```
function [Sa,Sb,Sc,Fr_angle] = control(isref_alpha,isref_beta,wr,i_meas,tr,Lm,t_sigma,r_sigma,kr,Req,Rm)

% Variables defined in the IM_MPC_parameters.m file
global Ts p lambda_sw v states

persistent x_opt Fr Sa_old Sb_old Sc_old
if isempty(x_opt), x_opt = 1; end
if isempty(Fr), Fr = 0 + 0i*1; end
if isempty(Sa_old), Sa_old = 0; end
if isempty(Sb_old), Sb_old = 0; end
if isempty(Sc_old), Sc_old = 0; end

% Calculation of the stator voltage equivalent space vector from (7)
vsT = v(x_opt)*Req; % Req=Rm/(Rs+Rm)=RsT/Rs

% Calculation of the stator current equivalent space vector from (8)
isT = i_meas/Req-v(x_opt)/Rm;

% Calculation of the rotor flux linkage space vector from (12) and the corresponding angle from (13)
Fr = Fr*(1-Ts/tr+1i*wr*p*Ts)+isT*(Lm*Ts/tr);
Fr_angle = atan2(imag(Fr),real(Fr));

% Initial value of the cost function
g_opt = 1e10;

for i = 1:8
% Calculation of the stator voltage equivalent space vector for the i-th switch combination
vsT_o1 = v(i)*Req;

% Sitching states for the i-th switch combination
Sa1 = states(i,1);
Sb1 = states(i,2);
Sc1 = states(i,3);

% Prediction of the stator current equivalent space vector from (11)
IsTk1 = (1-Ts/t_sigma)*isT+Ts/(t_sigma*r_sigma)*((kr/tr-kr*1i*wr*p)*Fr+vsT_o1);

% Separation of the stator current equivalent space vector into alpha-beta into components
isk1_alpha = real(IsTk1);
```

```
isk1_beta = imag(IsTk1);

% Cost function evaluation

    nsw = (abs(Sa1-Sa_old)+abs(Sb1-Sb_old)+abs(Sc1-Sc_old)); % Number of switching transitions

    % Constraining switching transitions to a maximum of two VSI branches
    if  nsw<3
    hsw=0;
    else
    hsw=10e10;
    end

    % Cost function
    g = (isref_alpha-isk1_alpha)^2+(isref_beta-isk1_beta)^2+hsw+lambda_sw*nsw;

    if (g<g_opt)
    g_opt = g;
    x_opt = i;
    end

end

%************************************
% Optimal switching states
Sa = states(x_opt,1);
Sb = states(x_opt,2);
Sc = states(x_opt,3);

% Storing optimal switching states for the control effort penalization in the next step
Sa_old=Sa;
Sb_old=Sb;
Sc_old=Sc;
```