

Laser with Motion Control

ECE 520

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Overview

1. Project Description
2. Design Flow
3. Materials/Components used
4. Vivado IP Block Design
5. Video Demonstration

Project Description

Purpose:

To demonstrate an understanding of both the hardware and software design process for SoC.

Requirements:

- Control a laser diode's movement.
- Allow the user to manually control the movement.
- Generate patterns by moving the laser diode.
- Display current status.

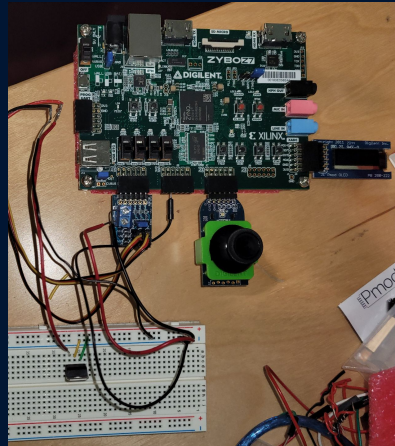
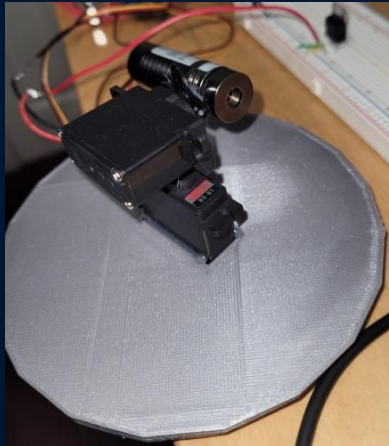
Design Process

Hardware

- Servos can be used for motion
- An OLED display PMOD can be used to display current state
- A Joystick can be used to get user input
- Switches on Zybo to select modes

Design Process

Hardware



Design Process

Software

C code was written to control the PWM, OLED, Joystick, and Switches on the Zybo.

A while loop is always running with a case statement and the switches being the expression. Each case will be a state that the program is in.

Design Process

Software

```
int main()
{
    init_platform();
    initLPT();
    driverLoop();

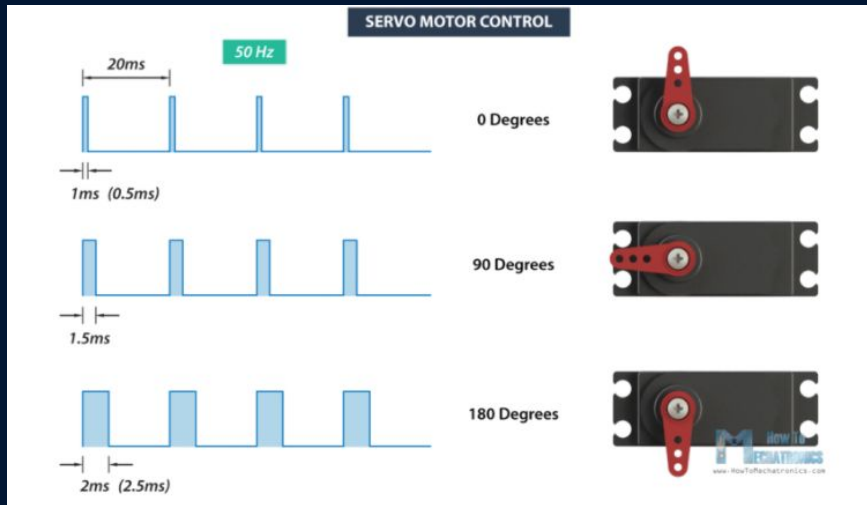
    cleanup_platform();
    return 0;
}
```

```
void driverLoop(){
    while(1){
        switch(XGpio_DiscreteRead(&Gpio, SWS_CHANNEL)){
            case 0x0:
                reset();
                break;
            case 0x1:
                servoJoy();
                break;
            case 0x2:
                squarePattern();
                break;
            case 0x3:
                linePattern();
                break;
            case 0x4:
                crossPattern();
                break;
            case 0x5:
                circlePattern();
                break;

            default :
                reset();
                break;
        }
    }
}
```

Design Process

Servo



Max PWM Signal Range	640-2250μsec
Travel per μs	.102°/μsec

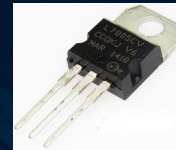
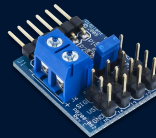
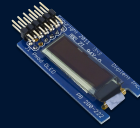
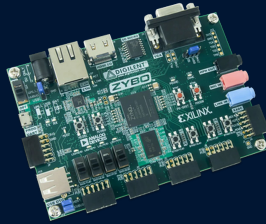
☒ FCLK_CLK0 IO PLL 100 100.000000

```
#define PERIOD 2000000  
#define MIN_DUTY 90000  
#define MAX_DUTY 223000
```

