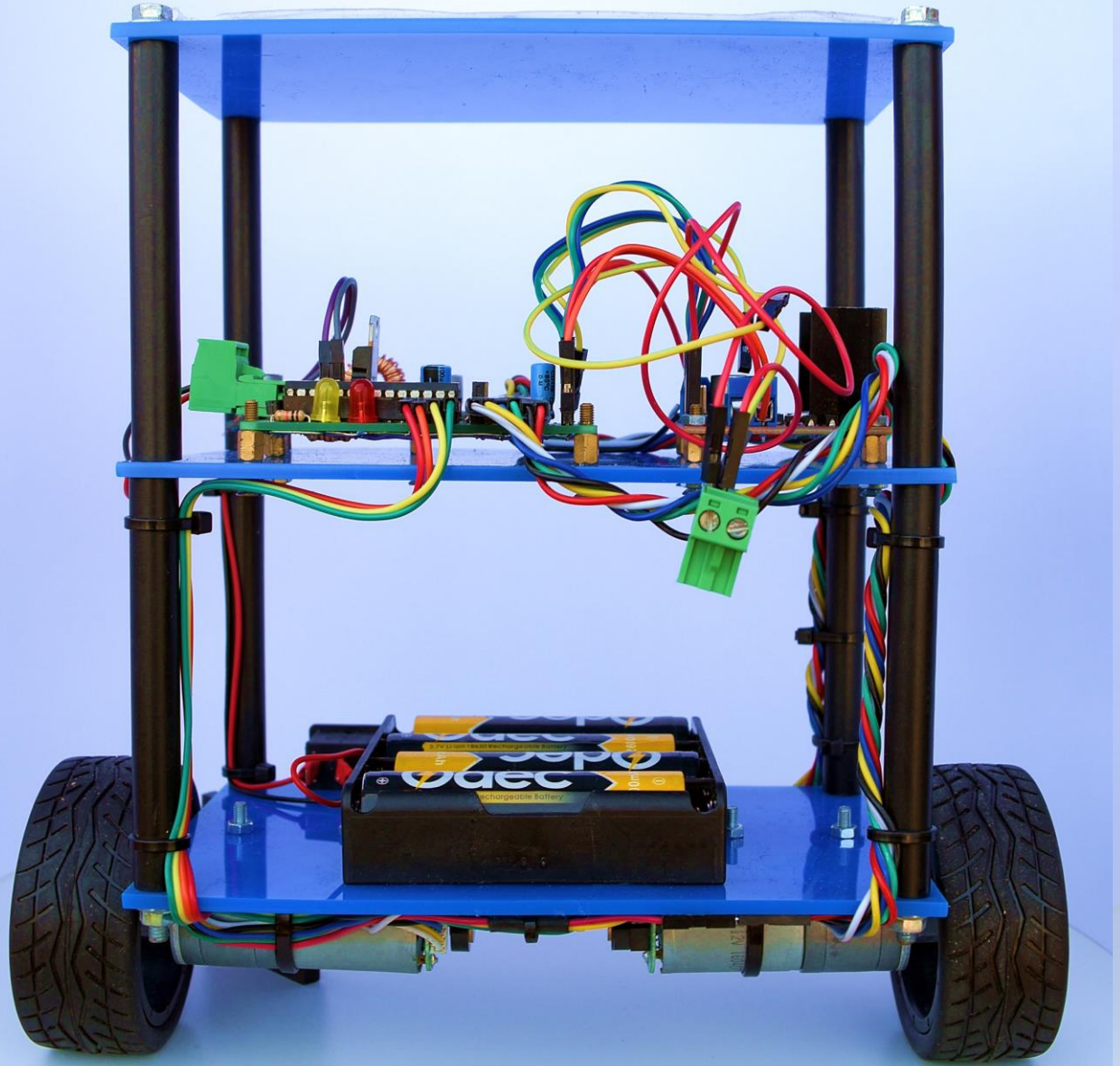
