

Identify iron loss

The iron loss model described in "iron_loss.m" is identified by this script.

$$V = |f I_a|$$

$$Q_{iron} = c_h V + c_J V^2 + c_{ex} V^{1.5}$$

import data

execute simlink model before.

actual frequency (Hz)

```
f = simOut.logout.getElement("f").Values.Data;
```

actual current (A)

```
Id = simOut.logout.getElement("Idq").Values.Data(:,1);  
Iq = simOut.logout.getElement("Idq").Values.Data(:,2);  
Ia = sqrt(Id.^2+Iq.^2);
```

actual loss (W)

```
Qiron = simOut.logout.getElement("Qiron_base").Values.Data;
```

identification

```
model = fitttype( ...  
    @(ch,cJ,cex,f,Ia) iron_loss(abs(f),abs(Ia),ch,cJ,cex), ...  
    "independent",{ 'f', 'Ia' });  
  
sf = fit([Ia,f],Qiron, ...  
    model, ...  
    "Start",[0,0,0]);  
  
ch = sf.ch;  
cJ = sf.cJ;  
cex = sf.cex;  
  
format shorte  
disp([ch,cJ,cex]);
```

```
2.1950e-02    1.3968e-06    -2.3721e-04
```

verify the identified model

create mesh from identified model

```
[f_model,Ia_model] = meshgrid( ...  
    linspace(min(f),max(f),21), ...  
    linspace(min(Ia),max(Ia),21));  
  
Qiron_model = iron_loss(f_model,Ia_model,ch,cJ,cex);
```

plotting

speed current, and loss

```
figure("Name","frequency - current - loss");  
scatter3(abs(f),abs(Ia),Qiron); hold on;  
mesh(f_model,Ia_model,Qiron_model,"FaceAlpha",0);  
xlabel("frequency $f$ (Hz)","Interpreter","latex");  
ylabel("current $I_a$ (A)","Interpreter","latex");  
zlabel("loss $Q_{iron}$ (W)","Interpreter","latex");  
ax = gca(); ax.FontSize = 12;
```

