User Manual of NyBoard V0

Introduction

- NyBoard is a motion control board for the robotic kitten named Nybble, the first product of OpenCat project. Taking the ATmega328P as the core processor, NyBoard has 16 independent PWM outputs, a port connecting the 6-axis motion sensor and an external 8KB EERPROM.
- The size of NyBoard is only 65×56mm. Components on the board are carefully laid out to precisely fit the contour of Raspberry Pi 3B. There is a 2×5 socket connecting the NyBoard and Pi, which includes the power, UART, reset and I^2C connections. Through it, the NyBoard can power Pi and communicate with Pi.
- NyBoard can accept power input ranging from 6V to 12V. Be careful with the electrodes when connecting your power supply to NyBoard's battery socket. There's "+" and "-" besides the socket. **Reversed connection may damage your NyBoard!**
- To isolate voltage fluctuation caused by servos' movement, NyBoard provides two independent power management. One supplies a stable 5V power to the chips, the other supplies an adjustable voltage (5-8V, stable 8V can only be achieved with 12V input) to suit most models of servos. To ensure safety during operation, please do not connect the servo to NyBoard first. Check the rated voltage of the servo, use a voltmeter to monitor the output for servos and adjust the potentiometer to obtain a desired voltage. Dial counterclockwise will increase the voltage.
- NyBoard has a built-in I^2C network with ATmeg328P working as master and other peripherals as slaves, including the PWM/servo driver, the 6-Axis motion sensor and external EEPROM. NyBoard also provides a jumper switch for users to choose whether ATmega328p or Pi (or another AI chip) will be the master of the I^2C network. We hope that by providing alternatives, users can explore and find the best configuration for their projects.

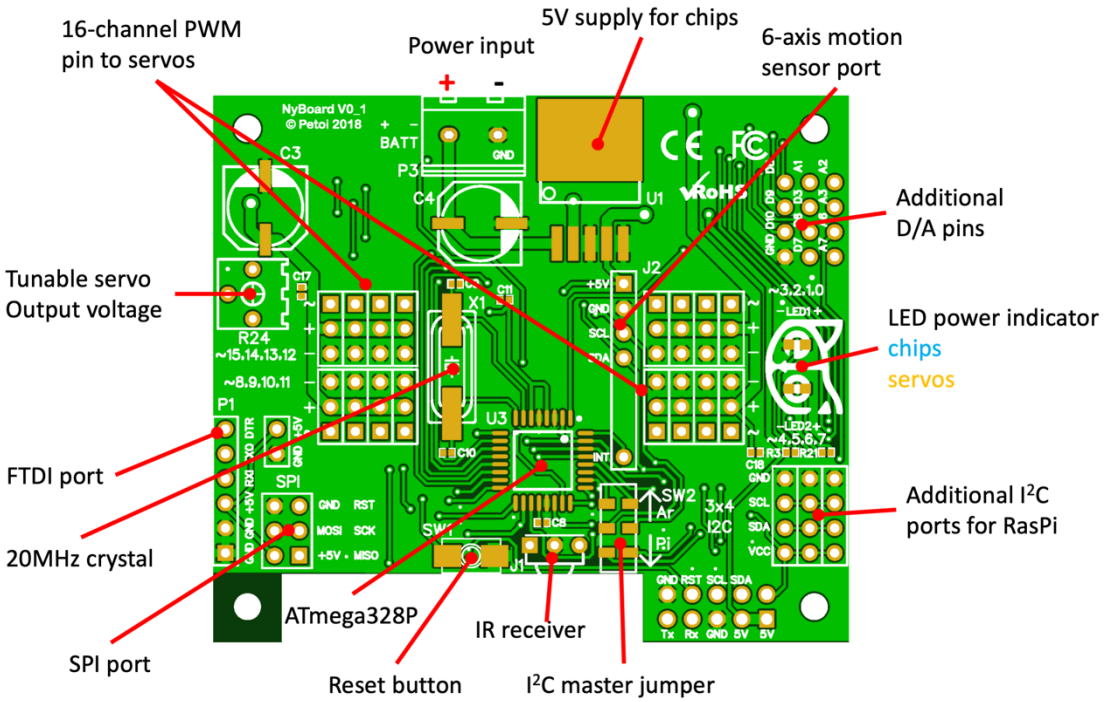
Features

- Core processor: ATmega328P working at the frequency of 20MHz.
- Grouped 2x3 SPI port for burning bootloader or uploading sketches.
- Servo: 16 channel PWM outputs.
- Power input: DC 6-12V
- Power Management: Two independent power supplies, 5V to chips (3A peak), 5-8V adjustable voltage to servos (5A peak).
- LED power indicators: 2 monochrome LEDs, blue for the chip, yellow for the servos.