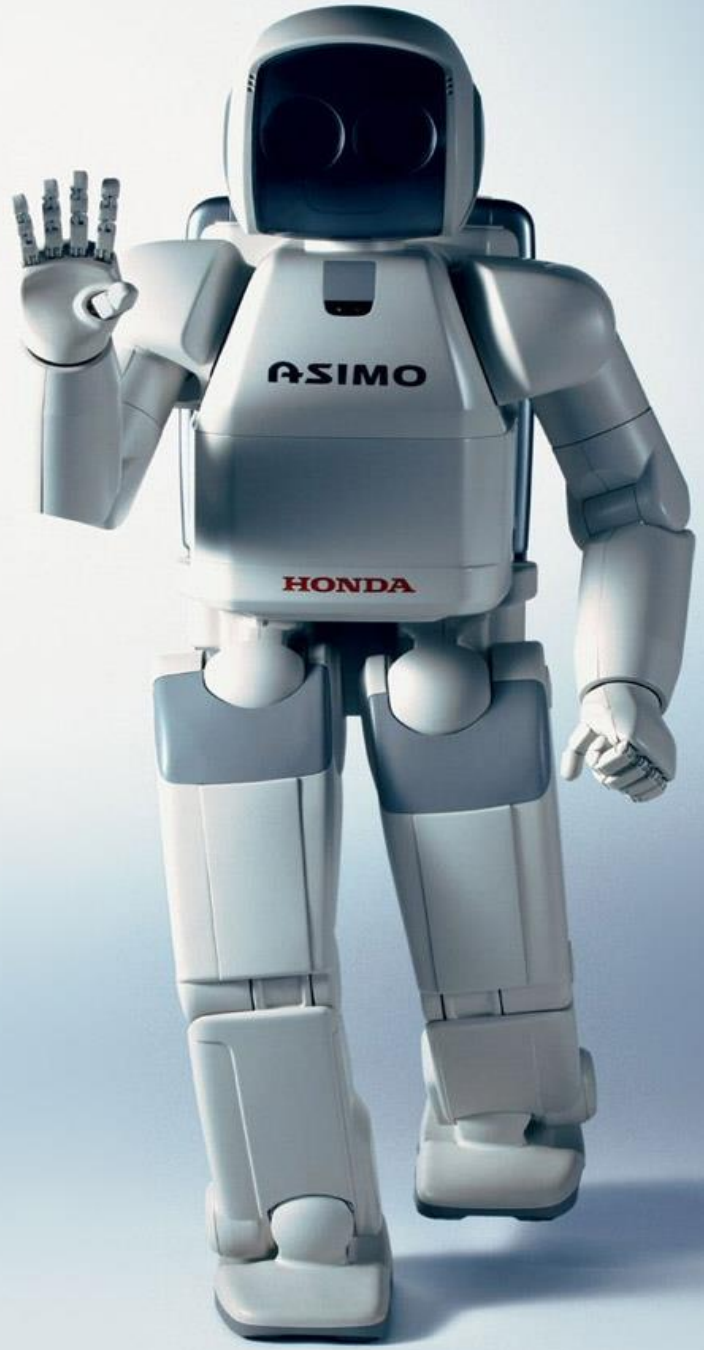
Robot auto bilanciante

