

## CMPE240 Project1, Spring 2023

### 2D Graphics Engine

#### 1. Introduction

In this project, a prototype system with LPC11C24 CPU module and an LCD display is designed and built. Two different screen saver patterns which are rotating squares and trees are generated, and displayed on the LCD display.

#### 2. List of Components

The below components are used in the project.

1. NXP LPC11C24 Eval Board
2. CTIONE BoardB for embedded graphics
3. TFT 128X160 1.8" LCD Display
4. Female and male pin headers
5. USB C to Micro USB cable

#### 3. System Block Diagram

Fig. 1 shows the block diagram of the entire system.

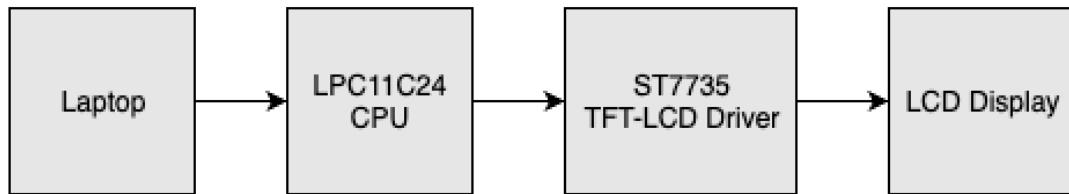


Figure 1: System block diagram.

#### 4. SPI Interface

In this project, SPI communication protocol is used between the CPU and the LCD display. Table 1 shows the pin connectivities, and Fig. 2 shows the schematic of the CPU interface to the LCD display.

Description	LPC11C24 pin name	LPC11C24 header name	LCD display pin name
GND	-	J2-54	GND
3.3VOUT	-	J2-28	VCC
RST	PIO2_2	J2-14	RESET
D/C	PIO2_1	J2-13	D/C
N/A	N/A	N/A	CARD_CS
SSEL0	PIO0_2	J2-8	TFT_CS
MOSI0	PIO0_9	J2-5	MOSI
SCK0	PIO2_11	J2-7	SCK
MISO0	PIO0_8	J2-6	MISO
3.3VOUT	-	J2-28	LITE

Table 1: Pin connectivity table.

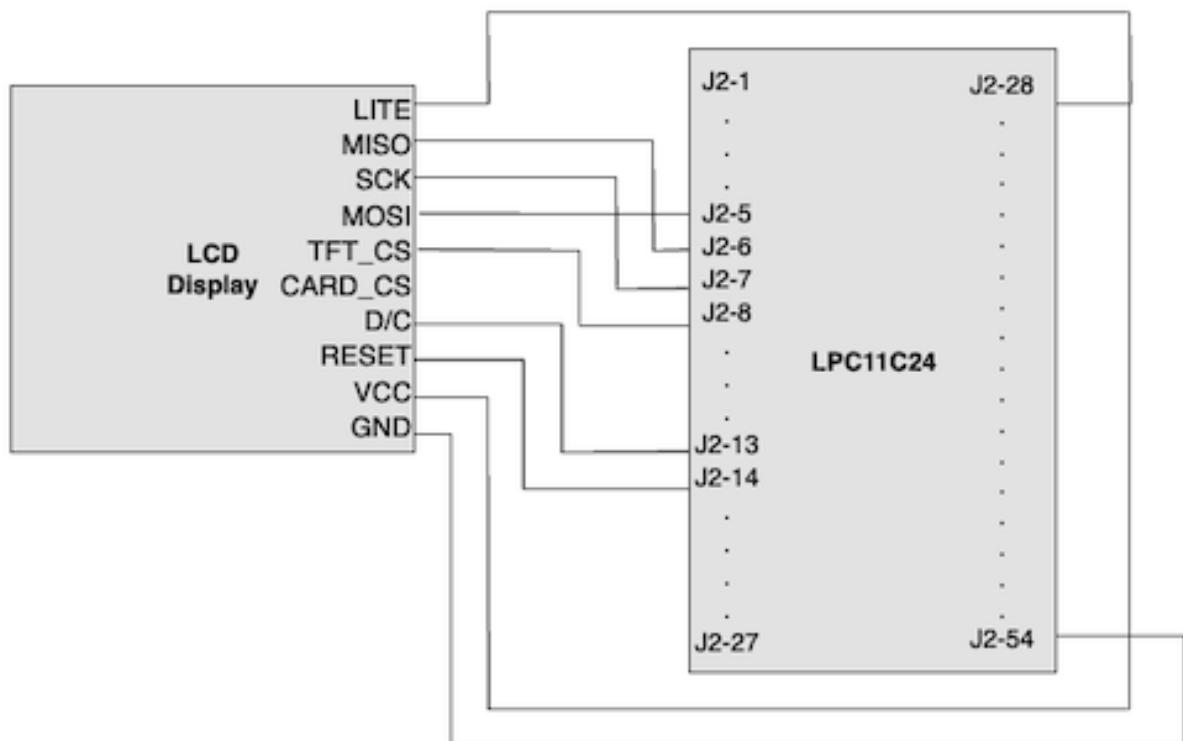


Figure 2: Schematic of the LPC11C24 interface to LCD Display.

