```
load("Data\CFD_confined_TSR_1_1.mat")
X = flow_data(1).X;
Y = flow_data(1).Y;
theta = zeros(length(flow_data),1);
for i = 1:length(flow_data)
    theta(i) = flow_data(i).theta;
end
%thetab = flip(theta);
thetab = 365 - theta;
syms t;
Ry2 = [cosd(t) sind(t); -sind(t) cosd(t)];
thet = [0:pi/32:2*pi,0]';
```

```
k = 32
```

```
k = 32
```

```
alpha = theta(k);
U = flow_data(k).u;
V = flow_data(k).v;
sz = length(X);
Xrot3 = zeros(sz);
Yrot3 = zeros(sz);
for j = 1:sz
    T3 = [X(:,1)';Y(:,j)'];
    XYRy2 = Ry2*T3;
    res = subs(XYRy2,t,alpha);
    Xrot3(:,j) = res(1,:);
    Yrot3(:,j) = res(2,:);
end
foiltest = plot_foil(theta(k),1);
XYRy2 = Ry2*foiltest';
res = subs(XYRy2,t,alpha);
foiltest(:,:) = res';
%qc = 2.118*[sind(theta(k));cosd(theta(k))];
qc = 2.042*[sind(theta(k));cosd(theta(k))];
qc = Ry2*qc;
qc = subs(qc,t,-alpha);
qc = double(qc);
[Cin,Ca] = Circle2(qc,1,Xrot3,Yrot3);
qc(1) = qc(1)-1
```

```
qc = 2×1
   -1.0000
    2.0420
```

```
[Rin,Ra] = Rect2(qc,0.25,2,Xrot3,Yrot3);
foiltest2 = plot_foil(theta(k),1.5);
XYRy2 = Ry2*foiltest2';
res = subs(XYRy2,t,alpha);
foiltest2(:,:) = res';
```

```
Bin = inpolygon(Xrot3,Yrot3,foiltest2(:,1),foiltest2(:,2))
```

```