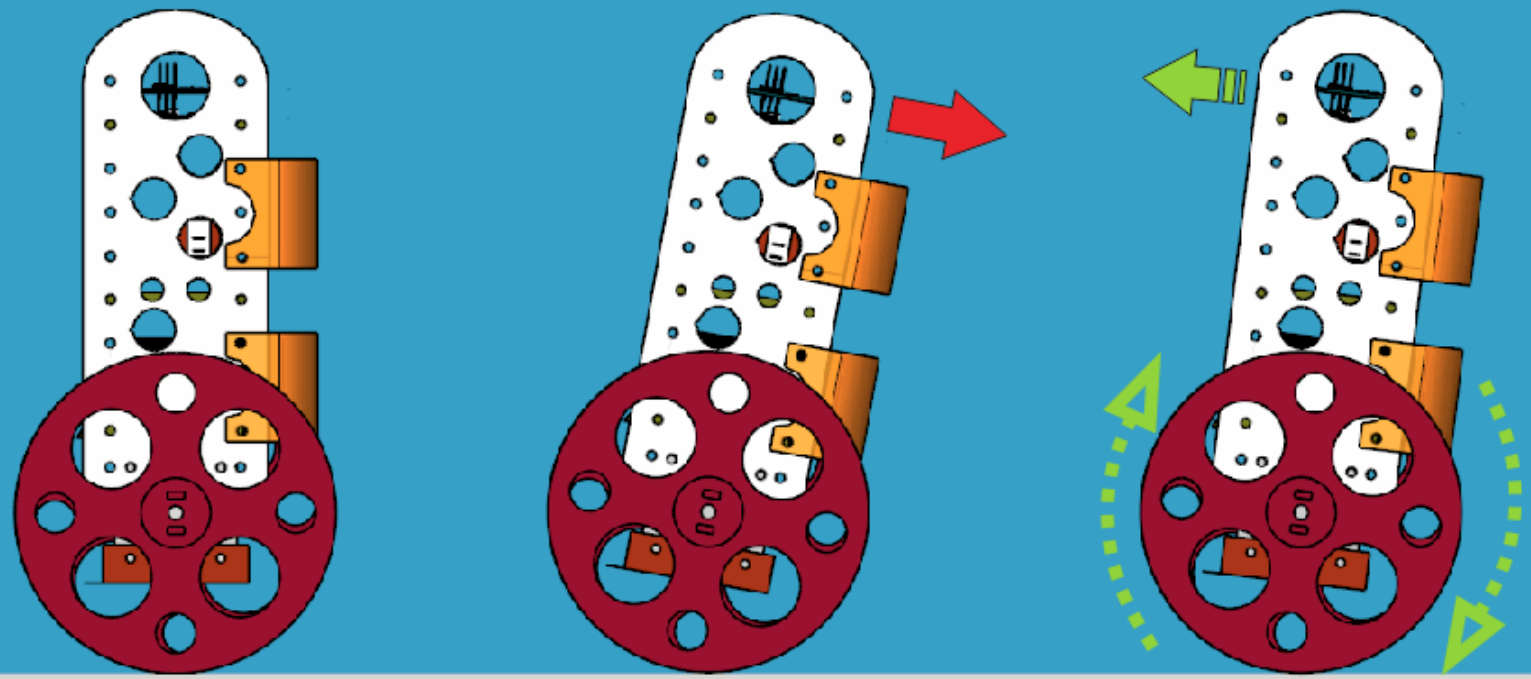


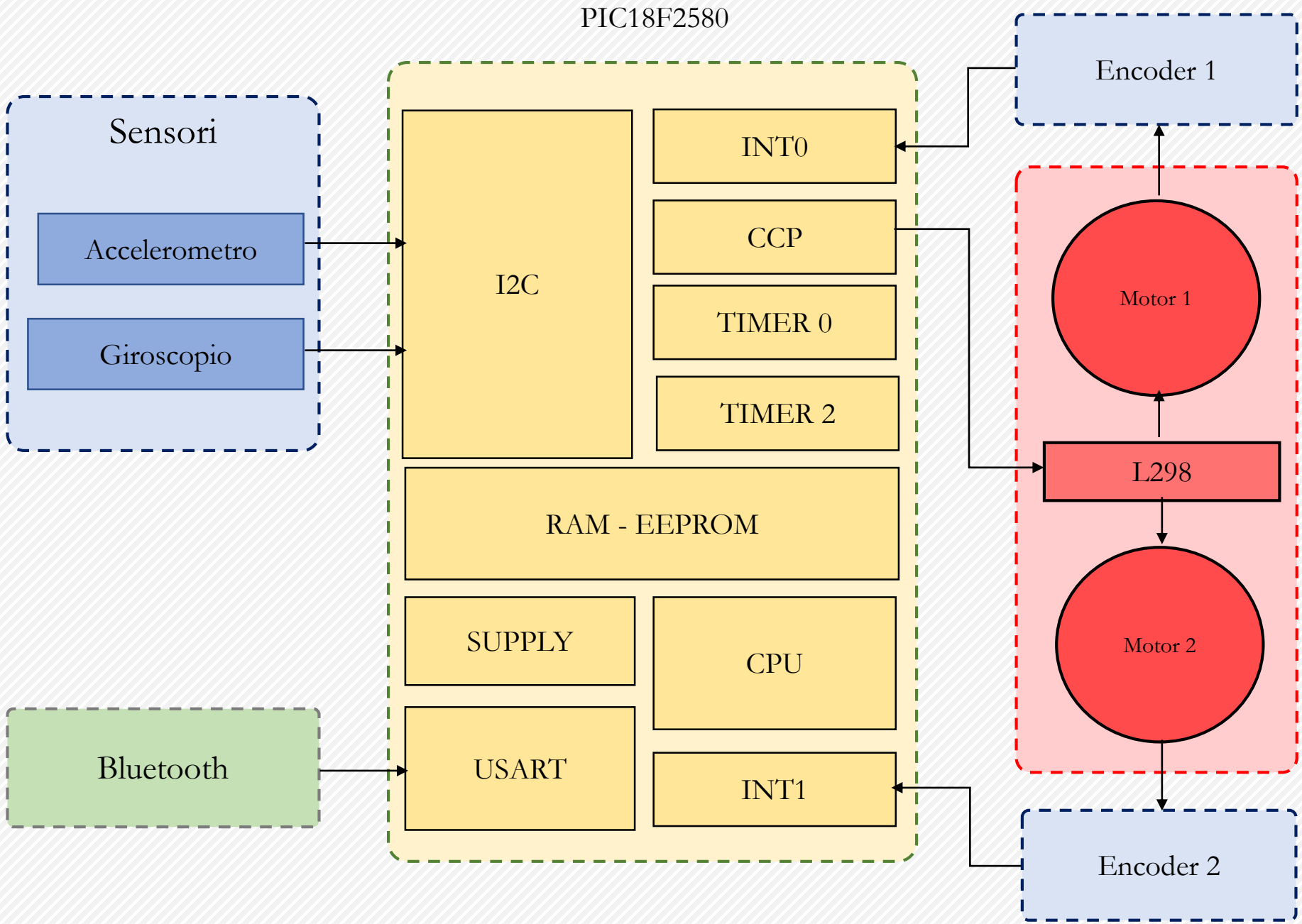

Segway PT

Honda ASIMO



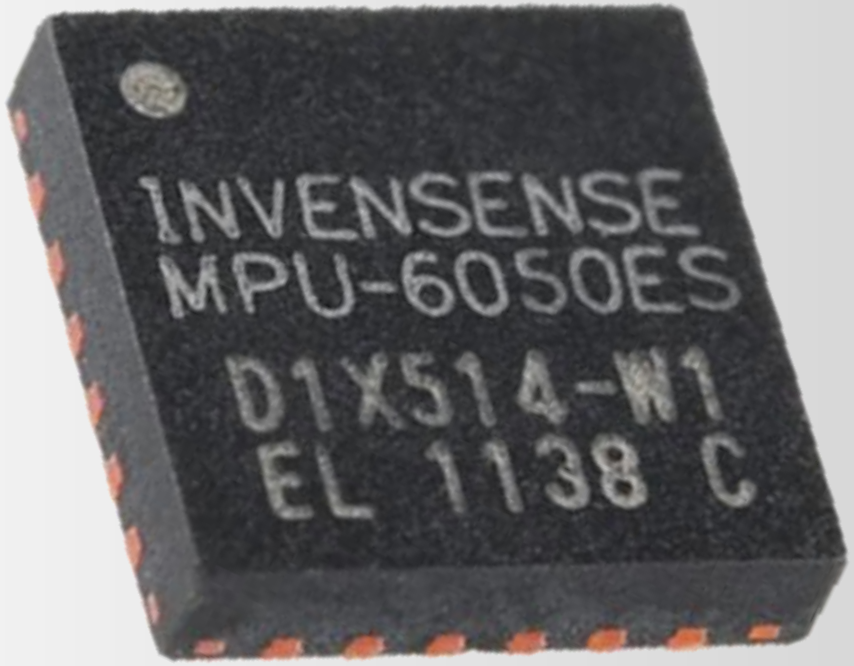
Balanduino

