Linear vorticity Panel Method for Aerofoils.

Influence Coefficents $A_{i,j}$ and B_i

```
DO I=1,NUMPAN
   XC=(X(I)+X(I+1))*0.5                          control point X -coord
   YC=(Y(I)+Y(I+1))*0.5                          control point Y -coord
   DX=X(I+1)-X(I)                                X length of panel I
   DY=Y(I+1)-Y(I)                                Y Length of panel I
   THETI=ARCTAN2(DY,DX)                          angle of Panel I
   SNI=SIN(THETI)
   CSI=COS(THETI)
   DO J=1,NUMPAN
       XT=XC-X(J)                                X  length - control point to J end of panel J
       YT=YC-Y(J)                                Y  length - control point to J end of panel J
       DX=X(J+1)-X(J)                            X length of panel J
       DY=Y(J+1)-Y(J)                            Y length of panel J
       THETA=ARCTAN2(DY,DX)                      angle of panel J
       CS=COS(THETA)
       SN=SIN(THETA)
       CSM=COS(-THETA)
       SNM=SIN(-THETA)
       X1=XT*CS+YT*SN
       Y1=-XT*SN+YT*CS
       X2=DX*CS+DY*SN
       R1=SQRT(ABS(X1*X1+Y1*Y1))
       R2=SQRT(ABS((X1-X2)*(X1-X2)+Y1*Y1))
       TH1=ARCTAN2(Y1,X1)
       TH2=ARCTAN2(Y1,(X1-X2))
       IF (I.EQ.J) THEN                                    effect of panel on itself
             U1L=-0.5*(X1-X2)/X2
             U2L=0.5*X1/X2
             W1L=-0.15916
             W2L=0.15916
       ELSE
             U1L=-(Y1*LOG(R2/R1)+X1*(TH2-TH1)-X2*(TH2-TH1))/(TWOPI*X2)
             U2L=(Y1*LOG(R2/R1)+X1*(TH2-TH1))/(TWOPI*X2)
             W1L=-((X2-Y1*(TH2-TH1))-X1*LOG(R1/R2)+X2*LOG(R1/R2))/(TWOPI*X2)
             W2L=((X2-Y1*(TH2-TH1))-X1*LOG(R1/R2))/(TWOPI*X2)
       ENDIF
       U1=U1L*CSM+W1L*SNM
       U2=U2L*CSM+W2L*SNM
       W1=-U1L*SNM+W1L*CSM
       W2=-U2L*SNM+W2L*CSM
       IF (J.EQ.1) THEN
          AMAT(I,1)=-U1*SNI+W1*CSI                                  A(I,1)
          HOLDA=-U2*SNI+W2*CSI
       ELSEIF (J.EQ.NUMPAN) THEN
          AMAT(I,NUMPAN)=-U1*SNI+W1*CSI+HOLDA                       A(I,N-1)
          AMAT(I,NUMPNT)=-U2*SNI+W2*CSI                             A(I,N)
       ELSE
           AMAT(I,J)=-U1*SNI+W1*CSI+HOLDA                           A(I,J)
           HOLDA=-U2*SNI+W2*CSI
       ENDIF
   ENDDO
   RHS(I)=COS(ALF)*SNI-SIN(ALF)*CSI                                 B(I)
ENDDO
                                                                 SET Kutta condition
DO J=1,NUMPNT
   AMAT(NUMPNT,J)=0.0                                            A(N,.. .) = 0
ENDDO
RHS(NUMPNT) = 0.0                                                  B(N)
AMAT(NUMPNT,1)=1.0
A(N,1)=AMAT(NUMPNT,NUMPNT)=1.0                                     A(N,N)
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