TRAJECTORYGENERATION

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Discretisa o uma tragetória a partir de pontos do caminho e o tempo de cada intervalo e o intervalor da discretização, retornando a tragetória suavizada pelo polinômio de quarto grau e discretizado conforme os parâmetros.

Calling Syntax

thpathi=trajectorygeneration(traj_points, T, Ts);

I/O Variables

`IN 1 Double Matrix` **traj_points**: vector of angles of the initial, intermediate and final positions of the actuator 1xN N = number of points

`IN 2 Double` **T**: Time of each segment

`IN 3 Double` **Ts**: Discretization resolution time for each segment

`OUT 1 Double Array` **thpathi**: Matrix containing position velocity and acceleration as columns and each instant discretized as rows

Example

```
traj_points = [0 22 16 0];
T = 3;
Ts = 0.2;

[thpathi]=trajectorygeneration(traj_points, T, Ts);
```

Hypothesis

```
traj_points tenha pelomenos 2 pontos para se formar um intervalo
Ts deve ser algumas vezes menor que T para que ocorra uma discretização
```

Limitations

```
T deve ser divisível por Ts
```

Function

```
function [thpathi]=trajectorygeneration(traj_points, T, Ts)

cctot = trajectoryplanning(traj_points,T);
thpathi = zeros([(T/Ts)*length(cctot(:,1)),3]);
pps = T/Ts;

for a=1:length(cctot(:,1))
    for b=1:pps
        td = (b-1)*Ts;
        thpathi((a-1)*pps+b,1) = cctot(a,1) + cctot(a,2)*td + cctot(a,3)*td^2
 + cctot(a,4)*td^3;
        thpathi((a-1)*pps+b,2) = cctot(a,2) + 2*cctot(a,3)*td +
 3*cctot(a,4)*td^2;
        thpathi((a-1)*pps+b,3) = 2*cctot(a,3) + 6*cctot(a,4)*td;
    end
end
end
```

thpathi =

0	0	14.6667
0.2803	2.7378	12.7111
1.0690	5.0844	10.7556
2.2880	7.0400	8.8000
3.8590	8.6044	6.8444
5.7037	9.7778	4.8889
7.7440	10.5600	2.9333
9.9016	10.9511	0.9778
12.0984	10.9511	-0.9778
14.2560	10.5600	-2.9333
16.2963	9.7778	-4.8889
18.1410	8.6044	-6.8444
19.7120	7.0400	-8.8000
20.9310	5.0844	-10.7556
21.7197	2.7378	-12.7111
22.0000	0	-1.5556
21.9692	-0.3067	-1.5111
21.8779	-0.6044	-1.4667
21.7280	-0.8933	-1.4222
21.5212	-1.1733	-1.3778
21.2593	-1.4444	-1.3333
20.9440	-1.7067	-1.2889
20.5772	-1.9600	-1.2444
20.1606	-2.2044	-1.2000
19.6960	-2.4400	-1.1556
19.1852	-2.6667	-1.1111
18.6299	-2.8844	-1.0667
18.0320	-3.0933	-1.0222
17.3932	-3.2933	-0.9778
16.7153	-3.4844	-0.9333

```
   16.0000   -3.6667   -5.7778
   15.1573   -4.7289   -4.8444
   14.1209   -5.6044   -3.9111
   12.9280   -6.2933   -2.9778
   11.6160   -6.7956   -2.0444
   10.2222   -7.1111   -1.1111
    8.7840   -7.2400   -0.1778
    7.3387   -7.1822    0.7556
    5.9236   -6.9378    1.6889
    4.5760   -6.5067    2.6222
    3.3333   -5.8889    3.5556
    2.2329   -5.0844    4.4889
    1.3120   -4.0933    5.4222
    0.6080   -2.9156    6.3556
    0.1582   -1.5511    7.2889
```

Published with MATLAB® R2022b