

Seven Segments Law of Motion

short notes and application examples

It is possible to assign initial and final values for position, velocity and acceleration.

It is also possible to adjust the law shape by assigning the duration of the seven periods (seven segments).

```
xi=3; xf=5; dx=xf-xi; % initial and final positions
v0=0; vf=0; % initial and final velocity
a0=0; af=0; % initial and final acceleration

k1=1; k2=2; k3=3; % relative length of the 7 segments
k4=3;
k5=1; k6=3; k7=1;

T=5; % total time
tt=0:0.01:5; % array for time samples
nn=max(size(tt)); % n. of samples

L1=k1*T/(k1+k2+k3+k4+k5+k6+k7); % time duration of each segment
L2=k2*T/(k1+k2+k3+k4+k5+k6+k7);
L3=k3*T/(k1+k2+k3+k4+k5+k6+k7);
L4=k4*T/(k1+k2+k3+k4+k5+k6+k7);
L5=k5*T/(k1+k2+k3+k4+k5+k6+k7);
L6=k6*T/(k1+k2+k3+k4+k5+k6+k7);
L7=k7*T/(k1+k2+k3+k4+k5+k6+k7);

% preliminary initialization s
[sc,vc,A,D]=settetratti_generica(T,xi,dx,v0,vf,a0,af,L1,L2,L3,L4,L5,L6,L7);

% law calculation
for i=1:nn
    t=tt(i);

    [xx7(i),vv7(i),aa7(i)]=settetratti_generica(t,T,xi,dx,v0,vf,a0,af,L1,L2,L3,L4,L5,L6,L7,sc,vc,A,D);
end

% plot results
figure
subplot(3,1,1)
plot(tt,xx7)
ylabel('position')
xlabel('time')
subplot(3,1,2)
plot(tt,vv7,[tt(1) tt(end)], [0 0])
ylabel('velocity')
xlabel('time')
subplot(3,1,3)
plot(tt,aa7,[tt(1) tt(end)], [0 0])
ylabel('acceleration')
xlabel('time')
```

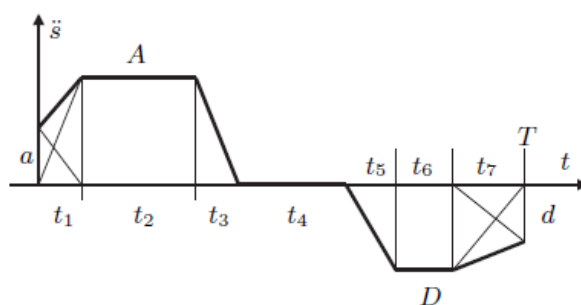
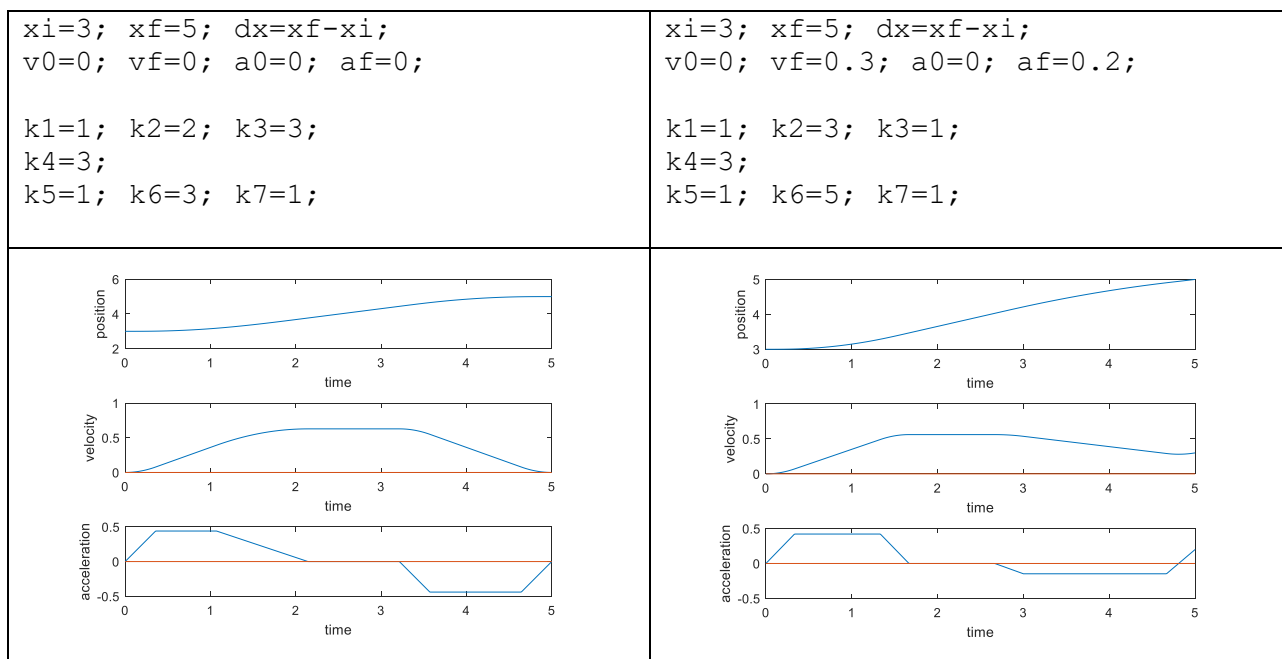


Figura 9.47 Legge di moto a 7 tratti con accelerazione lineare a tratti ($T = \sum_{j=1}^7 t_j$).

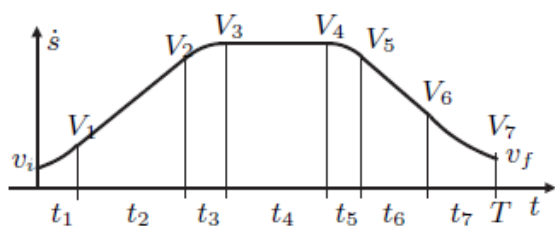


Figura 9.48 Legge di moto a 7 tratti: andamento qualitativo della velocità ($v_i = v_0, v_f = V_7, T = \sum_{j=1}^7 t_j$).

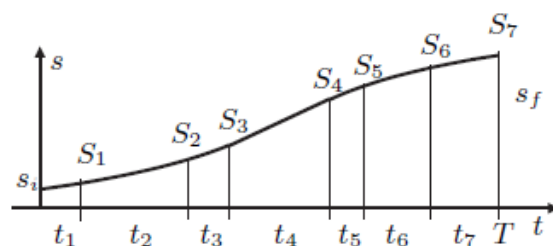


Figura 9.49 Legge di moto a 7 tratti: andamento qualitativo della posizione ($s_i = s_0, s_f = S_7, T = \sum_{j=1}^7 t_j$).