### Introduction

Display technologies have been developed for many years. In the late 20th century, Cathode Ray Tube (CRT) dominated the market. However, new trends in display include the demand of picture quality, size and power consumption. So Liquid Crystal Display (LCD) is then emerging to be the current market. Due to their relatively light weight, low operating power and compact design, LCD becomes a popular part of home entertainment system and continues to dominate the existing market.

Traditional LCD requires color filter to display full color. Field Sequential Color of LCD (FSC-LCD) generates full color without color filters, with the use of color addition. Color filter is quite expensive and energy consuming which absorbs energy. As a result, without using color filters one can lower the absorption of light. Thus, FSC-LCD in long term, it is relatively power saving and has longer service life. The response time of the liquid crystal has played an important role to apply the color sequential technology effectively. It is because the speed of FSC-LCD has three times faster than the traditional display. To implement this technology, we need to have relatively fast response time to the RGB frame rate. So, we mainly focus on writing the driver to control the RGB frame rate of the backlight which is compatible with the screen refreshment rate.

### Aim and Objectives

The aim of this project is to apply the principle of color sequential of liquid crystal display. An OCB-LCD will be fabricated for testing the display driver. The performance of different parameters of the LCD will also be evaluated in order to improve our project.

The objective of the project is to combine the small LC Cell blocks to become a large screen. As the field sequential color technology is not really common in the market of large monitors, we mainly focus on how the smaller screens are integrated to be a larger screen. By using the field sequential color technology, we can enhance the picture quality and improve the performance compared to the traditional one.

### System Block Diagram

- **Microcontroller**
- **Column Display Driver**
- **Power Supply**
- **RGB-Backlight**
- **Fabricated Display**

### Methodology

#### Hardware Implementation

- **Optically Compensated Bend Cell (OCB) is adopted for our display**
  - OCB is stable in splay state
  - OCB is operated at bend state that its driving voltage is bigger than the critical voltage for state transition (from splay state to bend state)

**Characteristics of our designed LC Cell**

- Transmission Voltage Curve (V TC)
- Response Time Data

#### Software Implementation

- C programming is used to drive the microcontroller
  - Designed by AVR Studio 5.1
  - Initialized the microcontroller
  - Import the image data
  - Control the signals to obtain desirable output image

**Combine R-G-B Sub-frames will obtain a U F I O O**

### Main Circuit Board

- **RGB-Backlight**
- **Display Column Driver for Upper Part of Data**
- **Microcontroller**
- **Fabricated Display**
- **Voltage Regulator System**
- **Display Column Driver for Lower Part of Data**

### Results

- **Print Circuit Board (PCB) shows our designed circuit**
  - Designed by Altium Designer Winter 09
  - Draw schematics → Converted to layout file → Output file for fabrication

### Conclusion

In our project, the FSC-Technology was designed in our system to display graphs. We have already proved that the pixels can be driven independently. Thus, we can design the larger display by using FSC-Technology.

After making the PCB layout of the above components, several tests were carried out to check whether each part of function had worked properly or not. Individual tests of each function were tested first. After obtaining the successful testing results, we combined all of the components and then tested the whole system. During the testing process, different sets of input data were used to make the system to provide corresponding signals and voltages.

In general, most of the results fulfill the project objectives. The hardware driver and software driver were built for demonstrating the FSC-Technology. System is set for testing by combining the RGB-Backlight, the LC Cell, the hardware and the software driver. Results are observed by the fabricated display, showing the validation between the circuit and the program.

The concept of our project is a wide range of application with display, such as monitors and mobile screens. To conclude, our project has a large potential for development. We believe that this technology will be used widely and will be a success in the future.