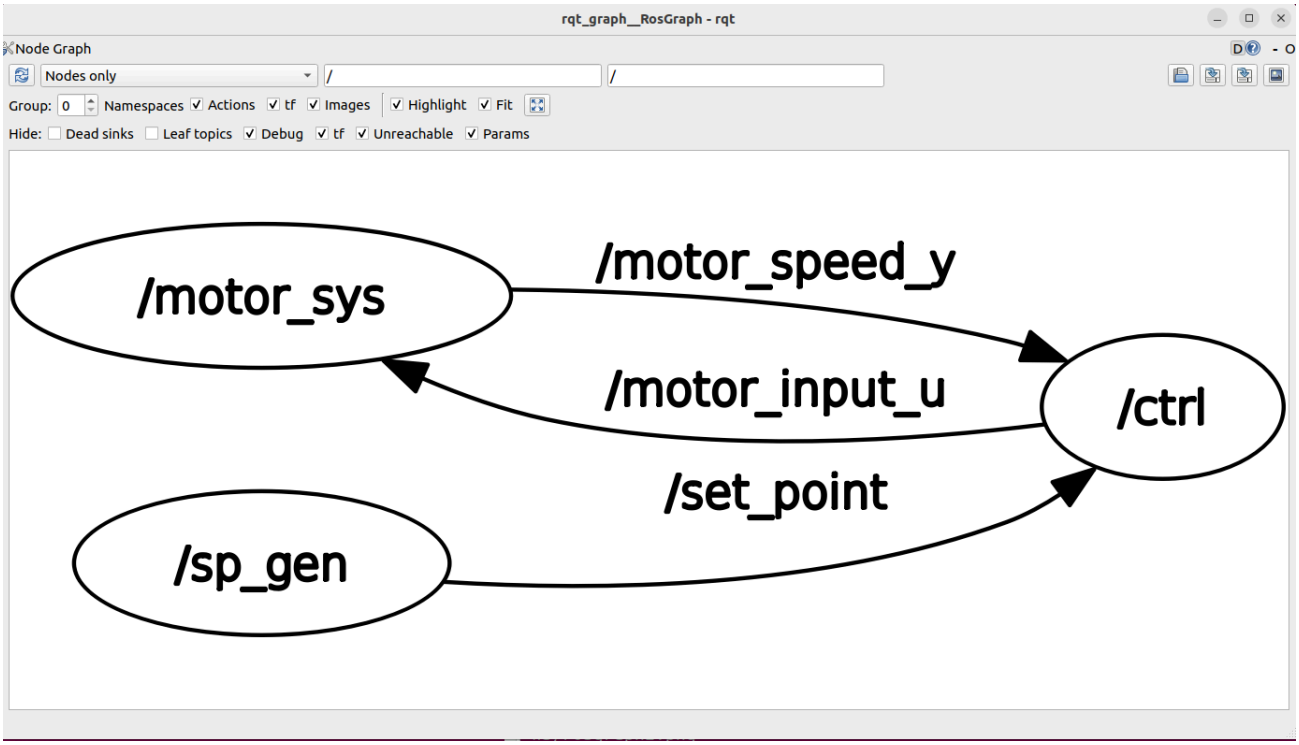
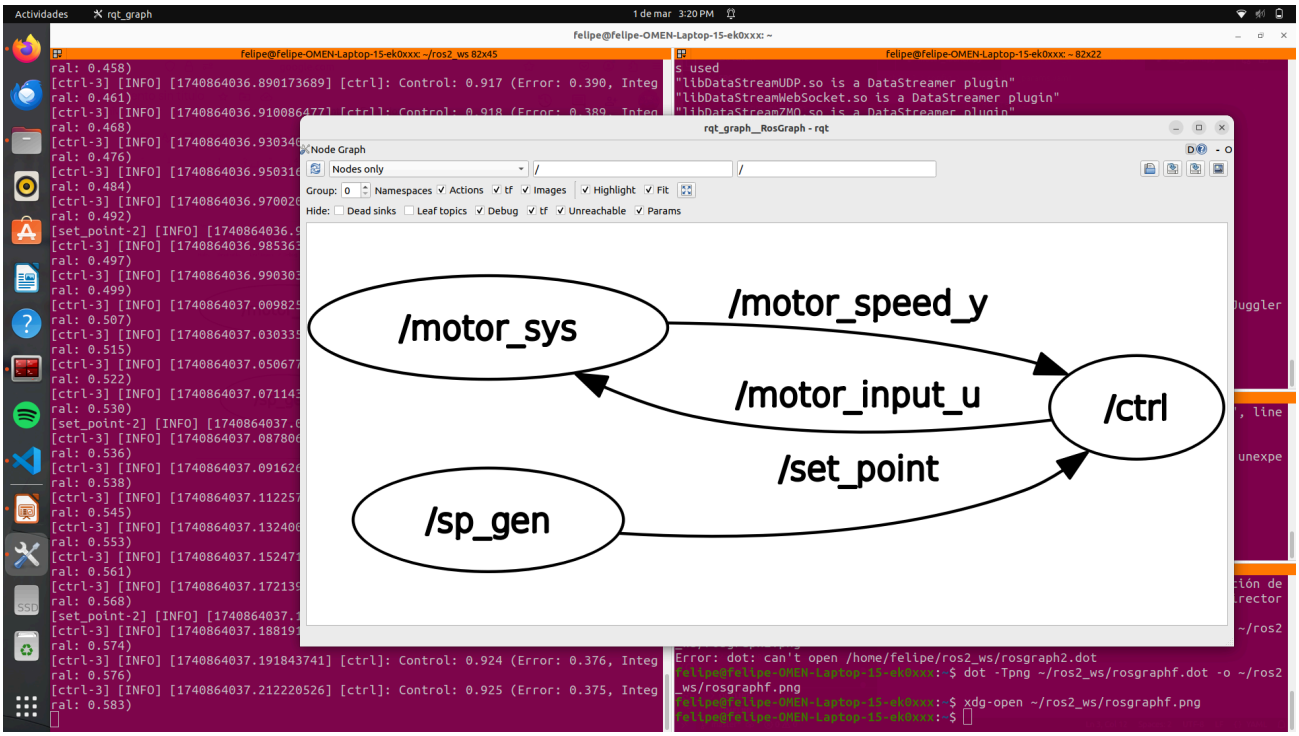
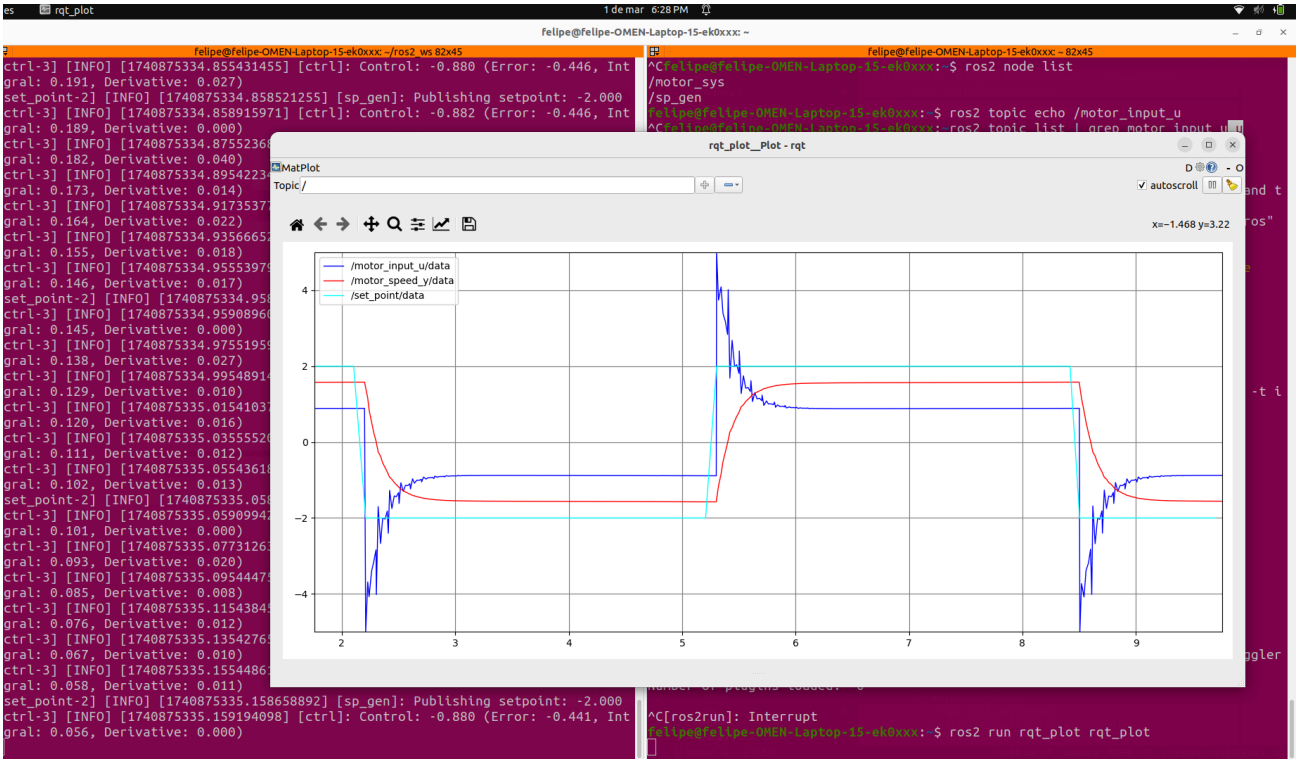
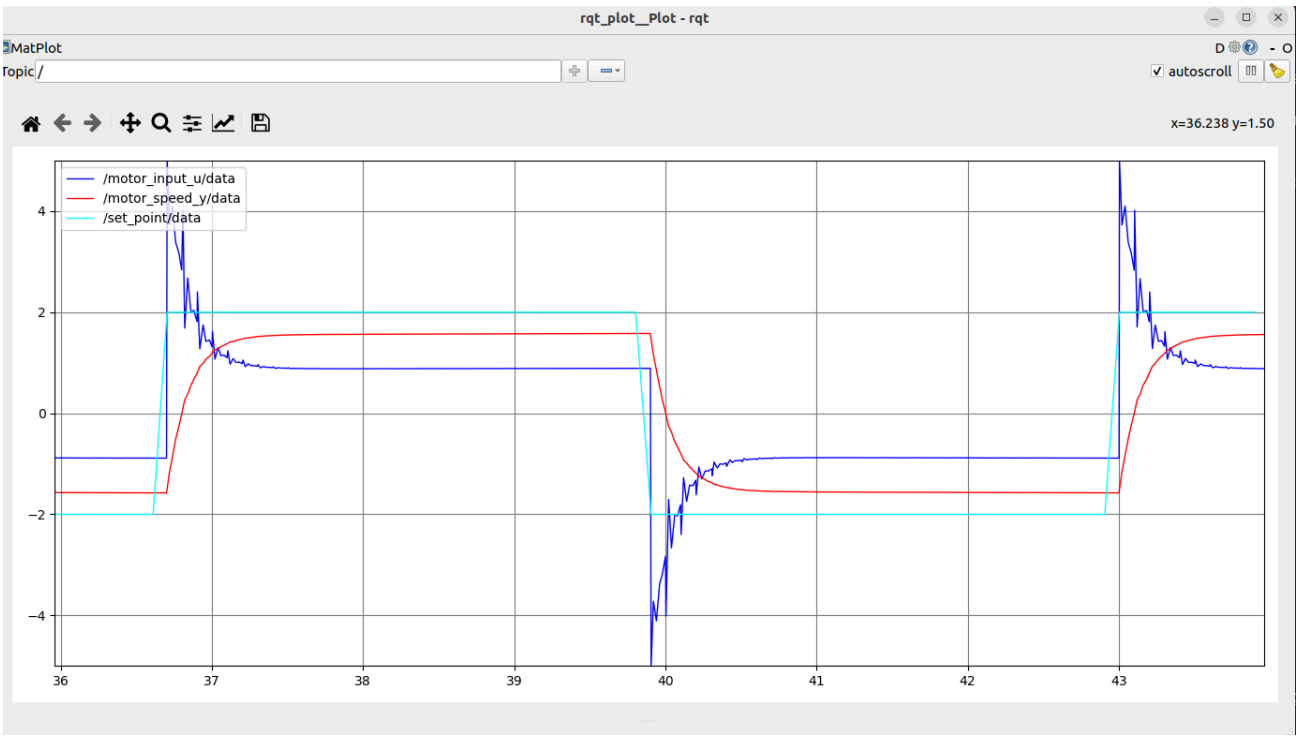
Felipe de Jesús García García A01705893

Mini-Reto. Semana 2






rqt_plot
1 de mar 6:28 PM
felipe@felipe-OMEN-Laptop-15-ek0xxx: ~
felipe@felipe-OMEN-Laptop-15-ek0xxx: ~/ros2_ws 82x45
felipe@felipe-OMEN-Laptop-15-ek0xxx: ~ 82x45
ctrl-3] [INFO] [1740875334.855431455] [ctrl]: Control: -0.880 (Error: -0.446, Int
gral: 0.191, Derivative: 0.027)
set_point-2] [INFO] [1740875334.858521255] [sp_gen]: Publishing setpoint: -2.000
ctrl-3] [INFO] [1740875334.858915971] [ctrl]: Control: -0.882 (Error: -0.446, Int
gral: 0.189, Derivative: 0.000)
ctrl-3] [INFO] [1740875334.875523
gral: 0.182, Derivative: 0.040)
ctrl-3] [INFO] [1740875334.895422
gral: 0.173, Derivative: 0.014)
ctrl-3] [INFO] [1740875334.917353
gral: 0.164, Derivative: 0.022)
ctrl-3] [INFO] [1740875334.935666
gral: 0.155, Derivative: 0.018)
ctrl-3] [INFO] [1740875334.955539
gral: 0.146, Derivative: 0.017)
set_point-2] [INFO] [1740875334.95
ctrl-3] [INFO] [1740875334.959089
gral: 0.145, Derivative: 0.000)