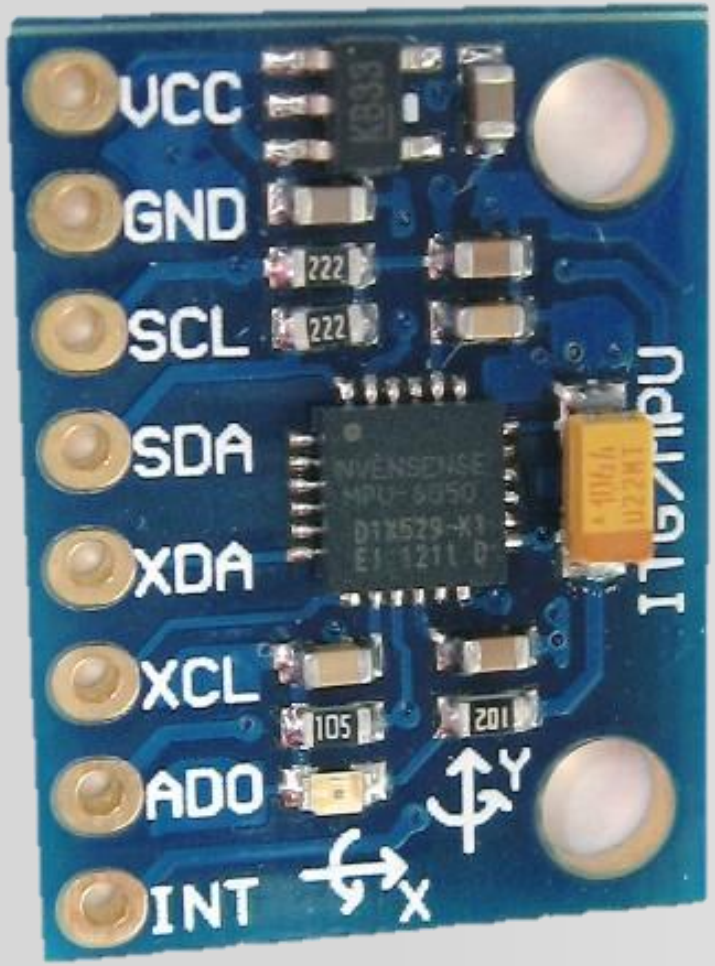



PIC18F2580
Sensori
Accelerometro
Giroscopio
I2C
INT0
CCP
TIMER 0
TIMER 2
RAM - EEPROM
SUPPLY
CPU
USART
INT1
Bluetooth
Encoder 1
Motor 1
L298
Motor 2
Encoder 2