Bin = 100×100 logical array
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
```

```
u3 = zeros(sz);
v3 = zeros(sz);
for i = 1:sz
    for j = 1:sz
        XYRy2 = Ry2*[U(i,j);V(i,j)];
        res = subs(XYRy2,t,alpha);
        u3(i,j) = res(1);
        v3(i,j) = res(2);
    end
end
```

```
test = [U(1,1);V(1,1)]
```

```
test = 2×1
    0.9983
   -0.0768
```

```
XYRy2 = Ry2*test;
res = subs(XYRy2,t,alpha);
double(res)
```

```
ans = 2×1
   -0.9951
    0.1112
```

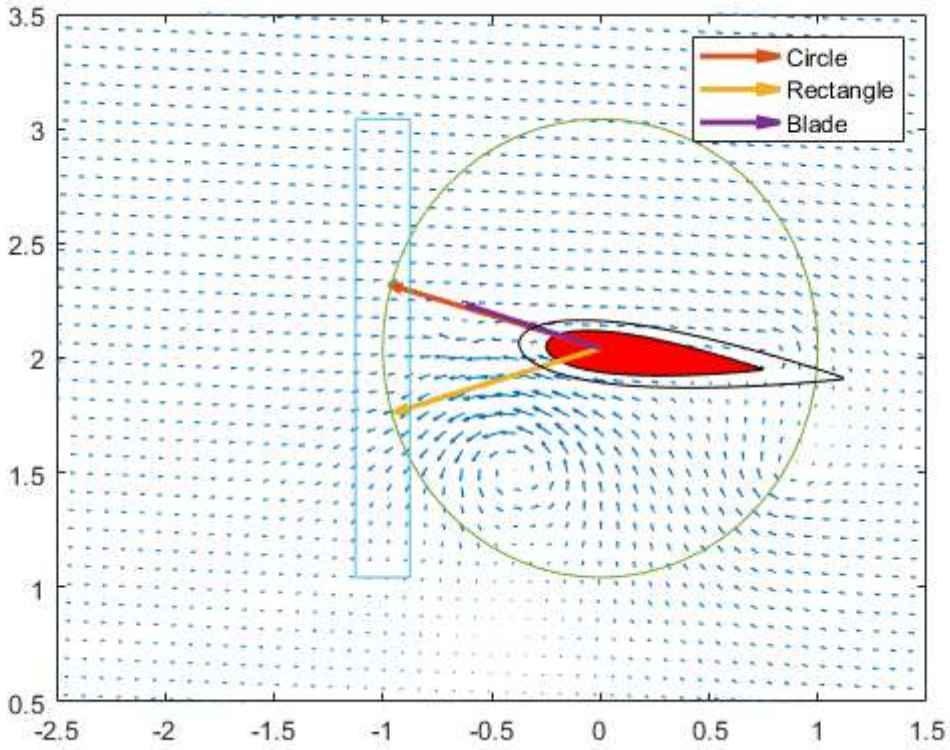
```
double(hypot(res(1),res(2)))
```

```
ans = 1.0013
```

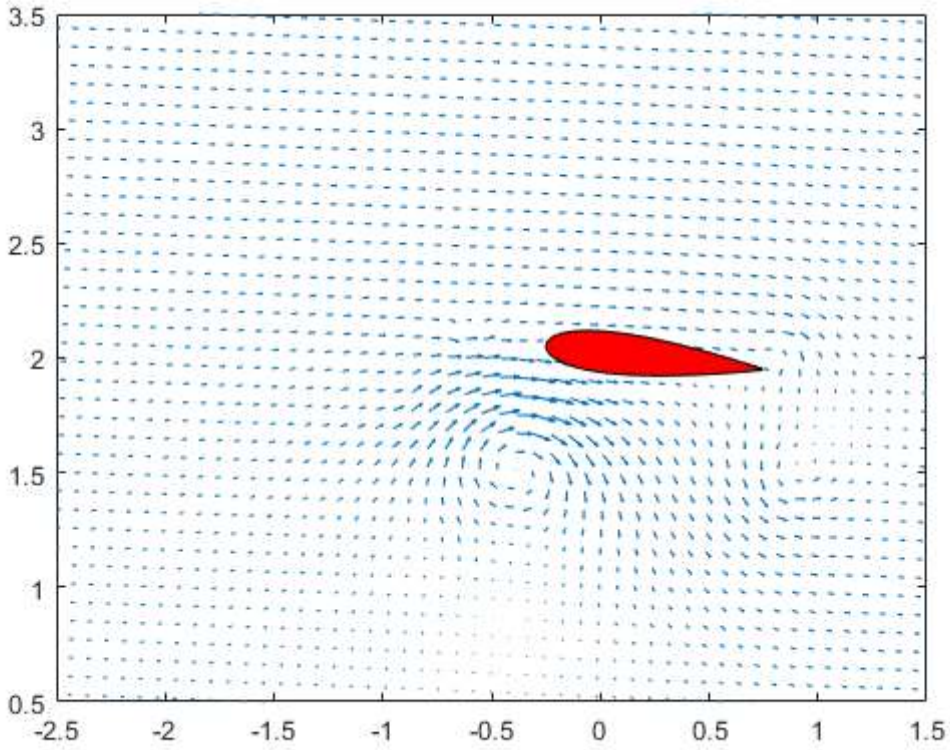
```
Umean(1) = mean(u3(Cin));
Vmean(1) = mean(v3(Cin));
Umean(2) = mean(u3(Rin));
Vmean(2) = mean(v3(Rin));
Umean(3) = mean(u3(Bin));
Vmean(3) = mean(v3(Bin));
```

```
quiver(Xrot3,Yrot3,u3,v3)
xlim([-2.5 1.5])
```

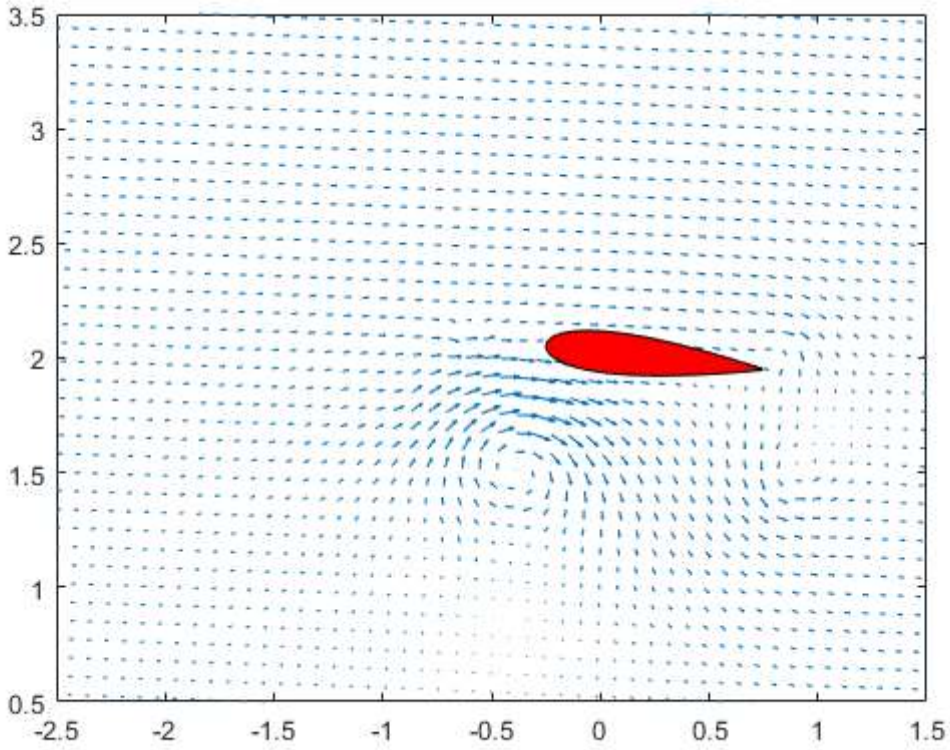
```
ylim([0.5 3.5])
hold on
fill(foiltest(:,1),foiltest(:,2),'r')
for i = 1:length(Umean)
quiver(0,2.042,Umean(i),Vmean(i),'LineWidth',2)
end
plot(Ca(:,1),Ca(:,2))
plot(Ra(:,1),Ra(:,2))
plot(foiltest2(:,1),foiltest2(:,2),'k')
hold off
legend('','','Circle','Rectangle','Blade')
```




```
load('Data\U_11P.mat')
load('Data\V_11P.mat')
