Course: Summer Industrial Training 2015

Lab Report: Lab No: 4, Lux Meter

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Executive Summary:

The objective of this lab is to implement the Lux meter to calculate intensity of incident light with the Freescale FRDM KL25Z platform using the LDR atop the interface board and the LCD panel interface for display.

Project Description:

The entire project mainly comprised of two sections. First half emphasized the calibration of the FRDM KL25Z platform and LCD interface using a mobile phone's camera flash as the light source and a standard android application at the phone. Second half was the actual implementation of the FRDM KL25Z platform as the Lux meter, to calculate and display the lux value after the calibration, using the voltage analog values obtained from the LDR.

API Description:

The three main APIs used in this project are:

- **TextLCD** - This is a class in the compiler defined to configure the various parameters related to the LCD panel interface at the FRDM KL25 board, with member functions to carry out operations like locate, write, clear etc. Syntax : TextLCD <object>(PINS).

- **DigitalOut** - A simple API to configure individual digital output pins. One digital pin is used to control the 'contrast' pin of the LCD in this project. Syntax : DigitalOut <object>(PIN).
- **AnalogIn** - This API class at mbed is used to acquire analog input values from the terminal as specified in the declaration. In this project, it is used to take the input readings from the LDR.
  Syntax : AnalogIn <object>(PIN).

Output Observed:

1. Variation in voltage and Lux meter values were observed and noted for calibration of the FRDM KL25Z board.
2. As the distance of the light source increases, the lux value decreases.
3. The voltage and lux values were then plotted on the graph and program implemented accordingly.

Test and Debug:

- ✓ Tried the entire project for two different set of readings with different positions for the LDR, phone sensor and the light source, to obtain more accurate lux values.
- ✓ Rectified the error while assigning values at the array used in program - ascending sequence is expected for the voltage values.
- ✓ Used short code statements while programming to find the final lux value using the slope and voltage readings.

Learning Outcomes:

- Functioning of the APIs as mentioned above, especially the 'AnalogIn' class for the analog values from LDR and its role in analog to digital conversion.
- Overall working of the Lux meter using the FRDM KL25Z board and LCD interface.
- Relation between the variation in light intensity, LDR voltage values and the lux readings.

APPENDIX A

Code:

```
#include "mbed.h"

#include "TextLCD.h"

TextLCD panel(PTA1,PTA2,PTD4,PTA12,PTA4,PTA5,TextLCD::LCD16x2);

 // RS, EN, DATA 1-4 PINS, LCD TYPE

DigitalOut pin13(PTA13); // Digital pin for interface GND.

AnalogIn adc(PTC0);  // Analog input from the LDR on interface board.

//Array describing voltage values -

float volt[15]={0.11,0.12,0.13,0.17,0.20,0.25,0.5,0.6,1,1.25,1.5,2.0,2.9};

//Array describing flux values -

float lux[15]={10000,7500,4500,3000,2075,1020,360,200,60,35,21,8,0};

float newlux;  // Variable for the final Lux value to be found.

int main()

{

 pin13=0;

        while(1)

               {

                 float sample3;

                 sample3=adc.read()*3.3;  // Actual voltage value assigned to a
                                            variable.

                 panel.locate(0,0);    // Start location for the LCD panel
```

```
            panel.printf("Volt==%0.2f",sample3);  //Display of the voltage
                                                          value


      for(int i=0;i<=9;i++) // Repeat iteration for all the value ranges.

           {

              if(sample3>volt[i] && sample3<=volt[i+1])  // check the
                      location of the point amidst the set voltage values.

                {

                newlux=((lux[i+1]-lux[i])/(volt[i]-volt[i+1]))*sample3;

                                            // Lux = slope * voltage value.

                 }

           }

  panel.locate(0,1);

  panel.printf("LUX= %2.2f", newlux); // Display the final lux value.

  wait(0.1);

  panel.cls();

   }

}
```

Observed Lux and Voltage values -

VOLT	LUX
2.90	0
2.00	8
1.50	21
1.25	35
1.00	60
0.60	200
0.50	360
0.25	1020
0.20	2075
0.17	3000
0.13	4500
0.12	7500
0.11	10000