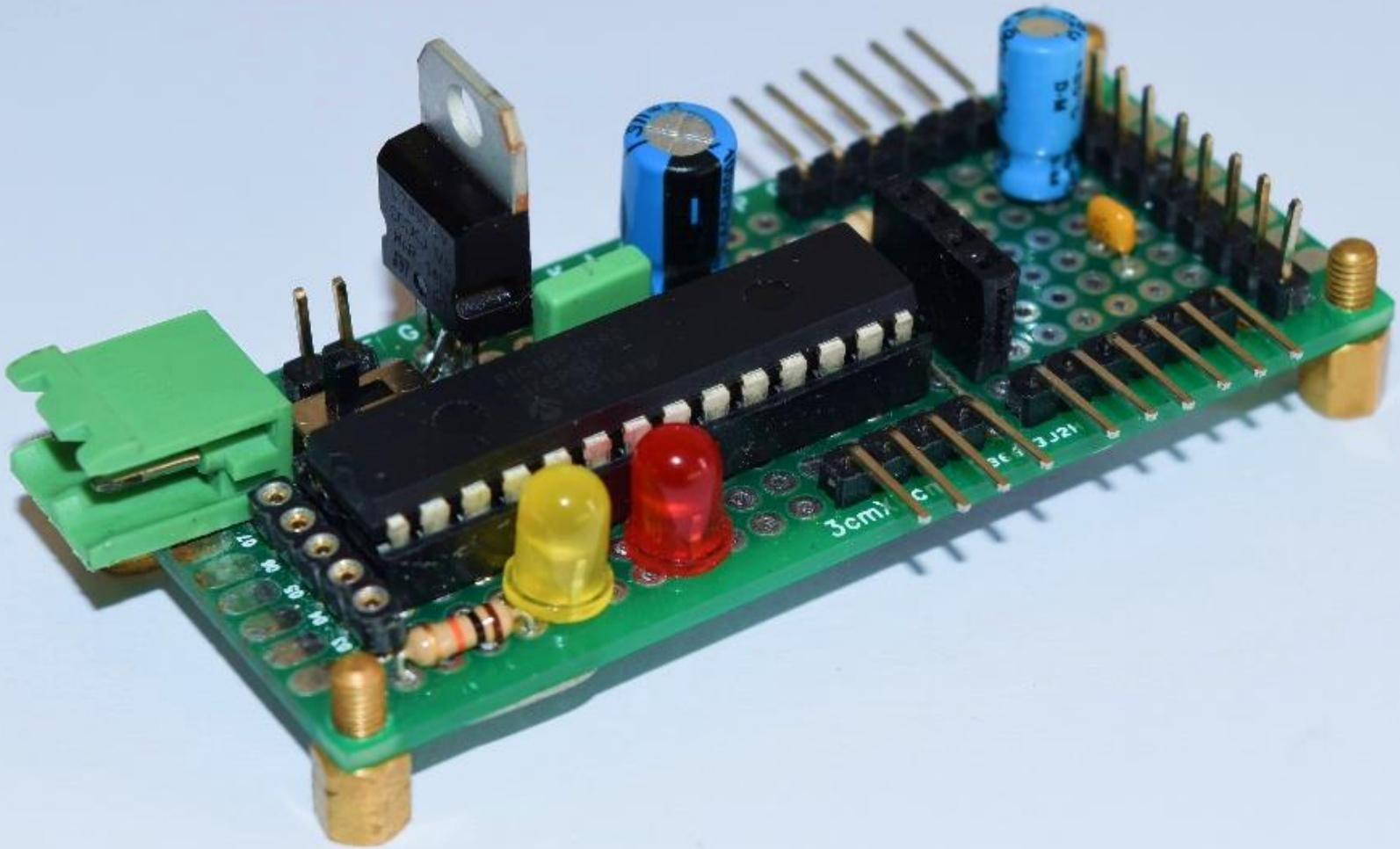
Sensori

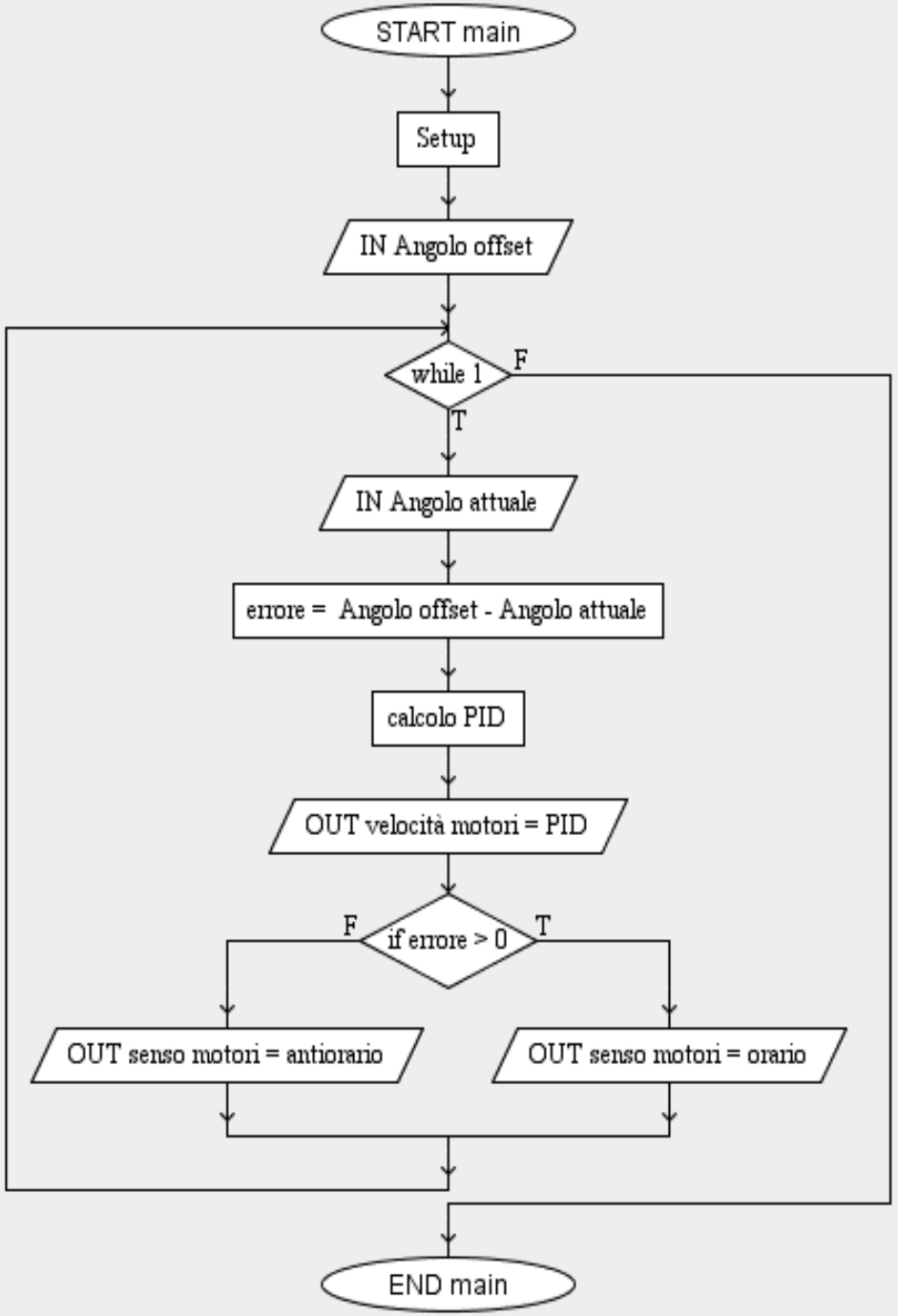
accelerometro e *giroscopio*

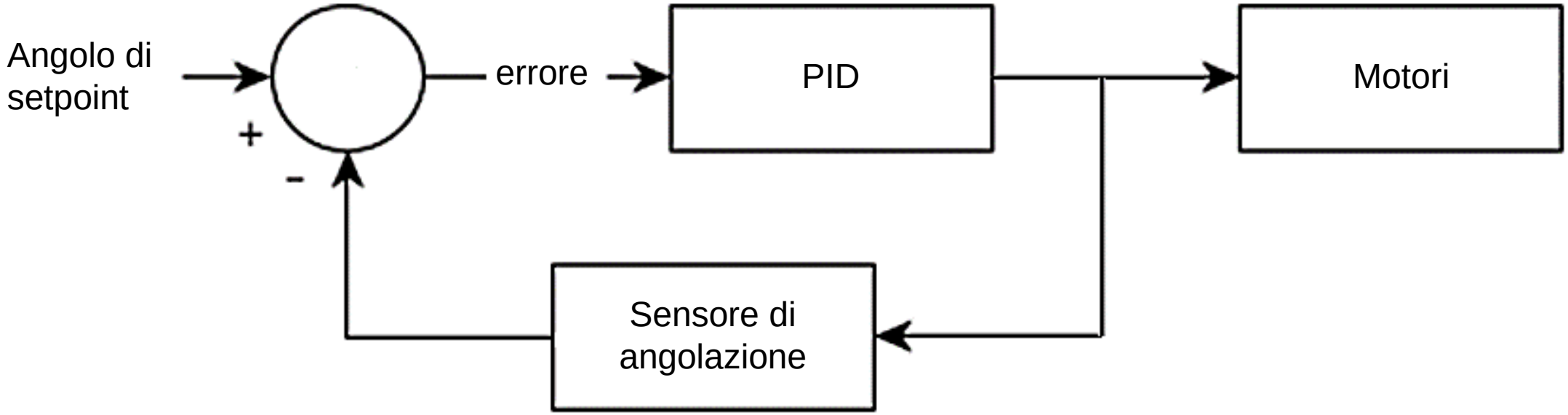




Scheda madre



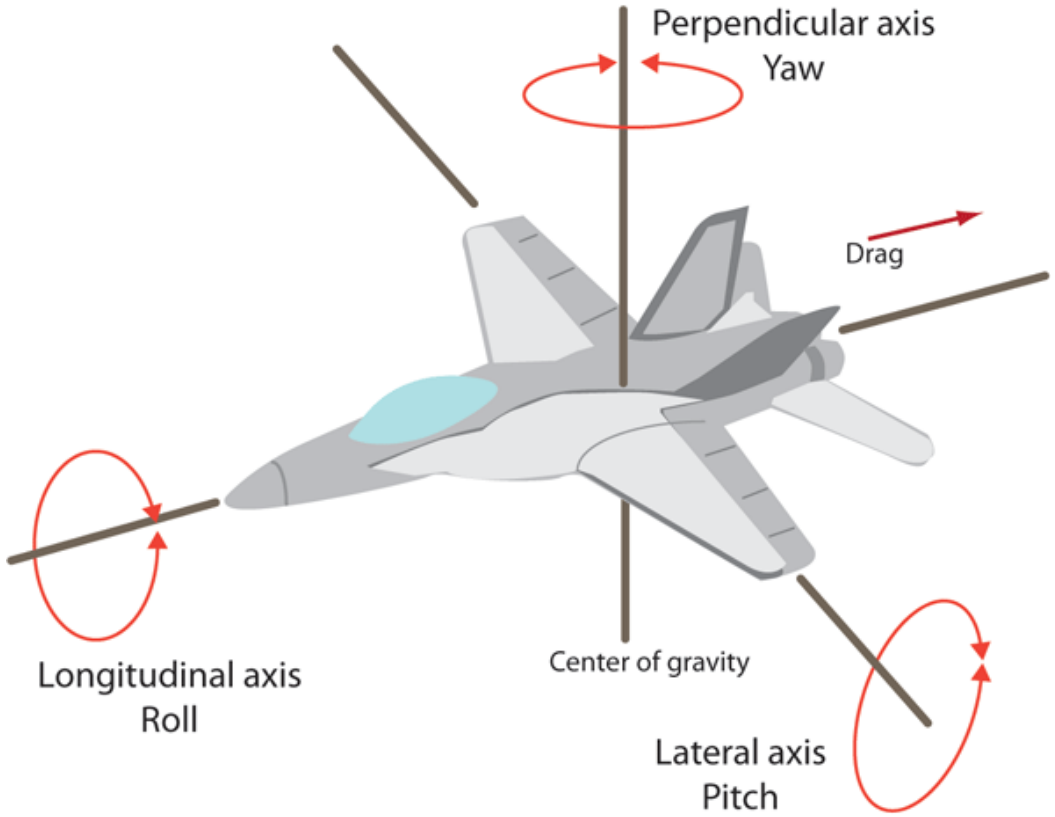

START main
Setup
