# 2D Graphics Engine Lab Requirements

HL

This lab counts total 10 points. Note hard copy of the lab report has to be ready for the time to make in class demo, fail to bring the hard copy can result in 5 marks reduction. In addition, the soft copy of the report plus the source code exported as a project have to be submitted on line. This lab as a preliminary step to build 2D vector graphics processing engine, you will

1. Design and prototype LPC1769 micro-processor system board, and enable one SPI LCD display by designated LPC1769 node as your choice. It can be either slave or master, which can be defined in the later labs. Let's define this LPC1769 as LPC1769 LCD node.

2. Use draw line test code to run draw-a-line testing program from you LPC1769-LCD node. Once this is done, you are ready for the implementation of 2D screen saver functions 1 and 2. Function 1 is for rotating square patterns display and Function 2 is for generating trees.

3. Generate 2D screen saver of rotating squares based on vector graphics formula discussed in the class (5 points)

(1) use $P(x,y) = P\_1(x\_1,y\_1) + lamda * ( P\_2(x\_2,y\_2) - P\_1(x\_1,y\_1))$ with lamda = 0.8 by default, and lamda = 0.2 when prompted for user selected input;

(2) create two dimensional rotating patterns with data set of "parent" square;

(3) randomized location by using rand() function;

(4) randomized reduction of the parent square;

(5) choose one color for each set of rotation patterns, and rotates at least 10 levles or higher;

(6) continue to display each set of patterns without erasing the patterns.

4. Generate 2D trees with its branches level no less than 10 or higher based on vector graphics formula discussed in the class (5 points)

(1) use $P(x,y) = P\_1(x\_1,y\_1) + lamda * ( P\_2(x\_2,y\_2) - P\_1(x\_1,y\_1))$ with lamda = 0.8 by default for tree branch reduction;

(2) create patch of forest by modifying one parent tree;

(3) randomized location of the new trees by using rand() function;

(4) randomized reduction of the parent tree trunks and branches;

(5) randomized angles for the branches;

(6) continue to display trees without erasing till the keyboard input detected.

5. Submit project report together with

(1) exported project (source code) subject to testing and verification, including compilation and build, as well as actual LPC1769 board testing.

6. For debugging purpose, implementation of SPI data flash is required but no demo and no software submission until later next lab. The SPI flash will be utilized to hold digital image data for the later lab implementation of integration of pixel graphics.

7. Rubrics for lab demo:

(1) Satisfies the requirements stated in the lab 1 readme.txt;

(2) lab report should cover (hardware side):

- (2.1) system block diagrams of the entire system setup including laptop computer;
- (2.2) system block diagram of the SPI color LCD interface;
- (2.3) Schematics of the LPC1769 interface to LCD color display panel;
- (2.4) table(s) of the pin connectivity;
- (2.5) photo(s) of the implementation.

(3) lab report:

- (3.1) software part should cover
  - a. Algorithm description;
  - b. Flow chart(s);
  - c. Pseudo code;
  - d. testing and verification section;
  - e. source code listing (appendix).

(END)