

CMPE 242 Project

PWM and PID Motor Drive Testing

HL

Use your embedded prototype system to build a PID Control platform with PWM and GPIO interace.

The goal is to understand how PWM frequency and duty cycle can be set by inintialization and configuration of TCNTBn, TCMpBn, and configuration registers. You will write (or modify) a PWM device driver program to realize this requirement. In addition, to demonstrate your PWM program, you will build stepper motor drive circuit by using existing motor drive board to change motor speed and direction (clock wise vs. counter clock wise).

1. Requirements

(1. 1) Locate the connector(s) which expose the CPU PWM pin and identify a GPIO (GPP) pins, and connect these pins to the stepper motor drive of your choice.

(1.2) For the NANO platform, use the following pins for your project:

gpio 79, connector pin 12

gpio 78, connector pin 40

pwm, connector pin 32

Jetson Nano J41 Header Pinout for GPIO/PWM

<https://www.jetsonhacks.com/nvidia-jetson-nano-j41-header-pinout/>

Note: I2C and UART pins are connected to hardware and should not be reassigned. By default, all other pins (except power) are assigned as GPIO. Pins labeled with other functions are recommended functions if using a different device tree.

Use pin 32 for PWM

pin 12 for gpio79

pin 12 for gpio78

Sysfs GPIO	Name	Pin	Pin	Name	Sysfs GPIO
	3.3 VDC Power	1	2	5.0 VDC Power	
	I2C_2_SDA I2C Bus 1	3	4	5.0 VDC Power	
	I2C_2_SCL I2C Bus 1	5	6	GND	
gpio216	AUDIO_MCLK	7	8	UART_2_TX /dev/ttyTHS1	
	GND	9	10	UART_2_RX /dev/ttyTHS1	
gpio50	UART_2_RTS	11	12	I2S_4_SCLK	gpio79
gpio14	SPI_2_SCK	13	14	GND	
gpio194	LCD_TE	15	16	SPI_2_CS1	gpio232
	3.3 VDC Power	17	18	SPI_2_CS0	gpio15
gpio16	SPI_1_MOSI	19	20	GND	
gpio17	SPI_1_MISO	21	22	SPI_2_MISO	gpio13
gpio18	SPI_1_SCK	23	24	SPI_1_CS0	gpio19
	GND	25	26	SPI_1_CS1	gpio20

Sysfs GPIO	Name	Pin	Pin	Name	Sysfs GPIO
	GND	27	28	SPI_1_CS1	gpio20
	I2C_1_SDA I2C Bus 0	27	28	I2C_1_SCL I2C Bus 0	
gpio149	CAM_AF_EN	29	30	GND	
gpio200	GPIO_P20	31	32	LCD_BL_PWM	gpio168
gpio38	GPIO_P66	33	34	GND	
gpio76	I2S_4_LRCK	35	36	UART_2_CTS	gpio51
gpio12	SPI_2_MOSI	37	38	I2S_4_SDIN	gpio77
	GND	39	40	I2S_4_SDOUT	gpio78

Harry Li, Ph.D.

Ref: <https://github.com/hualili/CMPE242-Embedded-Systems/blob/master/2022S/2022S-106-ioconfig-py-v4-hl-2021-12-19.pdf>

(1.3) Mount the motor drive board on the wire wrapping board if using the Easy Drive, otherwise use connector to connect to your motor drive.

(1.4) Write/modify PWM program to allow both frequency and duty cycle change per user application program input. Write an user application program to prompt user input from the ARM development kit, and your program will read user input frequency and duty cycle, and send to the PWM device driver to drive the stepper motor drive, observe the motor speed change and direction change.

2. Submission:

2.1. Source code and binary code;

2.2. Schematics of your design;

2.3. Photo of the implementation;

2.4. Video clips (5 seconds) for program execution and motor movement.

2.5 Create one PDF document to combine 2.2 and 2.3. Then zip all the file into one with the following naming convention:

First_LastName_MotorPWM_CMPE242.zip

Submit to SJSU Canvas.

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