IN Angolo offset
while 1
F
T
IN Angolo attuale
errore = Angolo offset - Angolo attuale
calcolo PID
OUT velocità motori = PID
F
if errore > 0
T
OUT senso motori = antiorario
OUT senso motori = orario
END main


Angolo di
setpoint
+
-
errore
PID
Motori
Sensore di
angolazione

ACQUISIZIONE ACCELERAZIONE E VELOCITÀ ANGOLARE, E CONVERSIONE IN UN ANGOLO

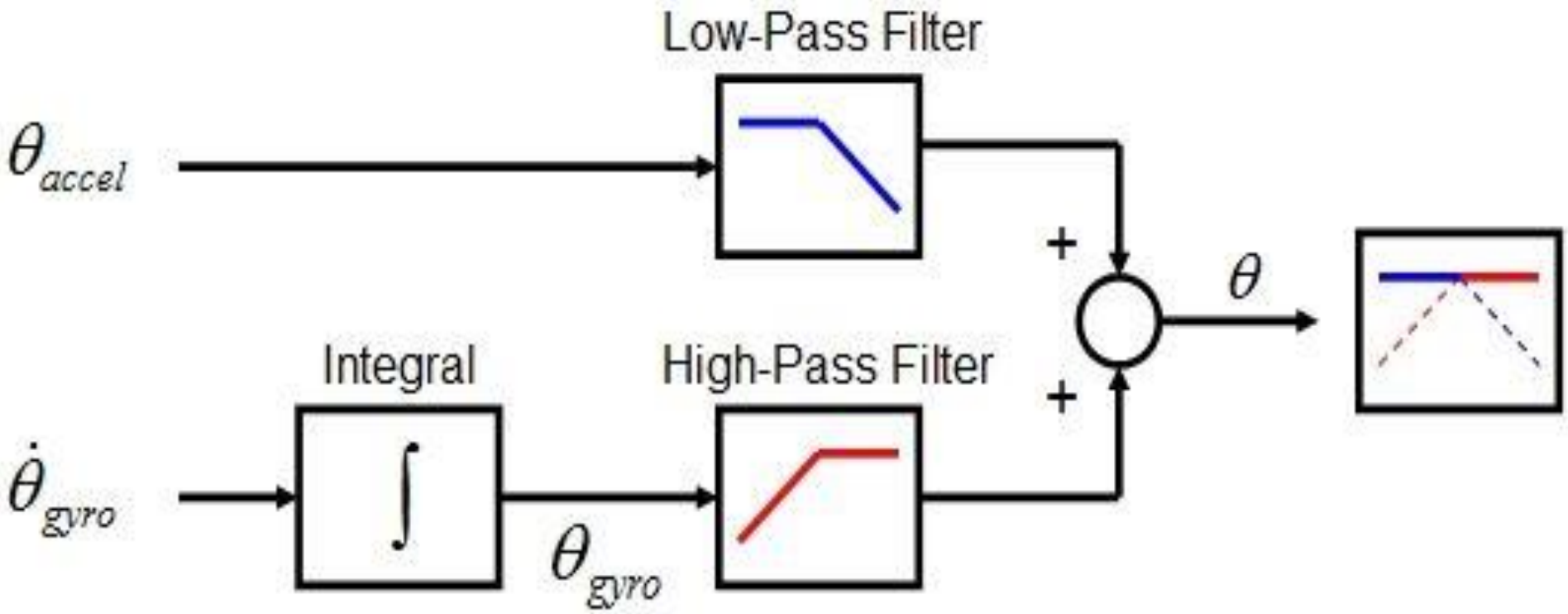
$$\theta_{accel} = arctg\left(\frac{acc_x}{\sqrt{acc_y{}^2 + acc_z{}^2}}\right)$$