- Motion sensor port: connects to GY521-MPU6050, which is centered on the board. Note: MPU6050 should always be facing up for the measurement using default library.
- Socket to Pi: 2×5 pin, connects to power, I^2C, UART and reset. I^2C and UART are leveled at 3.3V.
- I^2C jumper switch: choose ATmega328P or Pi as the master of the I^2C network
- EEPROM: 8KB. Page write limit is 32B.
- Additional D/A pins: 3×4 socket with unused pins of ATmega328P
- FTDI port: 1×6 socket for connecting the serial-to-USB translator
- Additional I^2C ports: 3x I^2C ports directly connected to the 2x5 socket of Pi, leveled at 3.3V.
- IR receiver: Receiving frequency 38KHz (using Arduino digital pin D4)
- Buzzer: Active (using Arduino PWM pin D5)
- Reset button: Reset the NyBoard
- Battery voltage detector: can be programed to alarm when battery is low (using Arduino analog pin ADC0)
- PCB: double-layer, 65×56mm

Ports and Specification

The tables are ordered matching the squares on the board, from left to right, top to bottom:



- Power input

+	-

- 16 channel PWM pin to servos

15	14	13	12		3	2	1	0
+					+			
GND					GND			
GND					GND			
+					+			
8	9	10	11		4	5	6	7

- FTDI port

DTR
TXO
RXI
+5V
GND
GND

- SPI port

GND	RST
MOSI	SCK
+5V	MISO

- IR receiver

OUT	GND	+5V

- 6-Axis motion sensor port

Mark on NyBoard	Corresponding pins on GY521
+5V	VCC
GND	GND
SCL	SCL
SDA	SDA
/	/
/	/
/	/
INT	INT

- I^2C jumper switch

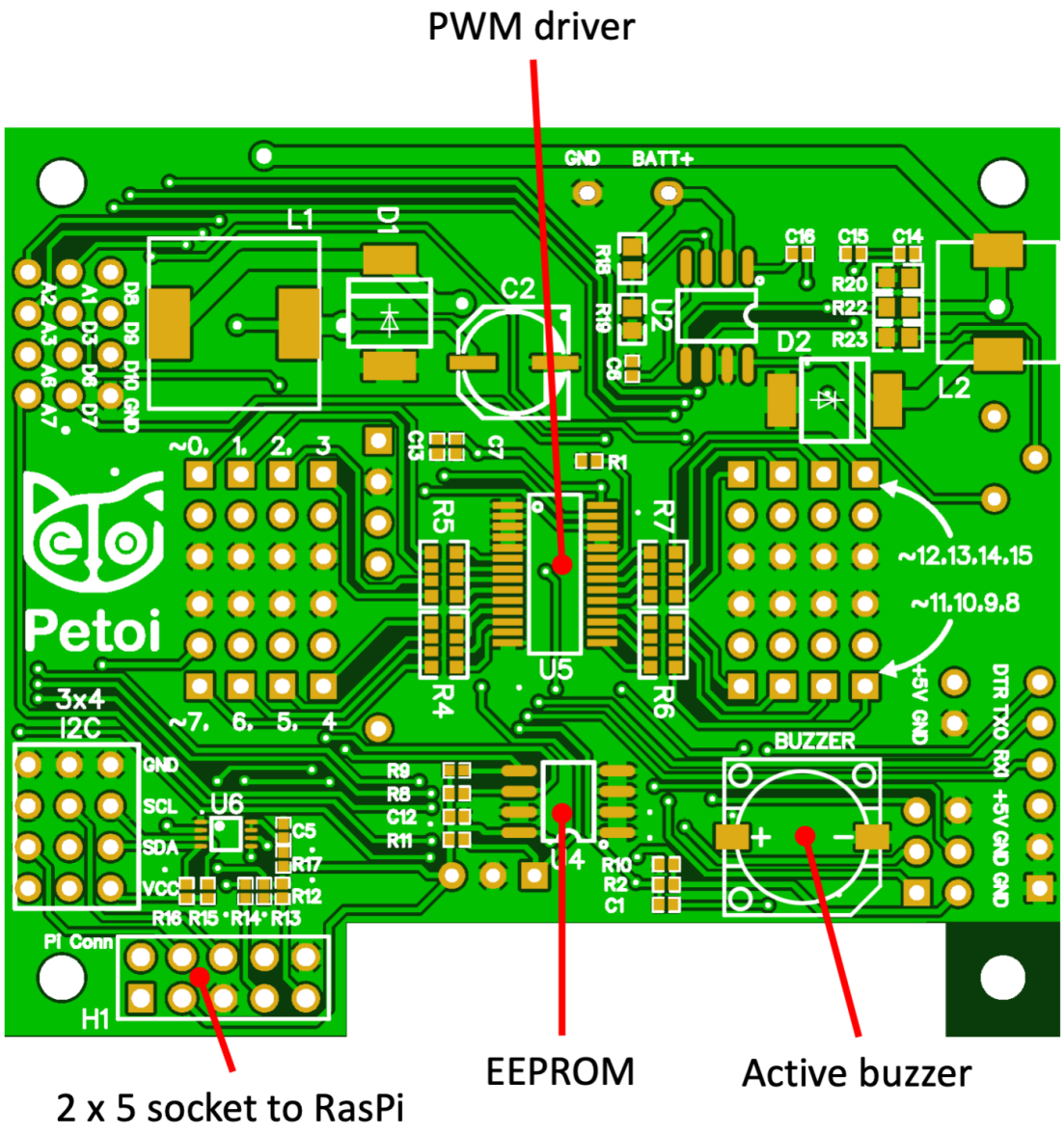
Dial up to select ATmega328P, dial down to select Pi (or another AI chip)

- Additional D/A Pins

D8	ADC1	ADC2
D9	D3	ADC3
D10	D6	ADC6
GND	D7	ADC7

- Additional I2C ports (the voltage of VCC is 3.3V)

GND	GND	GND
SCL_P	SCL_P	SCL_P
SDA_P	SDA_P	SDA_P
VCC	VCC	VCC



- Socket to Pi

VCC	SDA_P	SCL_P	RST	GND
+5V	+5V	GND	TXD	RXD

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