ctrl-3] [INFO] [1740875334.975519
gral: 0.138, Derivative: 0.027)
ctrl-3] [INFO] [1740875334.995489
gral: 0.129, Derivative: 0.010)
ctrl-3] [INFO] [1740875335.015410
gral: 0.120, Derivative: 0.016)
ctrl-3] [INFO] [1740875335.035555
gral: 0.111, Derivative: 0.012)
ctrl-3] [INFO] [1740875335.055436
gral: 0.102, Derivative: 0.013)
set_point-2] [INFO] [1740875335.05
ctrl-3] [INFO] [1740875335.059099
gral: 0.101, Derivative: 0.000)
ctrl-3] [INFO] [1740875335.077312
gral: 0.093, Derivative: 0.020)
ctrl-3] [INFO] [1740875335.095447
gral: 0.085, Derivative: 0.008)
ctrl-3] [INFO] [1740875335.115438
gral: 0.076, Derivative: 0.012)
ctrl-3] [INFO] [1740875335.135427
gral: 0.067, Derivative: 0.010)
ctrl-3] [INFO] [1740875335.155448
gral: 0.058, Derivative: 0.011)
set_point-2] [INFO] [1740875335.158658892] [sp_gen]: Publishing setpoint: -2.000
ctrl-3] [INFO] [1740875335.159194098] [ctrl]: Control: -0.880 (Error: -0.441, Int
gral: 0.056, Derivative: 0.000)
^Cfelipe@felipe-OMEN-Laptop-15-ek0xxx:~$ ros2 node list
/motor_sys
/sp_gen
felipe@felipe-OMEN-Laptop-15-ek0xxx:~$ ros2 topic echo /motor_input_u
