Texas Instruments Robotics System Learning Kit
Module 11
Activity: Interfacing Graphical Displays
Question 1
Define a personal image that you would like to display. Make it 7 pixels high and 5 pixels wide. For example, the University of Texas at Austin symbol is a UT.

This image can be defined in the font table as the 5 8-bit numbers {0x1f, 0x24, 0x7c, 0x24, 0x1f}

Notice bit 0 is on top, and notice bit 7 is clear. See the last two lines of the ASCII table in the Nokia5110.c file. Place the 5 8-bit numbers that define your image into the 0x7F line, and test it by outputting Nokia5110_OutChar(0x7F);

Question 2
Assume the SPI clock is 12 MHz. Assume each character has a blank vertical line to the left and to the right of 8 tall by 5 wide image. In other words to output the above UT symbol the software must output these data {0x00, 0x01, 0x24, 0x7c, 0x24, 0x1f, 0x00}

Approximately how long does it take to draw one ASCII character on the LCD?

Question 3
Notice in the Nokia5110.c file there are a set of functions that operate on a RAM buffer called screen. This functions are

- Nokia5110_ClearBuffer: Clears the buffer (not the LCD)
- Nokia5110_PrintBMP: Draw image into buffer
- Nokia5110_ClrPxl: Clear pixel in buffer
- Nokia5110_SetPxl: Set pixel in buffer
- Nokia5110_DisplayBuffer: Displays buffer on LCD

The way the driver is used is to
1) Call ClearBuffer
2) Call PrintBMP ClrPxl SetPxl as needed to form the image
3) Call DisplayBuffer to update the display
As long as the 1-2-3 sequence occurs faster than 30 times/sec, the display looks continuous to the human eye.

Part a) Develop a function that draws a straight line into this buffer. The x coordinates vary from 0 to 47, and the y coordinates vary from 0 to 63. You may call any of the existing Nokia5110.c functions.

Nokia5110_Line(uint8_t x1, uint8_t y1, uint8_t x2, uint8_t y2);

Part b) Develop a function that draws an unfilled rectangle into this buffer. The x coordinates vary from 0 to 47, and the y coordinates vary from 0 to 63. You may call any of the existing Nokia5110.c functions. The two points are opposite corners of the rectangle.

Nokia5110_Rect(uint8_t x1, uint8_t y1, uint8_t x2, uint8_t y2);

Part c) Develop a function that draws a filled rectangle into this buffer. The x coordinates vary from 0 to 47, and the y coordinates vary from 0 to 63. You may call any of the existing Nokia5110.c functions. The two points are opposite corners of the rectangle.

Nokia5110_RectFill(uint8_t x1, uint8_t y1, uint8_t x2, uint8_t y2);

Feel free to substitute the SSD1306 OLED for Nokia 5110.
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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
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