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Korea Institute of Energy Technology

Visionary Course – Energy AI
Week 09

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Week 09b – Assemble Your JetRacer

Materials

Visit the followings:

- https://www.waveshare.com/wiki/JetRacer_Pro_AI_Kit
- https://www.waveshare.com/w/upload/f/fa/Jetracer_pro_Assembly_EN.pdf

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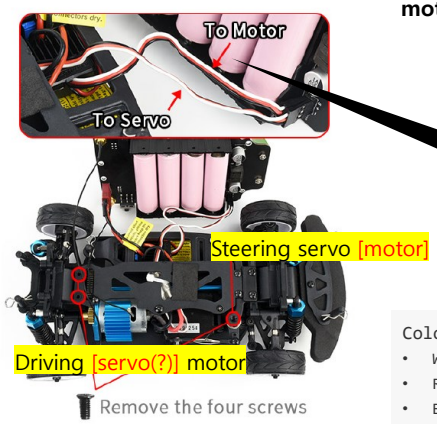
Assembly Steps 1-2

1. Set camera holder and antenna on Jetracer Pro Expansion board.

Please, double check the stacking order of the components.

2. Connect the cables of motor, servo and the DEH to the exapension board according to the picture below.



2-1. Power line connection is needed from the battery pack on the expansion board to the driving motor

Please, double check whether the lines are connected to right pin header.

Color Convention:

- White – Signal
- Red – Power/Ref (+ Voltage)
- Black – Ground (0 Voltage)

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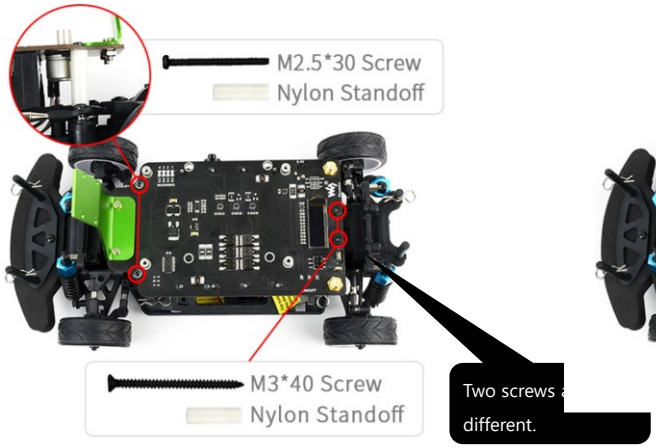
Assembly Steps 3-4

3. Fix JetRacer Pro Expansion board on chassis.



4. Put the Jetson Nano Developer Kit and fix it.

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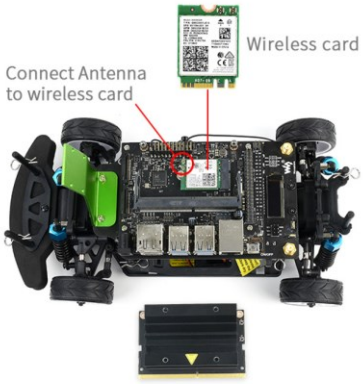
Assembly Steps 5-6

5. Remove the Jetson Nano board, connect the wireless card and connect the antenna.



6. Replace Jetson Nano. Assemble cooling fan by its own screws. Connect the wires to the fan interface. Connect the Jestson Nano Developer Kit to JetRacer Expansion board by 6PIN wires.

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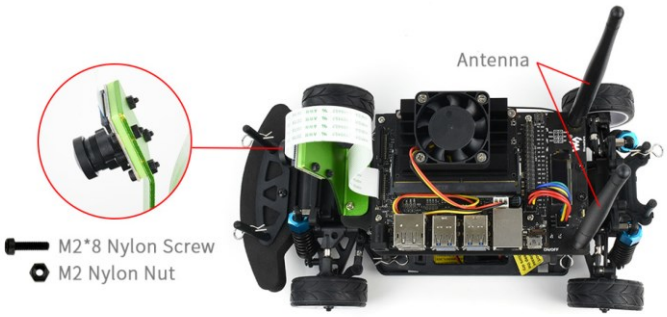
Assembly Step 7

7. Mount camera on its holder by nylon screws. Note that the Acrylic board should be put between camera and the metal holder to avoid shorting. Finally, assemble the antenna.



