**ME2400**

**Measurement Instrumentation and Control**

**Course Project Jan – May 2019**

**Assignment 2**

**Group Number B120**

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**Problem 1:**

The given problem is to design an absolute encoder with 8-bit gray code encoding. The Matlab program is divided into three functions, each with their specific uses.

* **Gray Code Generation:**

The first function Is the function to generate the 8-bit gray code. The code is as follows,

%function to generate n-bit gray code

function y = grayCodeGenerator(n)

left = ["0", "1"]; %Initialize for 1-bit gray code

%Main loop to generate n-bit gray code

for i = 1:(n-1)

right = fliplr(left); %Flip the (n-1)-bit gray code

left = strcat("0", left); %Add zero before (n-1)-bit gray code

right = strcat("1", right); %Add one before the reversed code

left = [left, right]; %Concatenate both to give the resultant

end %end for

y = left; %return variable

end

* **Plotting a single sector in r-theta coordinates:**

This function plots a single sector in the encoder along with their corresponding values.

function [] = plotLineFromGrayCode(grayCodeString, iteration)

%Convert string to character vector

grayCode = convertStringsToChars(grayCodeString);

%Theta range for the given code calculated with the help of the

%iteration variable passed

startTheta = (2\*pi/256)\*(iteration-1);

endTheta = (2\*pi/256)\*(iteration);

%Fill theta vector

theta = startTheta : 0.001 : endTheta;

%Main loop for plotting

for i = 1:8

%Make a grey plot for grayCode digit 0

if grayCode(i) == '0'

rho = ones(size(theta))\*( i );

polarplot(theta,rho, 'LineWidth', 25, 'Color', [0.35, 0.35, 0.35]);

hold on;

end %End if

%Make a white plot for grayCode digit 1

if grayCode(i) == '1'

rho = ones(size(theta))\*( i );

polarplot(theta,rho, 'LineWidth', 25, 'Color', [1,1,1]);

hold on;

end %End if

end %End for

%Plot the text along the radial line

text( (startTheta + endTheta) / 2, 9, grayCodeString, 'Color', 'w', 'FontSize', 7, 'Rotation', radtodeg((startTheta+endTheta)/2));

end %End function

* **Main Function:**

The below function is the main function it utilizes the other two functions to complete the plot,

function [] = assignment2()

GrayCodes = grayCodeGenerator(8); %Generate graycodes

total = size(GrayCodes);

%Set up background

set(gcf,'color','k');

set(gca,'visible','off');

figure(1);

for i = 1:total(2)

%Plot a sector at each iteration

plotLineFromGrayCode(GrayCodes(i), i);

hold on;

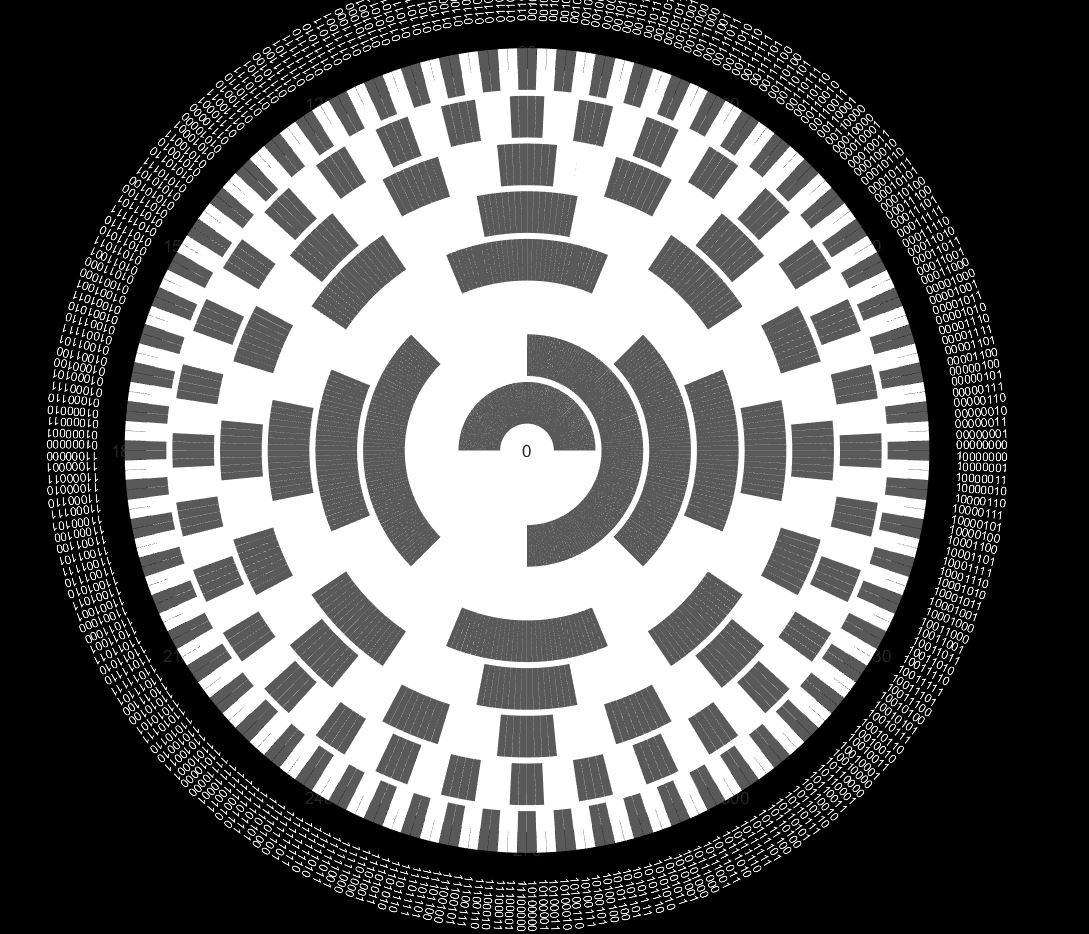
grid off;

end %End for

end %End function

* **Result:**

With the help of the above functions the figure is plotted and it’s given as shown.



**Problem 2:**

* The value of V0 for the given values is 0, since there is zero strain and zero temperature change.
* The value of V0 is 0.002073v,assuming the value of temperature coefficient to be 45 \* 10-4/K.
* The value of V0, keeping the strain magnitude same and reverse strain in R2 and R4 is zero as the effect of change in resistance of R2 cancels that of R4.
* The value of V0, keeping the strain magnitude same and reverse strain in R2 and R3 is 0.004153.
* The value of V0, for same strain and temperature difference 10K is 0.09194V.
* The value of V0, in this case is zero as the effect of R2 cancels the effect on R1.