^Cfelipe@felipe-OMEN-Laptop-15-ek0xxx:~$ ros2 topic list | grep motor_input_u
^C[ros2run]: Interrupt
felipe@felipe-OMEN-Laptop-15-ek0xxx:~$ ros2 run rqt_plot rqt_plot
rqt_plot__Plot - rqt
MatPlot
Topic /
autoscroll
x=−1.468 y=3.22
/motor_input_u/data
/motor_speed_y/data
/set_point/data


rqt_plot__Plot - rqt
MatPlot
Topic /
autoscroll
x=36.238 y=1.50
/motor_input_u/data
/motor_speed_y/data
/set_point/data

```
felipe@felipe-OMEN-Laptop-15-ek0xxx:~/ros2_ws$ ros2 topic echo /motor_input_u
data: -0.876878023147583
---
data: -0.8784865736961365
---
data: -0.8752244114875793
---
data: -0.8776495456695557
---
data: -0.8766515851020813
---
data: -0.877083957195282
---
data: -0.8769581317901611
---
data: -0.8782661557197571
---
data: -0.8756046295166016
---
data: -0.8776744604110718
---
data: -0.8769126534461975
```

```
---
^Cfelipe@felipe-OMEN-Laptop-15-ek0xxx:~/ros2_ws$ ros2 topic echo /motor_speed_y
data: 1.5764446258544922
---
data: 1.5766761302947998
---
data: 1.5767627954483032
---
data: 1.5769550800323486
---
data: 1.5771055221557617
---
data: 1.5772732496261597
---
data: 1.5775038003921509
---
data: 1.5775913000106812
