% LOGO_SCAN  Routine lays out CU logo inside a ring, and then simulates a scan.
% Creation of logo that is 'hardwired' to the size [-31,31]x[-31,31]

```matlab
% The array a(i,j) is structured as
%  XXXXXXXXXXXX       
%  XXXXXXXXXX        
%   XXXXXXXXXXXX       
%   XXXXXXXXXXXX       
%                  ^ y
%                  | 
%                 | | 
%                 | j | 
%                63 + - - - - + - - - - + > x
```

```matlab
% Create ring
x = -31:31;
[xx,yy] = meshgrid(x,x); % 2-D arrays with x and y-coord. respectively
r = sqrt(xx.^2+yy.^2)/31; % Distance to center of grid
a = 2*exp(max(-40.0,-6000.0*(r-0.7).^4)).*max(1.0,1.0,0.75*yy/31.0);

% Place CU logo at the middle of the ring; replace value by 1.2
% whenever there is an 'X' (or other non-blank symbol) in logo
ac = a(22:42,22:42); ac(cu~=' ') = 1.2; a(22:42,22:42) = ac;
a = a/max(max(a)); % Normalize a so in range [0,1]

% Display test object gridpoint-by-gridpoint using 2-D gray scale
gr = gray; % Pick up standard gray map, but swap
colormap(gr(64:-1:1,:)) % so 0 values (background) becomes light
pcolor(xx,-yy,a); axis equal; axis tight

% Start new figure; Surface plot plus grey scale image below
figure
colormap(gr(64:-1:1,:)) % Again swap direction of grey scale
axis ([-32 32 -32 32 0 4])
hold on % Want to do two plots using the same axes
pcolor(xx,-yy,a*4); shading interp % Remove grid lines in base plane

% Create the scan. This time specify size as desired
m = 66; % Number of angles to use
sc = zeros(m,1); % Array to hold the scan vectors

% Describe (still non-rotated) grid for scanning
n2 = (nr+1)/2-1; % Number of rays for each angle
[xxl,yy1] = meshgrid(xt,xt);
F = griddedInterpolant(xx',yy',a',cubic); % Prepare image for interpolation
```

```matlab
for j=0:m-1 % Loop over m angles
  th = pi*j/m; st = sin(th); ct = cos(th);
  xc = xxl*ct-yy1*st; % Generate the x1,x2-coordinates for
  yc = xxl*st+yy1*ct; % the grid points in the xpl,xp2 grid.
  s = F(xc',yc'); % Interpolate
  sc(:,j+1) = sum(s,2); % Sum along each ray
end
sc = sc/max(max(sc)); % Normalize so max value = 1.
```

% Display scan data as surface plot plus grey scale image below
figure
colormap(gr(64:-1:1,:))
mesh (0:m-1,-xt,sc+2)
axis ([0 m-1 -31 31 0 4])
hold on
pcolor (0:m-1,-xt,sc*4); shading interp
xlabel(\theta); ylabel(r')