] = [W]$



$\dot{E} = P - Q_{ut}$

$E = CT$

C: Värmekapacitet antas konstant

avkylning $= Q_{ut} = k(T - T_{rum})$

k: Värmeövergångstal

$\dot{E} = P - Q_{ut}$

$C\dot{T} = P - k(T - T_{rum})$

$\dot{T} = -\frac{k}{C}T + \frac{1}{C}P + \frac{k}{C}T_{rum}$

$\boxed{\dot{T} = -\frac{k}{C}T + \frac{1}{C}(P + T_{rum})}$

På formen $\dot{x} = ax + b$ (b u)

$x = T$

$a = -\frac{k}{C}$

$b = \frac{1}{C}(P + k\,T_{rum})$

u