Project Charter

Project Title: GUILED

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Project Goal

The goal of the project is to create a configurable, modular, scalable and model based framework for the RGB LED Matrix Display using the WS2812 protocol. We will develop a software that will enable the final user to draw or drag-n-drop a picture of appropriate size that will then be displayed on the RGB LED Matrix. We also aim at making a simulator that can be used to test out our firmware to adopt a model-based development methodology.

Approach

We converged on the RGB LED Matrix idea because in addition to being flashy, it presents: a) Timing Challenges b) Scalability Issues c) Good use-case for Simulation.

From the get go, we want to establish a solid project framework which allows us to develop the solution efficiently, flexibly, and *right*. In addition to using the tools above, we intend on developing simulation and test tools *in parallel* with code development, rather than an after thought.

Resources:

We will be using the Neopixel/WS2812 LEDs to form four 16x16 matrices. Each of the matrices are controlled by a Freescale Freedom KL25Z board and driven by a separate power supply. Depending on the picture to be rendered, the four matrices will work in tandem. This would mean that the four KL25Z boards have to communicate with each other to start rendering the picture at the same time.

We will also be using a Laptop for the GUI and simulator. With respect to the tools we would be using, we chose the mBED compiler online for programming the Freescale Freedom KL25Z Board and Processing to develop the PC-side GUI and simulator. For version control, we are using Github, and Google Docs for collaborative documentation and storage.

Major Deliverables:

1. Matrix display demo: Four 16x16 LED matrices working in tandem.
2. PC GUI : A software that will provide the user with a graphical interface to configure the display, drag and drop pictures and draw directly onto the matrix.
3. KL25Z Firmware
4. Simulator FW/GUI : A software to simulate the WS2182 LEDs which will be used to develop firmware.

Schedule:

For this project, we have determined a fast paced schedule will allow us to maximize productivity and plan for unforeseen circumstances, including destruction of hardware, software inconsistencies, and horrible, nasty bugs that are beyond repair. As such, we propose the following schedule:

- Design - 2.5 Weeks
- Development - 3 Weeks
- Debugging - 1 Week
- Wrap up - Remaining time in the semester

Risk and Feasibility:

There are hardware and software issues that may cause difficulty with this project.

On the hardware side, the LED's require a substantial amount of power. Delivering it efficiently and safely will be a challenge, particularly given the strict timing requirements of the LEDs. We also need to ensure the voltage and current passing through the board is within a safe range.

On the computational side, we will be dealing with a small amount of SRAM (16kB) and running out of memory is a real concern. We also need to make sure the implementation is efficient, to allow a high frame rate.