

MATLAB example code for Splines' functions
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```
function [ValueX,ValueY,ValueZ] = splines3(X,Y,Z,intervals)
```

```
%Try:
```

```
% intervals = 7;  
% X=[ 0.500; 0.3232; 0.25; 0.3232; 0.500; 0.6768; 0.750;  
0.6768; 0.500];  
% Y=[ -0.7500; -0.3768; 0.1560; 0.6768; 0.3232; -0.25; -  
0.3232; -0.500;-0.7500];  
% Z=[ 0.250; 0.3232; 0.50; 0.6768; 0.750; 0.6768; 0.500;  
0.3232; 0.250];  
%     splines3(X,Y,Z, intervals);
```

```
m = max(size(X));
```

```
[Sx,Sy] = slopes(X,Y)  
[Sx,Sz] = slopes(X,Z)
```

```
% slope = a/b = tan(alpha)  
% alpha = arctan(slope)  
% Vx = V * sin(alpha)  
% they are almost the same !!  
%     alphax = atan(Sx);  
%     Vx = V * sin(alphax);  
%     alphay = atan(Sy);  
%     Vy = V * sin(alphay);
```

```
%Vx = Sx;  
%Vy = Sy;
```

```
ValueX = X(1);
```

```
for i=1:m-1,  
    Uo = X(i);  
    U1 = X(i+1);  
    So = Sx(i);  
    S1 = Sx(i+1);  
  
    for t=1/intervals:1/intervals:1,  
        v = Value(Uo,U1,So,S1,t);  
        ValueX = [ValueX v];  
    end  
end
```

```
ValueY = Y(1);
```

```
for i=1:m-1,  
    Uo = Y(i);  
    U1 = Y(i+1);  
    So = Sy(i);
```

```

        S1 = Sy(i+1);

        for t=1/intervals:1/intervals:1,
            v = Value(Uo,U1,So,S1,t);
            ValueY = [ValueY v];
        end
    end

ValueZ = Z(1);

for i=1:m-1,
    Uo = Z(i);
    U1 = Z(i+1);
    So = Sz(i);
    S1 = Sz(i+1);

    for t=1/intervals:1/intervals:1,
        v = Value(Uo,U1,So,S1,t);
        ValueZ = [ValueZ v];
    end
end

plot3(ValueX,ValueY,ValueZ, '.',ValueX,ValueY,ValueZ, '-'),
hold on
plot3(X,Y,Z, 'or');
grid on

%%%%%%%%%%%%%%

```

```
function [Sx,Sy] = slopes(X,Y)

m = max(size(X));

for i=2:m-1,
    Ux(i)=X(i+1)-X(i-1);
end
Ux(1)=X(2)-X(1);
Ux(m)=X(m)-X(m-1);

Ux = 3 * Ux';

for i=2:m-1,
    Uy(i)=Y(i+1)-Y(i-1);
end
Uy(1)=Y(2)-Y(1);
Uy(m)=Y(m)-Y(m-1);

Uy = 3 * Uy';

M = matrix(m);

invM= inv(M);

Sx = invM * Ux;

Sy = invM * Uy;
```

```
function [Value] = Value(Uo,U1,So,S1,t)
```

```
Value = Uo * (t-1)^2 * (2*t+1) + So * (t-1)^2 * t;
```

```
Value = Value + U1 * t^2 * (3-2*t) - S1 * t^2 * (1-t);
```