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Week 09b – Make Your JetRacer Ready for Driving

How to Control Your JetRacer

Steering – Analog Servo (E6001)

amazon

ECHOBBY E6001 Analog Servo 6kg for RC Model Buggy Car Off-Road Truck

Visit the ECHOBBY Store

2 ratings

Price: $10.80

Material	Plastic
Brand	ECHOBBY
Theme	RC HOBBY

About this item

- Plastic Gear, Splashproof
- Weight: 42.4g
- 0.13sec /60 degree (4.8V)
- 5.2kg*cm (4.8V)
- Rotation Angle: +/- 60 degree

How to Control Your JetRacer

Steering – Analog Servo (E6001)

```
from jetracer.nvidia_racecar import NvidiaRacecar

car = NvidiaRacecar()
```

$y = car.steering\_gain \times x + car.steering\_offset$

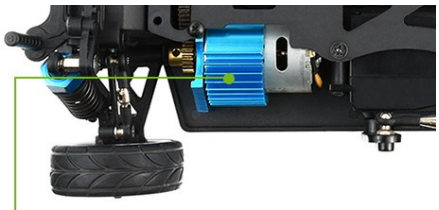
where
x : *car.steering*
y : the value written to the motor driver

Calibration needed for car.steering_gain and car.steering_offset

Make the car move forward with x = 0, fully right with x = 1, and fully left with x = -1

How to Control Your JetRacer

Throttle – Carbon Brushed Motor



RC380 high speed carbon brushed motor
Idle speed 15000RPM

Carbon Brushed Motor

High speed high power carbon brushed motor, longer working life, stable performance

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How to Control Your JetRacer

Throttle – Carbon Brushed Motor

```
from jetracer.nvidia_racecar import NvidiaRacecar

car = NvidiaRacecar()
```

$y = car.throttle\_gain \times x$

where
x : *car.throttle*
y : the value written to the speed controller

- When the car is stopped and a negative throttle is set, it will reverse.
- If the car is moving forward and a negative throttle is set, it will brake.

Calibration needed for car.throttle_gain

Make the car run forward at a maximum speed with x = 1, backward at a maximum speed with x = -1

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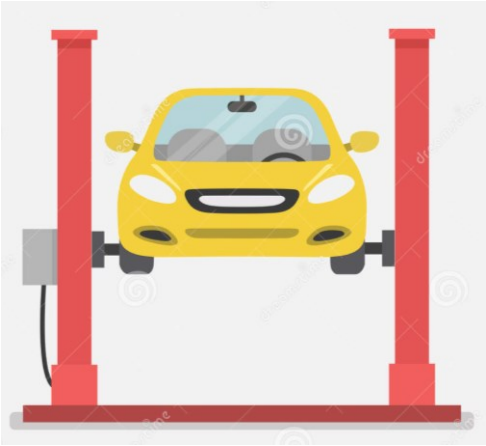
Calibrate Your JetRacer

- Lift you car and find the calibration parameters (through trial and error)

IP address:8888/lab/tree/jetracer/notebooks/basic_motion.ipynb



- $car.steering\_gain$
- $car.steering\_offset$
- $car.throttle\_gain$

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Week 09b – Drive Your JetRacer

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Drive Your Car using Gamepad Controller

IP address:8888/lab/tree/jetracer/notebooks/teleoperation.ipynb

1. Plug the dongle into your laptop's USB port.
2. Execute the Python code below.

```
import ipywidgets.widgets as widgets

controller = widgets.Controller(index=0)  # replace with index of your controller

display(controller)
```

Press any button to find the index for your gamepad!

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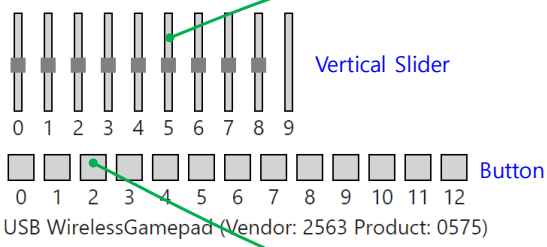
Drive Your Car using Gamepad Controller

```
import ipywidgets.widgets as widgets

controller = widgets.Controller(index=0)  # replace with index of your controller

display(controller)
```

https://ipywidgets.readthedocs.io/

This script creates interactive HTML widgets

Remember the indexes for the mapping!



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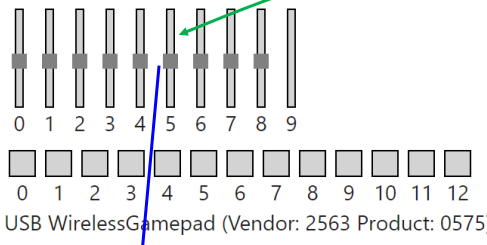
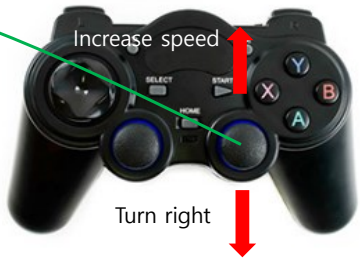
How to Change the Control Values?



Read the value of the slider widget.

Decide your own mapping for driving.



Example)

car.steering = 1
car.throttle = 0.5

Widget Index

```
left_link = traitlets.dlink((controller.axes[0], 'value'), (car, 'steering'), transform=lambda x: -x)

right_link = traitlets.dlink((controller.axes[5], 'value'), (car, 'throttle'), transform=lambda x: -x)
```

Conversion using lambda function if needed

https://traitlets.readthedocs.io/

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Drive Your JetRacer

What is your lap time?

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