Milestone 1 Stranger Things Communitcating with Will byers

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1 Abstract

This lab is aimed at utilizing all of the ”skills” we learned through the coding we did in labs 1-4 and incorporate them into a single project. The project intends to use our microprocessors to recreate said Christmas lights by stringing our microprocessors together so that a UART message can be passed along the string with each microprocessor interpreting part of the message and sending part of the message along to the next processor.

2 Introduction and Background Information

This project took inspiration from a scene in stanger things that involved a boy communicating with his mother by lighting up specific lights in a string of Christmas lights. The concept here is to use microprocessors and UART in order to light a string of LEDS in a specific color in a specific order using PWM in order to keep the trend going properly. The concept here is that we would put in LED color commands for a total of 26 letters to prove the concept works. We would put in an order of LED colors that each of 26 processors would light up in order and then send the next color to the next processor and LED in the string.

3 Background

In this particular lab we used the MSP430FR5994. Reason being is that the processor used in this experiment must meet certain requirements. For instance it must be UART compatable, meaning we can send complex signals from a computer in order to tell the processor what color we want the LED as well as what color the next LED should be. It also had 3 Capture compare registers that we could use when we need two in order to handle the world load in this case (here we are only having the first set

of code to turn the LED and a signal code to send for the next LED, we are not yet implementing the code to handle the total 26 lights.

3.1 Equations

$$\int_0^\infty \cos(\alpha + j\omega) = z \tag{1}$$

$$1000 - ((hex/0xFF) * 1000) = DutyCycle \tag{2}$$

$$800000/(16 * 9600) = 52.083 \tag{3}$$

$$255(startstrength) - UCA0RXBUF(inputsignalstrength) = TB0CCR(outputstrength) \tag{4}$$

3.2 Figures

The figure below shows the basic structure of our signal and how our processors need to handle them. The first 3 bytes taken in will give a color for our led to display and the bytes that come after that need to be sent on to the next processor so that it can take 3 bytes etc.

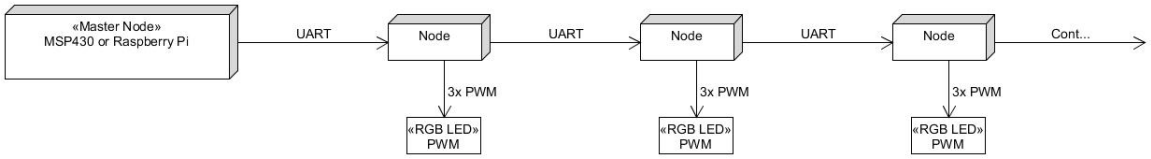

Figure 1: This image shows the basic design for how the code will travel through our string of processors..

4 Evaluation and Results

The steps taken for the actual circuit were simple. First google was used to see the pin assignments for the common anode LED. The pin assignments from left to right were R (red), + (5V VCC), G(green), B(blue). That were put into the breadboard with a 1k ohm resistor connecting the Green and Blue pin to the 3.6 and 3.7 pin on the MSP430FR5994 board respectively. While a 300 ohm resistor was used to connect the Red led to the 3.7 pin because the Red pin has a higher voltage drop than the Blue and Green pin. Finally, the VCC pin of the LED was wired into the 5V pin of the processor to supply power to the LED. Code composer was then used to compile the code and run it to the board. However, do to a hardware issue with the COM port of the processor, Code composer had to be shut down before Real Term could begin.

After configuring Real Time for COM 4, 9600 BAUD, and HEX. an initial signal command of 0x08 0XFF 0XFF 0X00 0X00 0X00 0XFF 0X0D was sent This 8 segment hex code has several parts. The first and last segment are to initialize and finalize the segments. Segments 2-4 and 5-7 correspond to the color of the LED for segments 2-4 and the color of the LED to be passed to the next processor in 5-7. Segment 2 correspond to the color red, segment 3 to green, and segment 4 to blue. 0XFF in this case with our code would indicate a 0

The RGB LED was chosen as the LED of choice because it had open pins that could be used on a breadboard as well as being easily replaceable. The values for the resistors were all initially 1k ohms due to a 10mA preferred current with a 5V source to provide enough power to light a LED. However when implementing the design the red LED did not have the same subjective brightness as the green and blue LED even with the same calculator duty cycle so the resistor for the red pin was reduced to a 300 ohm resistor. This caused the current to go slightly over our 10mA threshold however was still a safe operating current for our LED so further changes were not made. Else if statements were used in the code implementation over case statements due to the ordering preferred of accounting for the red,green,then the blue LED.

5 Discussion/Conclusions

Making this project opposed to buying pre made LED RGB strips is for the purpose of customization over what an LED strip is typically capable of doing. For instance upon full completion of this lab a full stranger things wall can be implemented and used to send messages however we desire, particularly good for upcoming Halloween. Also a lot was learned a lot about how much coffee we can drink and the difference between the first milestone and labs 1-4.