

Spring 2021
California State University, Northridge
Department of Electrical & Computer Engineering



Final Project
Laser with Motion Control
May 17, 2021
ECE 520L

Written By: Jose Luis Martinez

Final Project Instructions:

Connecting the PMODS and Setting up the Servos

1. Parts Required
 - a. Zybo
 - b. 2 servos
 - c. Laser module
 - d. OLED PMOD
 - e. Joystick PMOD
 - f. CON 3 PMOD (Optional)
 - g. 5V voltage regulator
 - h. DC Power Supply
2. To mount the laser diode and servos:
 - a. Place a servo on a base so that the shaft is facing the vertical direction.
 - b. Place another servo on that servo so that the shaft is now facing horizontally.
 - c. Align the servos so that their shafts are at their midpoint.
 - d. Mount the laser diode on the second servo so that it is facing slightly upwards. I used hot glue to stick everything together as I did not have a 3d printer.
3. On the ZYBO connect the joystick PMOD to JC.
4. On the ZYBO connect the OLED PMOD to JA.
5. On the ZYBO connect the Con 3 PMOD to JE.
6. Connect the servos to the Con 3 PMOD to the P2 and P3 ports.
7. Make sure to set the jumper on the Con 3 PMOD to accept external power.
8. Connect a 7V line to Con 3 PMOD and ground.
9. With a 5V regulator provide 5V to the laser module.

Final Project Instructions:

Programming the ZYBO

1. The zipped file will contain the following:
 - a. Vivado Project
 - i. This contains the source project for Final Project 1.
 - b. Source code **main.c**.
 - c. Video with demonstration.
 - d. Zybo constraints file.
 - e. All images used in this instruction report.
2. This project was created using Vivado 2019.1 and ZYBO was used as the target hardware device. Make sure to extract the folder before starting.
 - a. To open this project open the zipped folder and go to
 \Final_Project_Jose_Martinez.zip\laser_w_servos

Name	Type	Compressed size	Password ...
laser_w_servos	File folder		
laser_w_servos.cache	File folder		
laser_w_servos.hw	File folder		
laser_w_servos.ip_user_files	File folder		
laser_w_servos.runs	File folder		
laser_w_servos.sdk	File folder		
laser_w_servos.srcs	File folder		
Packages	File folder		
laser_w_servos	Vivado Project File	3 KB	No

Fig. 1 Vivado Project Directory

3. Once in Vivado, go to **File** and click on **Launch SDK**. In SDK make sure your board is connected to the computer and is turned on. Then program the FPGA and make sure to connect to the terminal on the SDK or another terminal of your choice. Finally click run and you should see the ZYBO operate as shown on the video demonstration.
4. This project assumes that you have the the required PMODS connected to the ZYBO board and route power to the laser and servos.

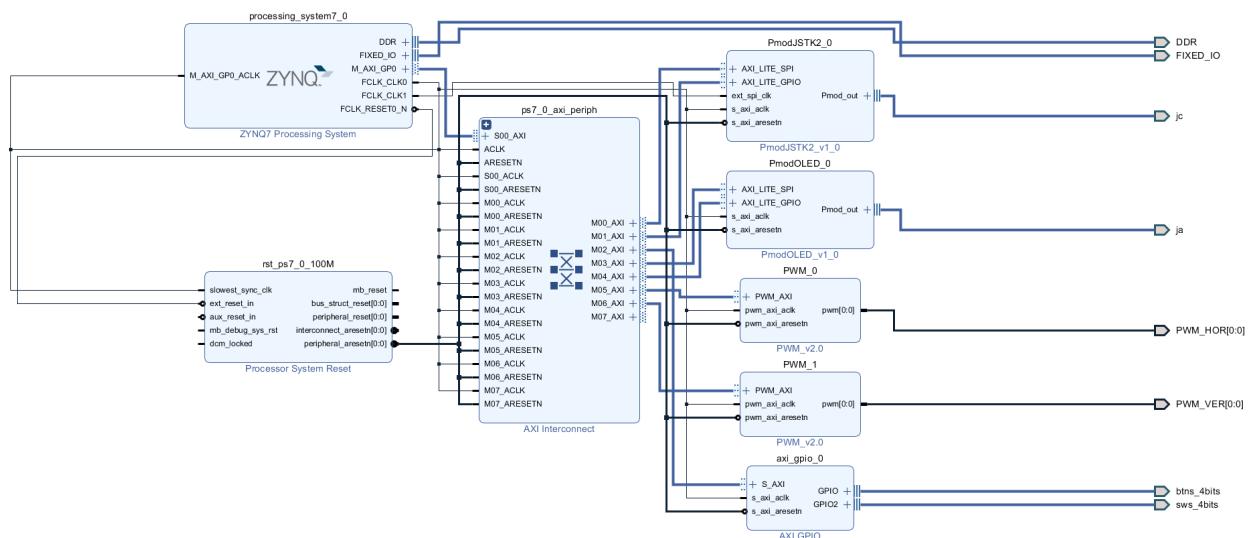


Fig. 2 Block Design



Fig. 3 Laser Mounted on 2 servos

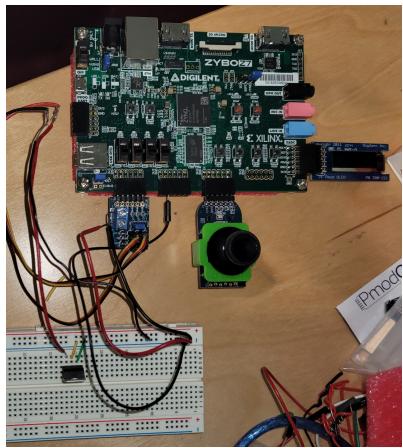


Fig. 4 Zybo with connected PMODS