---
data: 1.5777829885482788
---
data: 1.5779333114624023
---
```

```
^Cfelipe@felipe-OMEN-Laptop-15-ek0xxx:~/ros2_ws$ ros2 topic echo /set_point
data: -2.0
---
data: -2.0
---
data: -2.0
---
data: -2.0
---
data: -2.0
---
data: 2.0
---
data: 2.0
---
data: 2.0
---
data: 2.0
---
data: 2.0
```

En este mini-reto, el objetivo fue diseñar e implementar un **controlador PID (Proporcional-Integral-Derivativo)** en ROS2 para regular la velocidad de un sistema

dinámico simulado. Para lograr esto, el controlador debía recibir una referencia de velocidad (/set_point), compararla con la velocidad medida (/motor_speed_y) y generar una señal de control (/motor_input_u) que permitiera alcanzar y mantener la referencia deseada de manera estable.

Finalmente, se validó el funcionamiento del controlador utilizando herramientas como **rqt_graph y PlotJuggler**, donde se pudo visualizar la evolución del setpoint, la respuesta del sistema y la señal de control. Con los ajustes adecuados de Kp=2.0, Ki=0.5 y Kd=0.05, el sistema logró un mejor seguimiento de la referencia, con menor error y mayor estabilidad en la respuesta.