Circular Planar Inductor

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X = circular_planar_inductor(N,r0,ri,d,phi0,RES,h,x0,y0,z0,phix,phiy,phiz,view)

Author: JCCopyrights Summer 2019 This function generates a planar circular multilayer spiral - PCB Inductor The coil will have enough layers to acomodate all N turns. The first layer will be generated with center in (0,0,0) in XY plane The layers will be generated below (z<0) the first layer. It can be moved using the x0,..,phix... parameters

Parameters

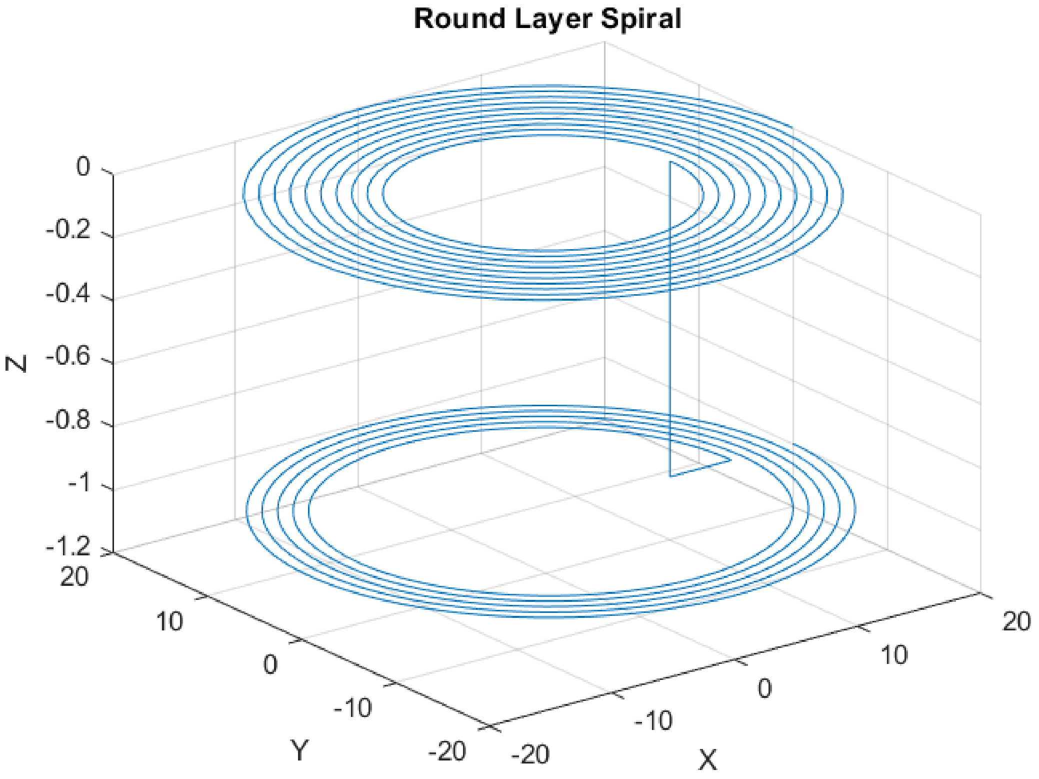
- @param **N** Number of Turns
- @param **r0** External radius of the coil
- @param **ri** Internal radius of the coil
- @param **d** Distane bewtween turns
- @param **phi0** Angle at which the turns start
- @param **RES** Number of nodes of the Geometry (Discretization)
- @param **h** Distance between layers of the Coil. Can be interoduced as a single value (equidistant) or an array

```
%     With different distances between each layer.
%
% * @param  *x0* Center position X
%
% * @param  *y0* Center position Y
%
% * @param  *z0* Center position Z
%
% * @param  *phix* Turn respect X axis
%
% * @param  *phiy* Turn respect Y axis
%
% * @param  *phiz* Turn respect Z axis
%
% * @param  *view* Optional parameter, if true generates figure with
 geometry
%
% * @retval *X*   Geometry nodes
```

Code

```
function X =
 circular_planar_inductor(N,r0,ri,d,phi0,RES,h,x0,y0,z0,phix,phiy,phiz,view)
 Rx=[1,0,0;0,cos(phix),-sin(phix);0,sin(phix),cos(phix)];
 Ry=[cos(phiy),0,sin(phiy);0,1,0;-sin(phiy),0,cos(phiy)];
 Rz=[cos(phiz),-sin(phiz),0;sin(phiz),cos(phiz),0;0,0,1];

 Nremainding=N; Nmax=floor((r0-ri)/d);
 i=1;
 while Nremainding>0 %Calculate turns per Layer
  if Nremainding>Nmax
   Nlayer(i)=Nmax;
   Nremainding=Nremainding-Nmax;
  else
   Nlayer(i)=Nremainding;
   Nremainding=Nremainding-Nremainding;
  end
  i=i+1;
 end

 if length(h)==1
  hlayer=h/(size(Nlayer,2)-1); %Height of each layer
  zlayer=hlayer.*(0:1:(size(Nlayer,2)-1));
 else
  hlayer=h;
  zlayer(1)=0;
  for i=2:1:(size(Nlayer,2))
   zlayer(i)=sum(hlayer(1:(i-1)));
  end
 end

 X=round_spiral(Nlayer(1), r0, d, phi0, RES, 0, 0, 0, 0, 0, 0, false);
 for i=2:1:size(Nlayer,2)
  if mod(i,2)==1 %Assures the correct direction of the turns
   X=[X,round_spiral(Nlayer(i), r0, d, phi0, RES, 0, 0, -zlayer(i), 0,
 0, 0, false)];
  else
   if Nlayer(i)== Nmax
    X=[X,fliplr(round_spiral(Nlayer(i), r0, d, phi0, RES, 0, 0, -
zlayer(i), pi, 0, 0, false))];
   else %Connection to the last turn has to be manually made
    Xaux=X(:,size(X,2))+[0;0;-hlayer]; %@TODO: Warning two points of
 the inductor could overlap
    X=[X,Xaux,fliplr(round_spiral(Nlayer(i), r0, d, phi0, RES, 0, 0, -
zlayer(i), pi, 0, 0, false))];
   end
  end
 end

 for i=1:size(X,2)
  X(:,i)=transpose(Rx*[X(1,i);X(2,i);X(3,i)]);
  X(:,i)=transpose(Ry*[X(1,i);X(2,i);X(3,i)]);
  X(:,i)=transpose(Rz*[X(1,i);X(2,i);X(3,i)]);
  X(:,i)=X(:,i)+[x0;y0;z0];
 end

 if nargin>13
  if view
   plot3(X(1,:),X(2,:),X(3,:))
   grid on
   xlabel('X')
   ylabel('Y')
   zlabel('Z')
   title('Round Layer Spiral');
  end
 end
end
```

Geometry



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