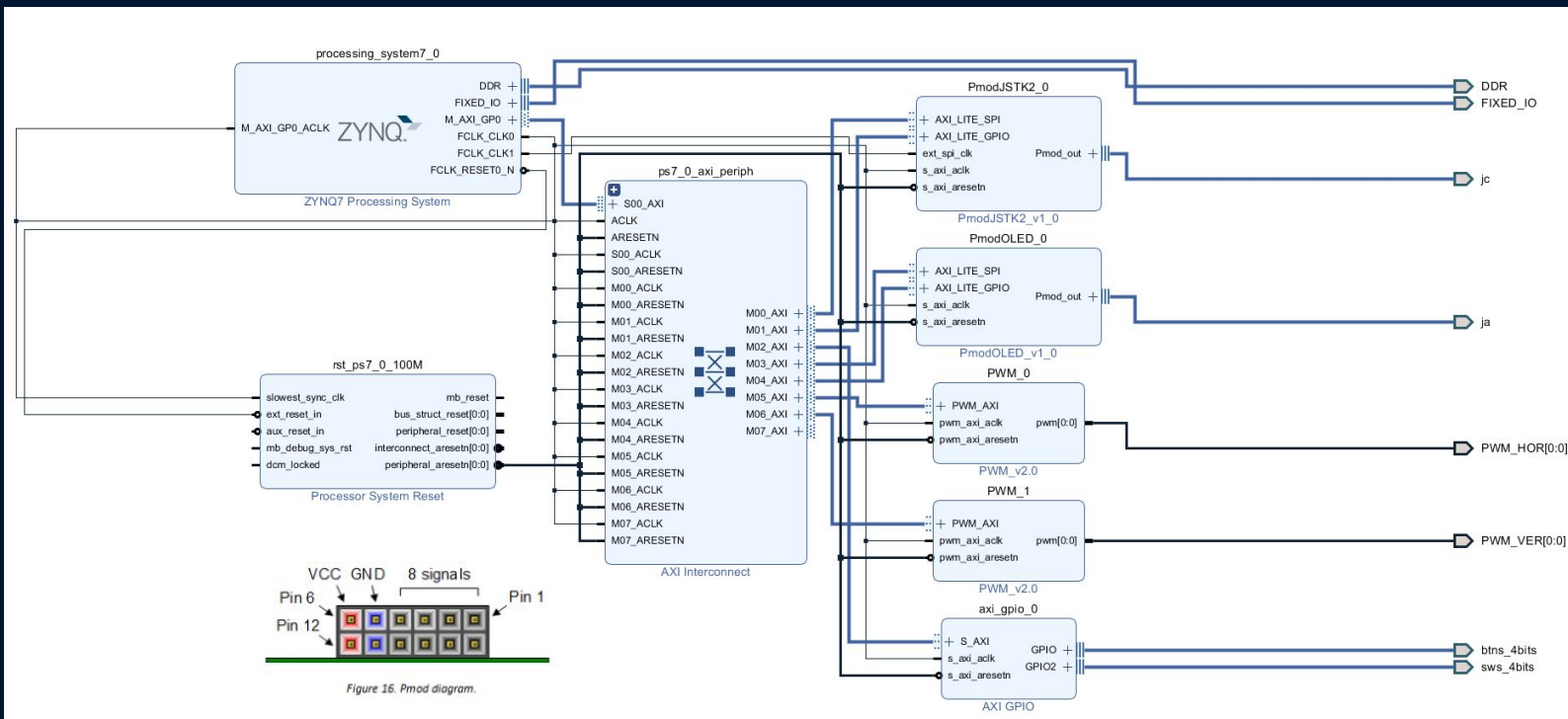
```
PWM_Set_Period(PWM_PAN, PERIOD);  
PWM_Set_Period(PWM_TILT, PERIOD);  
PWM_Set_Duty(PWM_PAN, (MIN_DUTY + MAX_DUTY)/2, 0);  
PWM_Set_Duty(PWM_TILT, (MIN_DUTY + MAX_DUTY)/2, 0);
```


Materials/Components Used

- Zybo
- 2 x servo
- Laser module
- OLED PMOD
- Joystick PMOD
- Con 3 PMOD
- l7805cv (5V Voltage regulator)
- DC Power Supply



Vivado IP Block Design



DEMO





The End

Any Questions?