## 5. Graphic Design

Two different screensaver patterns, which are rotating squares and trees are generated, and displayed on the display, based on user selection. When the program is run, the user is asked which pattern to display. The user is expected to enter '1' for the rotating square pattern, and '2' for the tree pattern. If the user selects the rotating square pattern, she/he is further asked to enter a 'lambda' value, which determines the reduction of the parent square. Fig. 3 shows the implemented rotating square and tree patterns.

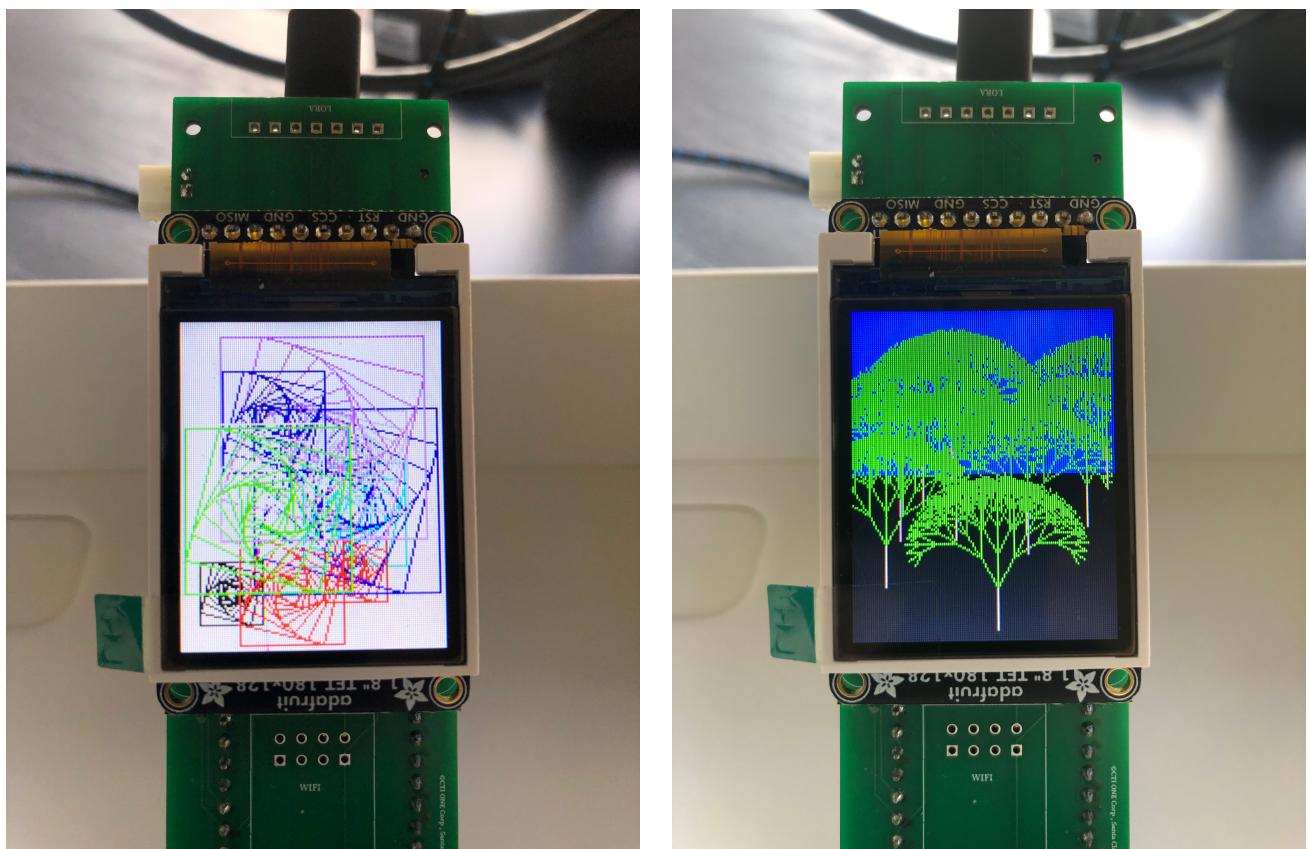


Figure 3: The implemented screensavers