

The Answer for the $Q_1(t)$:

[t u v]= [0.45465943 0.4279049 0.44592201]

The point on the polynomial surface is (2.1395245, 2.22961, 1.6185411)

The point on the query curve is (2.2732972, 2.2732972, 3.966899)

Distance=2.3526

The Answer for the $Q_2(t)$

[t u v]=[0.18397847 0.3617049 0.19776396]

The point on the polynomial surface is (1.8085245, 0.98881978, 1.5691985)

The point on the query curve is (0.91989237, 0.91989237, 4.2690505)

Distance=2.8432

The following is some discussion.

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M-file for $Q_1(t)$

%t,u,v are variables

syms u v t

syms h real

digits(8)

%h is step size

%u,v is from 0 to 1

x=5*u;

y=5*v;

z=(-0.38)+25/3*u+4/3*v-25/3*u*u-10/3*u*v;

%Q1t, t is from 0 to 1

qx=5*t;

qy=5*t;

qz=25/6*t*t-25/6*t+5;

distancesquare=(x-qx)^2+(y-qy)^2+(z-qz)^2;

%diff(distance,'t'),diff(distance,'u'),diff(distance,'v');

Ft=diff(distancesquare,'t');

Fu=diff(distancesquare,'u');

Fv=diff(distancesquare,'v');

%t0,u0,v0 are initial point;

t0=0.5;

u0=0.5;

v0=0.5;

for i=1:100

%deltat,deltau,deltav are numbers of partial derivation

deltat=eval(subs(Ft,[t,u,v],[t0,u0,v0]));

deltau=eval(subs(Fu,[t,u,v],[t0,u0,v0]));

deltav=eval(subs(Fv,[t,u,v],[t0,u0,v0]));

%t1,u1,v1 are variables

t1=t0+deltat*h;

.....

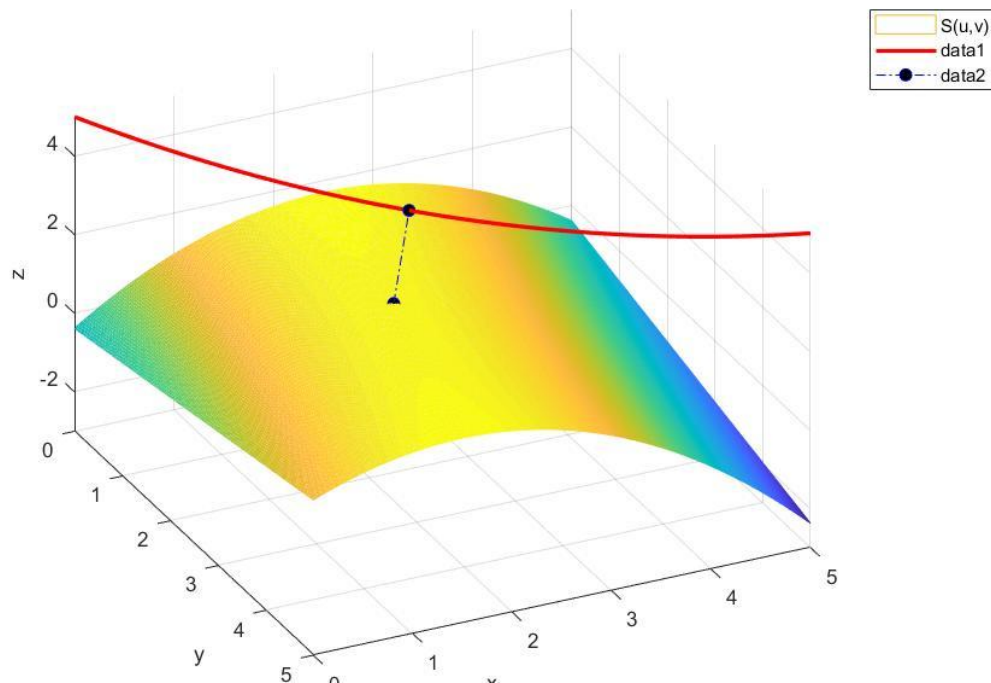
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u1=u0+deltau*h;
v1=v0+deltav*h;
newdistancesquare=subs(distancesquare,[t,u,v],[t1,u1,v1]);
%new t0,u0,v0
g=diff(newdistancesquare,'h');
h0=vpa(solve(g,h));
[r,c]=size(h0);
if r~= 1

h0=h0.*((t0+deltat*h0>=0).*(t0+deltat*h0<=1).*(u0+deltau*h0>=0).*(u0+deltau*h0<=1).*(v
0+deltav*h0>=0).*(v0+deltav*h0<=1));
    h0(find(h0==0))=[];
end
t0=t0+deltat*h0;
u0=u0+deltau*h0;
v0=v0+deltav*h0;
end
point_tuv=[t0,u0,v0]
distance=sqrt(eval(subs(distancesquare,[t,u,v],[t0,u0,v0])))
x=5*u0
y=5*v0
z=(-0.38)+25/3*u0+4/3*v0-25/3*u0*u0-10/3*u0*v0
qx=5*t0
qy=5*t0
qz=25/6*t0*t0-25/6*t0+5
.....

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Figure1



M-file for $Q_2(t)$

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%t,u,v h are variables
syms u v t
syms h real
digits(8)
%h is step size
%u,v is from 0 to 1
x=5*u;
y=5*v;
z=(-0.38)+25/3*u+4/3*v-25/3*u*u-10/3*u*v;
%Q1t, t is from 0 to 1
qx=5*t;
qy=5*t;
qz=53.976*t^4-104.64*t^3+64.256*t^2-12.589*t+5;
distancesquare=(x-qx)^2+(y-qy)^2+(z-qz)^2;
%partial derivative,expression;
Ft=diff(distancesquare,'t');
Fu=diff(distancesquare,'u');
Fv=diff(distancesquare,'v');
%t0,u0,v0 are initial point , numbers;
t0=0.5;
u0=0.5;
v0=0.5;
```

```

for i=1:100
%deltat,deltau,deltav are numbers of partial derivation
deltat=eval(subs(Ft,[t,u,v],[t0,u0,v0]));
deltau=eval(subs(Fu,[t,u,v],[t0,u0,v0]));
deltav=eval(subs(Fv,[t,u,v],[t0,u0,v0]));
%t1,u1,v1 are variables
t1=t0+deltat*h;
u1=u0+deltau*h;
v1=v0+deltav*h;
newdistancesquare=subs(distancesquare,[t,u,v],[t1,u1,v1]);
%new t0,u0,v0
g=diff(newdistancesquare,'h');
h0=vpa(solve(g==0,h));
A = h0 == real(h0);
h0=h0(A);
[r,c]=size(h0);
if r~= 1

h0=h0.*((t0+deltat*h0>=0).*(t0+deltat*h0<=1).*(u0+deltau*h0>=0).*(u0+deltau*h0<=1).*(v
0+deltav*h0>=0).*(v0+deltav*h0<=1));
    h0(find(h0==0))=[];
    end
%h0 多解, 考虑 t0,u0, v0 大小约束
t0=t0+deltat*h0;
u0=u0+deltau*h0;
v0=v0+deltav*h0;
end
point_tuv=[t0,u0,v0]
distance=sqrt(eval(subs(distancesquare,[t,u,v],[t0,u0,v0])))
x=5*u0
y=5*v0
z=(-0.38)+25/3*u0+4/3*v0-25/3*u0*u0-10/3*u0*v0
qx=5*t0
qy=5*t0
qz=53.976*t0^4-104.64*t0^3+64.256*t0^2-12.589*t0+5
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

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Figure 2

