

Formiranje matrice admitansi čvorova primjenom metode nesingularne transformacije

Matrica admitansi čvorova Y_B se može odrediti direktno sa admitantne zamjenske šeme mreže primjenom relacija:

$$Y_{ij} = \begin{cases} -y_{ij}, & i \neq j \\ \sum_{\substack{j=1, \\ j \neq i}}^n y_{ij}, & i = j \end{cases}$$

gdje je y_{ij} kompleksna admitansa između čvorova i i j .

Učitavanje podataka o sistemu iz Excel fajla

```
System_Name = "9 bus system" ;  
Buses = readtable(strcat(System_Name, ".xlsx"), "Sheet", "Bus data") ;  
disp(Buses)
```

Bus_ID	Bus_Type	V	Theta	P_load	Q_load	P_gen	Q_gen	Q_gen_min	Q_gen_max
1	1	1	0	0	0	0	0	-1	1
2	2	1	0	0	0	1.63	0	-1	1
3	2	1	0	0	0	0.85	0	-1	1
4	3	1	0	0	0	0	0	0	0
5	3	1	0	0.9	0.3	0	0	0	0
6	3	1	0	0	0	0	0	0	0
7	3	1	0	1	0.35	0	0	0	0
8	3	1	0	0	0	0	0	0	0
9	3	1	0	1.25	0.5	0	0	0	0

```
Branches = readtable(strcat(System_Name, ".xlsx"), "Sheet", "Branch data") ;  
disp(Branches)
```

From_Bus	To_Bus	R	X	B
1	4	0	0.0576	0
4	5	0.017	0.092	0.158
5	6	0.039	0.17	0.358
3	6	0	0.0586	0
6	7	0.0119	0.1008	0.209
7	8	0.0085	0.072	0.149
8	2	0	0.0625	0
8	9	0.032	0.161	0.306
9	4	0.01	0.085	0.176

Čuvanje podataka o sistemu u pogodnijem formatu

```
System.Buses = table2array(Buses) ;  
System.Branches = table2array(Branches) ;  
disp(System)
```

```
Buses: [9x10 double]  
Branches: [9x5 double]
```

```
save(strcat(System_Name, ".mat"), "System") ;
```

Učitavanje podataka o sistemu iz .mat fajla

```
load("9 bus system.mat", "System") ;
```

Određivanje broja nezavisnih čvorova i broja grana u mreži

```
Number_of_Buses = size(System.Buses,1) ;  
Number_of_Branches = size(System.Branches,1) ;
```

Inicijalizacija parametara mrežnih elemenata

```
From_Bus = System.Branches(:,1) ;  
To_Bus = System.Branches(:,2) ;  
R = System.Branches(:,3) ;  
X = System.Branches(:,4) ;  
B = System.Branches(:,5) ;
```

Inicijalizacija matrice admitansi čvorova

```
Yb = zeros(Number_of_Buses) ;
```

Određivanje elemenata matrice admitansi čvorova

```
for i = 1 : Number_of_Branches  
    % Vandijagonalni elementi  
    Yb(From_Bus(i),To_Bus(i)) = Yb(From_Bus(i),To_Bus(i)) - 1/(R(i)+sqrt(-1)*X(i)) ;  
    Yb(To_Bus(i),From_Bus(i)) = Yb(To_Bus(i),From_Bus(i)) - 1/(R(i)+sqrt(-1)*X(i)) ;  
    % Dijagonalni elementi  
    Yb(From_Bus(i),From_Bus(i)) = Yb(From_Bus(i),From_Bus(i)) + ...  
        1/(R(i)+sqrt(-1)*X(i)) + sqrt(-1)*B(i)/2 ;  
    Yb(To_Bus(i),To_Bus(i)) = Yb(To_Bus(i),To_Bus(i)) + ...  
        1/(R(i)+sqrt(-1)*X(i)) + sqrt(-1)*B(i)/2 ;  
end
```

Prikazivanje matrice Yb

```
disp(Yb)
```

Columns 1 through 3

```
0.0000 -17.3611i    0.0000 + 0.0000i    0.0000 + 0.0000i  
0.0000 + 0.0000i    0.0000 -16.0000i    0.0000 + 0.0000i  
0.0000 + 0.0000i    0.0000 + 0.0000i    0.0000 -17.0648i  
0.0000 +17.3611i    0.0000 + 0.0000i    0.0000 + 0.0000i  
0.0000 + 0.0000i    0.0000 + 0.0000i    0.0000 + 0.0000i  
0.0000 + 0.0000i    0.0000 + 0.0000i    0.0000 +17.0648i
```

0.0000 + 0.0000i	0.0000 + 0.0000i	0.0000 + 0.0000i
0.0000 + 0.0000i	0.0000 +16.0000i	0.0000 + 0.0000i
0.0000 + 0.0000i	0.0000 + 0.0000i	0.0000 + 0.0000i

Columns 4 through 6

0.0000 +17.3611i	0.0000 + 0.0000i	0.0000 + 0.0000i
0.0000 + 0.0000i	0.0000 + 0.0000i	0.0000 + 0.0000i
0.0000 + 0.0000i	0.0000 + 0.0000i	0.0000 +17.0648i
3.3074 -39.3089i	-1.9422 +10.5107i	0.0000 + 0.0000i
-1.9422 +10.5107i	3.2242 -15.8409i	-1.2820 + 5.5882i
0.0000 + 0.0000i	-1.2820 + 5.5882i	2.4371 -32.1539i
0.0000 + 0.0000i	0.0000 + 0.0000i	-1.1551 + 9.7843i
0.0000 + 0.0000i	0.0000 + 0.0000i	0.0000 + 0.0000i
-1.3652 +11.6041i	0.0000 + 0.0000i	0.0000 + 0.0000i

Columns 7 through 9

0.0000 + 0.0000i	0.0000 + 0.0000i	0.0000 + 0.0000i
0.0000 + 0.0000i	0.0000 +16.0000i	0.0000 + 0.0000i
0.0000 + 0.0000i	0.0000 + 0.0000i	0.0000 + 0.0000i
0.0000 + 0.0000i	0.0000 + 0.0000i	-1.3652 +11.6041i
0.0000 + 0.0000i	0.0000 + 0.0000i	0.0000 + 0.0000i
-1.1551 + 9.7843i	0.0000 + 0.0000i	0.0000 + 0.0000i
2.7722 -23.3032i	-1.6171 +13.6980i	0.0000 + 0.0000i
-1.6171 +13.6980i	2.8047 -35.4456i	-1.1876 + 5.9751i
0.0000 + 0.0000i	-1.1876 + 5.9751i	2.5528 -17.3382i