Lab 11: SysTick Timer

Daniel Bogden

Part 6: Modify SysTick_Handler to turn on each LED sequentially

a) 99.86438095 ms

b) The LED only blinks half this speed because for 1 cycle of the interrupt it is in the off position and for the next cycle it is in the on position.

Below is the main.c and SysTick_Config.c files code

Main.c

```
/*
* Author: Daniel Bogden
*/

//Function Declarations
void gpio_d_init(void);
unsigned int SysTick_Config(unsigned int ticks);

//# Defines
#define reload_value (1 << 23) - 1 /* System Timer reload value */
#define LEDs_ODR_Base (0x40020C14) /* LEDs Port D ODR Address */

unsigned int *pLEDs = (unsigned int *)LEDs_ODR_Base; /* Create pointer to
Port D - ODR Reg */

unsigned int counter = 1;

int main()
{

  //set system clock
  SetSysClock();
```

```
  //initialize Port D (LEDs)
  gpio_d_init();

  //configure SysTick System Timer
  SysTick_Config(reload_value);

  //loop forever
  while (1)
  {
    continue;
  }

  return 0;
}

void SysTick_Handler(void) //ISR - SysTick Interrupt Service Routine

{
  //toggle Port D - LED 15
  // *pLEDs ^= (1 << 15);

  /* Light up LEDs 0 through 15, once all on turn them off and repeat. */
  if (counter > 15)
  {
    counter = 0;
    *pLEDs = 0;
  }
  else
  {
    *pLEDs |= (1 << counter);
    counter++;
  }
}
```

SysTick_Config.c

```
/*
* Author: Daniel Bogden
*/

#define SysTick_BASE (0xE000E010) /*!< SysTick Base Address  */

struct SysTick_t *SysTick = (struct SysTick_t *)SysTick_BASE; /*!< SysTick
Struct Pointer  */

struct SysTick_t
{
  /*!< Offset: 0x000 (R/W)  SysTick Control and Status Register */
  unsigned int CTRL;

  /*!< Offset: 0x004 (R/W)  SysTick Reload Value Register       */
  unsigned int LOAD;

  /*!< Offset: 0x008 (R/W)  SysTick Current Value Register      */
  unsigned int VAL;

  /*!< Offset: 0x00C (R/ )  SysTick Calibration Register        */
  unsigned int SYST_CALIB;
};

unsigned int SysTick_Config(unsigned int ticks)
{

  /* set reload register */
  SysTick->LOAD = ticks - 1; /* set reload register - don't allow bigger
than 2^24-1! */

  SysTick->VAL = 0; /* Load the SysTick Counter Value */

  SysTick->CTRL = 7; /* Clock source is processor clock, Enable SysTick
IRQ, and enable SysTick Timer Counter */

  return (0); /* Function successful but we won't check */
}
```