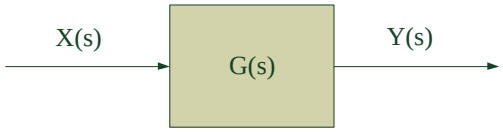
04 - Grafički modeli sistema i tranformacije modela

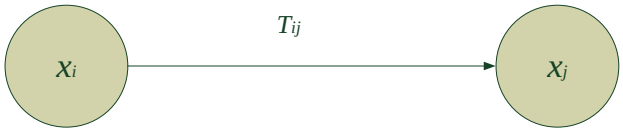
Grafički modeli koristi grafička sredstva i simbole za prikazivanje istraživanog sistema.

Najčešće korišćeni grafički modeli su blok dijagrami, grafivi toka signala, bond grafovi i Petri mreže.

Elementarni blok dijagram sadrži samo jedan blok.



Graf toka signla sačinjavaju grafovi medjusobno povezani orjentisanim granama.



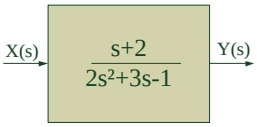
Algebarska j-na ponašanja sistema u kompleksnom domenu ima oblik:

$$(2s^2+3s-1)Y(s)=(s+2)X(s)$$

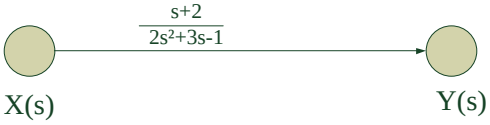
Nacrtati osnovni graf toka signala i elementarni blok dijagram.

$$G(s)=\frac{Y(s)}{X(s)}=\frac{s+2}{2s^2+3s-1}$$

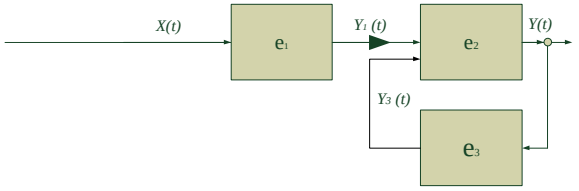
Elementarni blok dijagram:

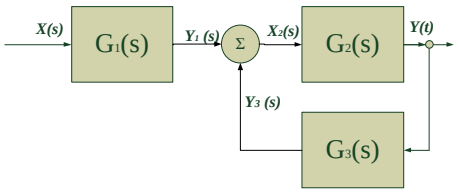


Graf toka signala:

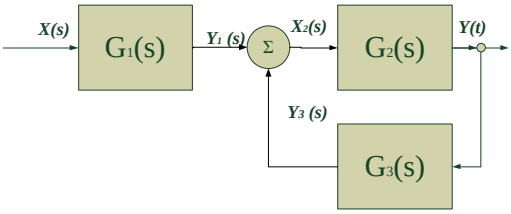


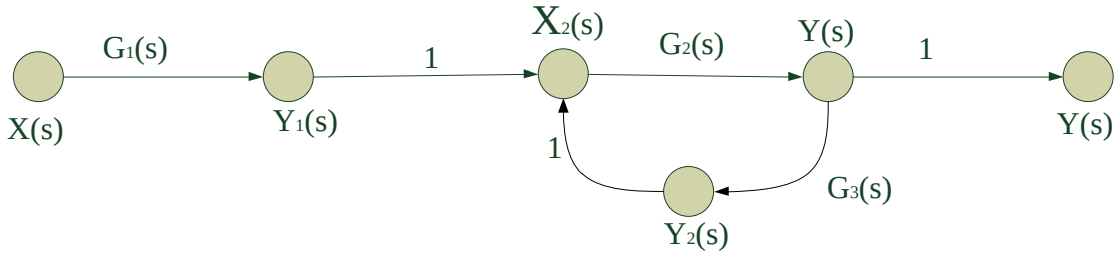
Sistem čija je struktura predstavljena na slici prikazati blok dijagramom.





Sistem čiji je blok dijagram predstavljen na slici prikazati graf toka signala





Posebni vid blok-dijagrama predstavljaju strukturni/ simulacioni dijagrami. Oni sadrže samo dva tipa blokova:

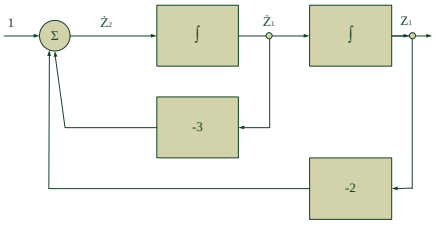
-integratore $G_1 = \frac{1}{s}$

-pojačavače $G_2 = k$

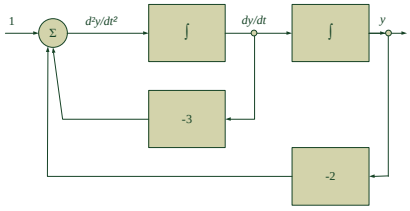
Konstruišu se na osnovu jednačina prostora stanja.

$\dot{z}_1 = z_2$

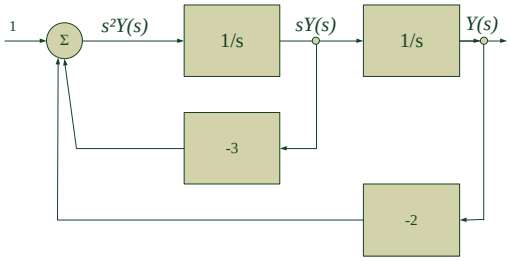
$\dot{z}_2 = 1 - 2z_1 - 3z_2$



$$\frac{d^2y}{dt^2} = 1 - 2y - 3\frac{dy}{dt}$$



$$s^2Y(s) = 1 - 2Y(s) - 3sY(s)$$



Diferencijalnu j-nu ponašanja sistema

$$\frac{d^5y}{dt^5} - \frac{d^3y}{dt^3} + \frac{1}{2}\frac{d^2y}{dt^2} + 2y = x$$

Transformisati u:

a) J-nu prostora stanja
b) Prenosnu funkciju
c) Simulacioni dijagram

$$\frac{d^5y}{dt^5} = x + \frac{d^3y}{dt^3} - \frac{1}{2}\frac{d^2y}{dt^2} - 2y$$

a) j-na prostora stanja

$$z_1 = y \qquad \dot{z}_1 = z_1$$
$$z_2 = \frac{dy}{dt} \qquad \dot{z}_2 = z_2$$
$$z_3 = \frac{d^2y}{dt^2} \qquad \dot{z}_3 = z_3$$
$$z_4 = \frac{d^3y}{dt^3} \qquad \dot{z}_4 = z_5$$
$$z_5 = \frac{d^4y}{dt^4} \qquad \dot{z}_5 = x + z_4 - \frac{1}{2}z_3 - 2z_1$$

b) prenosna funkcija

$$S^5Y(s) - S^3Y(s) + \frac{1}{2}S^2Y(s) + 2Y(s) = X(s)$$
$$Y(s)(S^5 - S^3 + \frac{1}{2}S^2 + 2) = X(s)$$
$$G(s) = \frac{Y(s)}{X(s)} = \frac{1}{S^5 - S^3 + \frac{1}{2}S^2 + 2}$$

c) simulacioni dijagram

$$\dddot{y} - \ddot{y} + \frac{1}{2}\dot{y} + 2y = x$$