quiver(Xrot3,Yrot3,U_phase(k).u,V_phase(k).v)
xlim([-2.5 1.5])
ylim([0.5 3.5])
hold on
fill(foiltest(:,1),foiltest(:,2),'r')
hold off
```




```
quiver(Xrot3,Yrot3,U,V)
xlim([-2.5 1.5])
ylim([0.5 3.5])
hold on
fill(foiltest(:,1),foiltest(:,2),'r')
hold off
```




```
sum(sum((U_phase(k).u-U)))
```

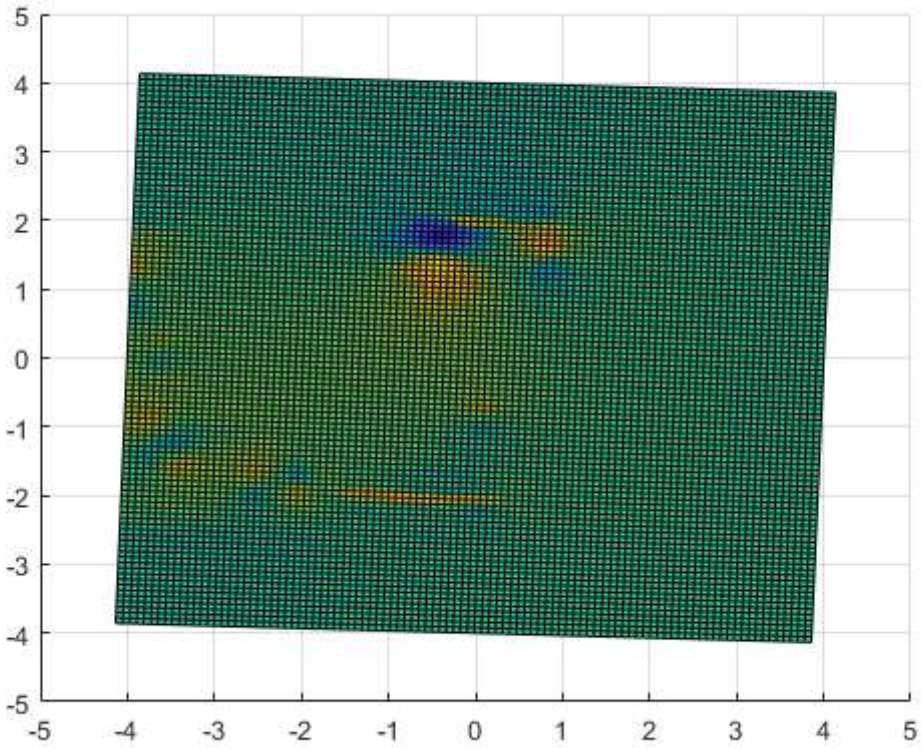
```
ans = 0
```

```
max(max((U_phase(k).u-U)))
```

```
ans = 0
```

```
% quiver(Xrot3,Yrot3,u3,v3)
% xlim([-1 1])
% ylim([1 3])
% hold on
% fill(foiltest(:,1),foiltest(:,2),'r')
% for i = 1%:length(Umean)
% quiver(0,2.042,Umean(i),Vmean(i),'m','LineWidth',2)
% end
% hold off
% legend('','','Circle')%,'Rectangle')
```

```
surf(Xrot3,Yrot3,u3)
view([ 0 90])
```




```
l = hypot(foiltest(:,1),foiltest(:,2))
```

```
l = 201×1
    2.0892
    2.0892
    2.0892
    2.0891
    2.0890
    2.0889
    2.0888
    2.0886
    2.0884
    2.0882
```

```
[M,I] = max(l)
```

```
M = 2.1201
I = 75
```

```
foiltest(75,:)
```

```
ans = 1×2
   -0.0833    2.1185
```

```
[m2,i2] = max(foiltest(:,1))
```

```
m2 = 0.7461
i2 = 1
```

```
[m3,i3] = min(foiltest(:,1))
```

```
m3 = -0.2488
i3 = 102
```

```
hypot(m2-m3,foiltest(i2,2)-foiltest(i3,2))
```

```
ans = 0.9998
```