Square Spiral Incremental Layer

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X = rectangular_planar_inductor(N,A,L,A0,L0,d,h,x0,y0,z0,phix,phiy,phiz,view)

Author: JCCopyrights Summer 2019 This function generates a planar rectangular 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 No more discretization for the segments is added as FastHenry discretizates automatically all the inputs.

Parameters

- @param **N** Number of Turns
- @param **A** Width of the coil
- @param **L** Height of the coil
- @param **A0** Internal width of the coil
- @param **L0** Internal height of the coil
- @param **d** Distane bewtween turns
- @param **h** Distance between layers of the Coil. Can be interoduced as a single value (equidistant) or an array

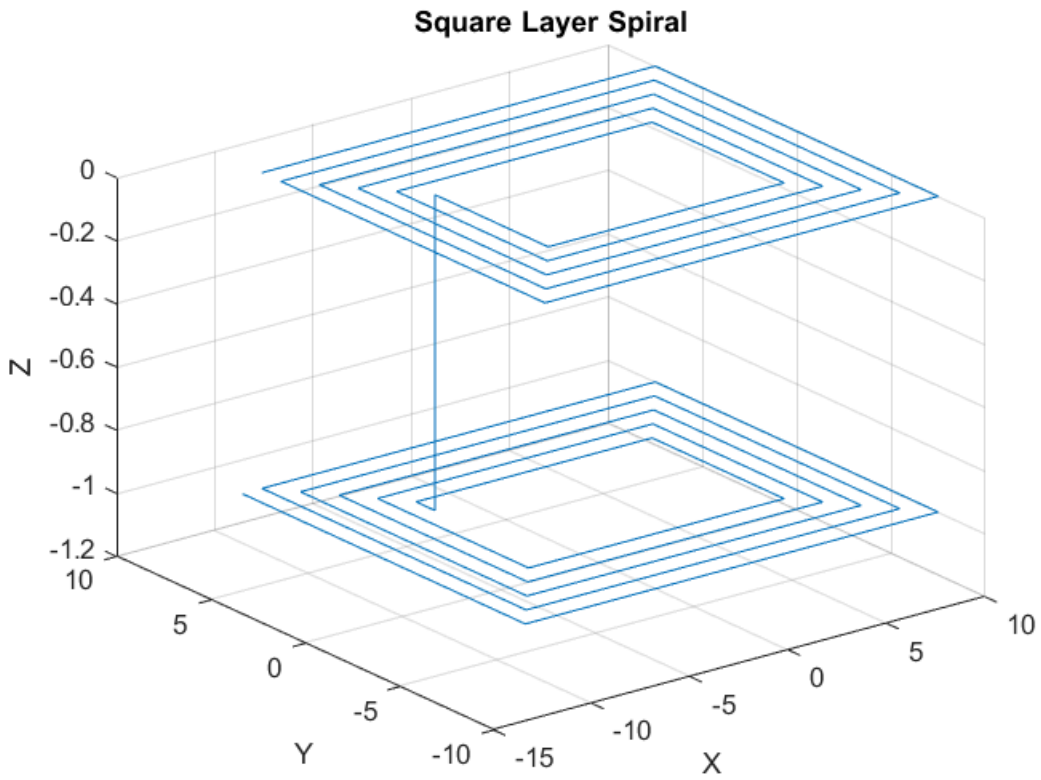
```
%     With different distances between each layer.
%
% * @param  *x0* Center position X
%
% * @param  *y0* Center position Y
%
% * @param  *z0* Center position Z
%
% * @param  *phix* Turn respect X axis
%
% * @param  *phiy* Turn respect Y axis
%
% * @param  *phiz* Turn respect Z axis
%
% * @param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

Code

```
function X =
 rectangular_planar_inductor(N,A,L,A0,L0,d,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(min(A/2-A0/2,L/2-L0/2)/d);
 i=1; %Calculate turns per Layer
 while Nremainding>0
  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
  hlayer=hlayer.*ones(1,(size(Nlayer,2)));
  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=square_spiral(Nlayer(1),A,L,d,0,0,0,0,0,0,false);
 %@TODO: Clean this fucking mess
 for i=2:1:size(Nlayer,2)
  if  mod(i,2)==1 %Assures the correct direction of the turns
   Xaux=X(:,size(X,2))+[0;0;-hlayer(i-1)];
   X=[X,Xaux,square_spiral(Nlayer(i),A,L,d,0,0,-
zlayer(i),0,0,0,false)];
  else %Even layers are more complicated
   Xaux=fliplr(square_spiral(Nlayer(i),A,L,d,0,0,-
zlayer(i),pi,0,0,false));
   Xaux(:,1)=[];%pops first data
   Xaux2(:,1)=X(:,size(X,2))+[0;0;-hlayer(i-1)];
   if Nlayer(i)== Nmax
    X=[X,Xaux2,Xaux,Xaux(:,size(Xaux,2))+[-
d;0;0],Xaux(:,size(Xaux,2))+[-d;L;0] ];
   else %Connection to the last turn has to be manually made
    Xaux(:,1)=[];
    Xaux3=Xaux2+[0;d*(Nmax-Nlayer(i)+1);0];
    X=[X,Xaux2,Xaux3,Xaux,Xaux(:,size(Xaux,2))+[-
d;0;0],Xaux(:,size(Xaux,2))+[-d;L;0] ];
```

```
    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('Square Layer Spiral');
   end
  end
 end
```

Geometry



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