
Solenoid Spiral

Table of Contents

Parameters	1
Code	1
Geometry	3

`X = solenoid_spiral(N,r0,h,phir,phi0,RES,x0,y0,z0,phix,phiy,phiz,view)`

Author: JCCopyrights Summer 2019 This function generates a solenoid circular spiral geometry to be used as a coil. The coil will be generated with center in (0,0,0) in XY plane. It can be moved using the x0,...,phix... parameters The turns are flat until phir angle, then until the end of the turn it starts linearly increasing in height.

Parameters

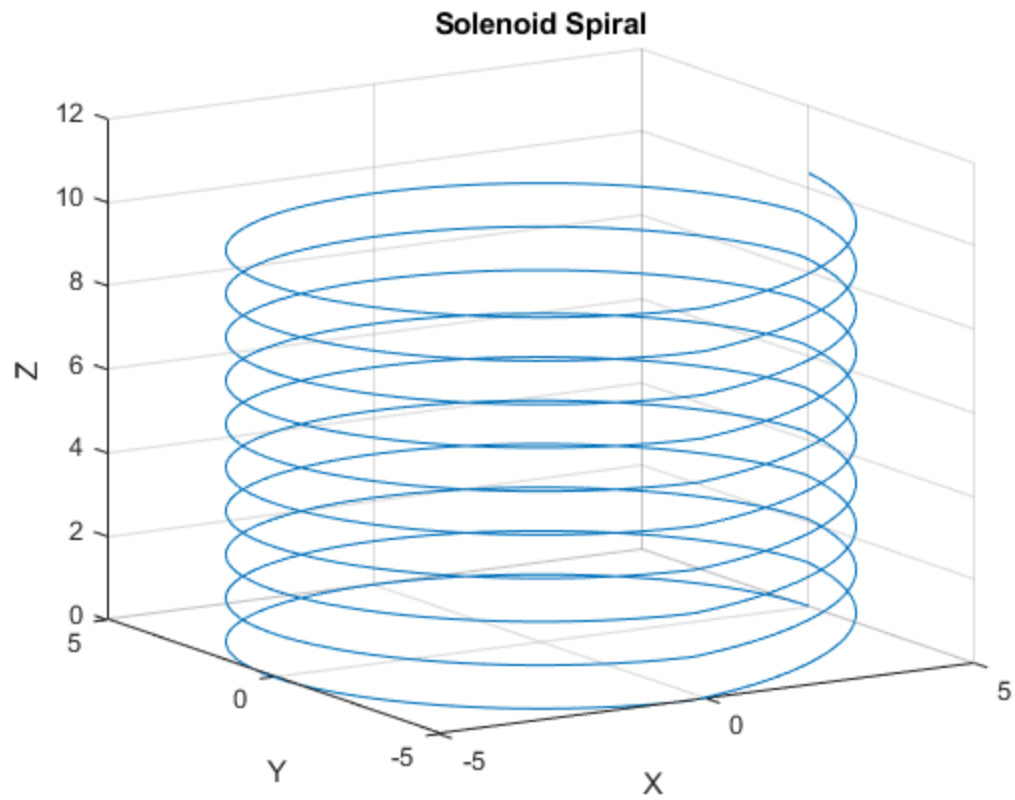
- @param **N** Number of Turns
- @param **r0** External radius of the coil
- @param **h** Height between turns
- @param **phir** Angle at which the turn ends
- @param **phi0** Angle at which the turns start
- @param **RES** Number of nodes of the Geometry (Discretization)
- @param **x0** Center position 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 =  
    solenoid_spiral(N,r0,h,phir,phi0,RES,x0,y0,z0,phix,phiy,phiz,view)  
    % The next turns begins at phir, and continous increasing until 2pi  
    +phi0  
    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];  
    omega =.010;  
    t = linspace(0,2*pi*N/omega,RES);
```

```
X=ones(3,size(t,2));
phi = omega*t+phi0;
r = r0;
X(1,:) = r .* cos(phi);
X(2,:) = r .* sin(phi);
X(3,1)=0;
counter=phir;
counter2=(2*pi+phi0);
phi_RES=omega*2*pi*N/(omega*(RES-1));
for i=2:size(t,2)
    if phi(i)>=counter
        %Starts Increasing for next Turn.
        X(3,i)=X(3,i-1)+h/((2*pi+phi0-phir)/phi_RES);
        if phi(i)>=counter2
            %Starts new Turn.
            counter=counter+2*pi;
            counter2=counter2+2*pi;
        end
    else
        X(3,i)=X(3,i-1);
    end
end
%The max height of the Helix is N*h
for i=1:size(t,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>12
    if view
        plot3(X(1,:),X(2,:),X(3,:))
        grid on
        xlabel('X')
        ylabel('Y')
        zlabel('Z')
        title('Solenoid Spiral');
    end
end
end
```

Geometry



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