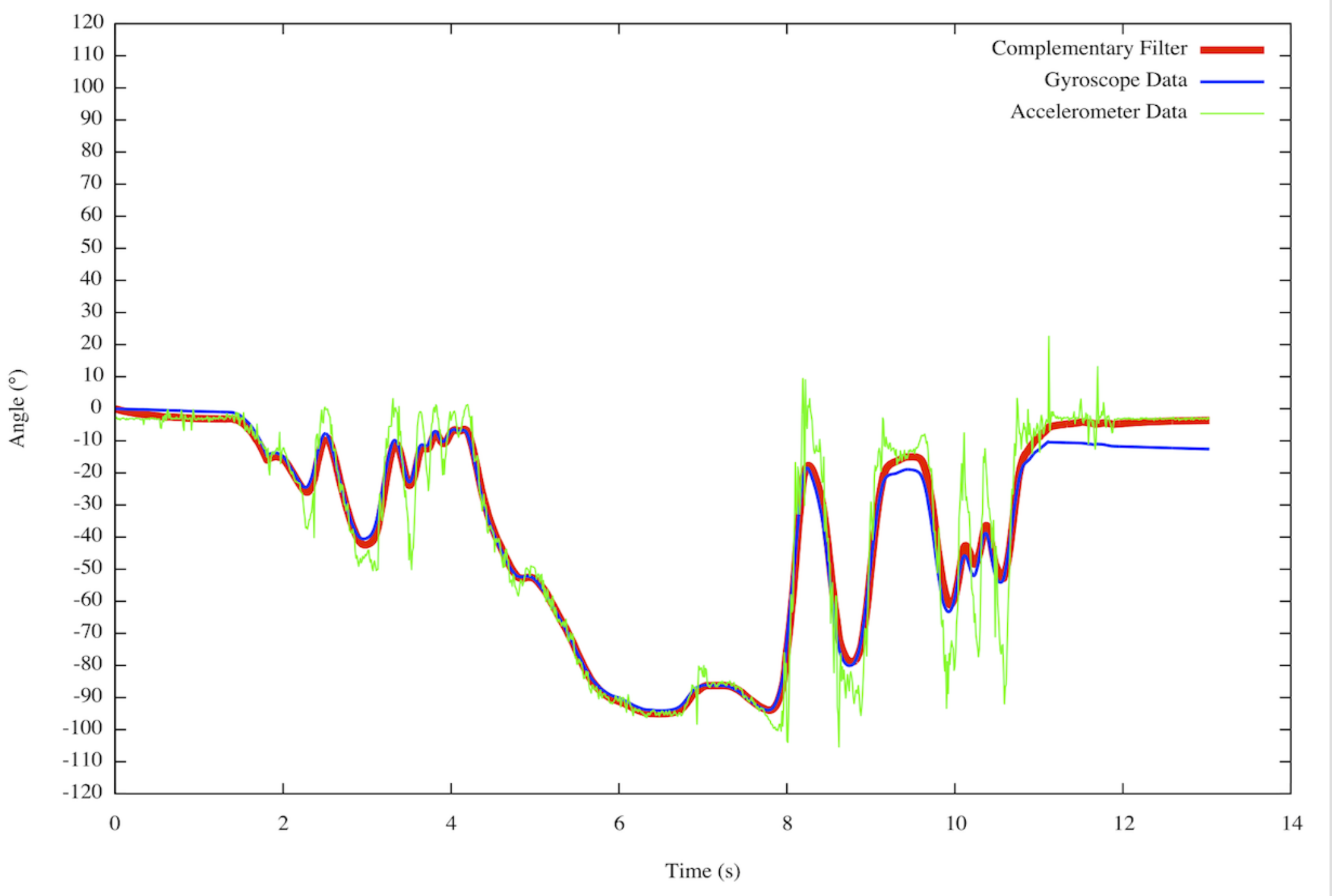
$$\int_0^t \dot{\theta_{gyro}}(t)\,dt \cong \sum \dot{\theta_{gyro}}(t) \cdot t_{sample}$$

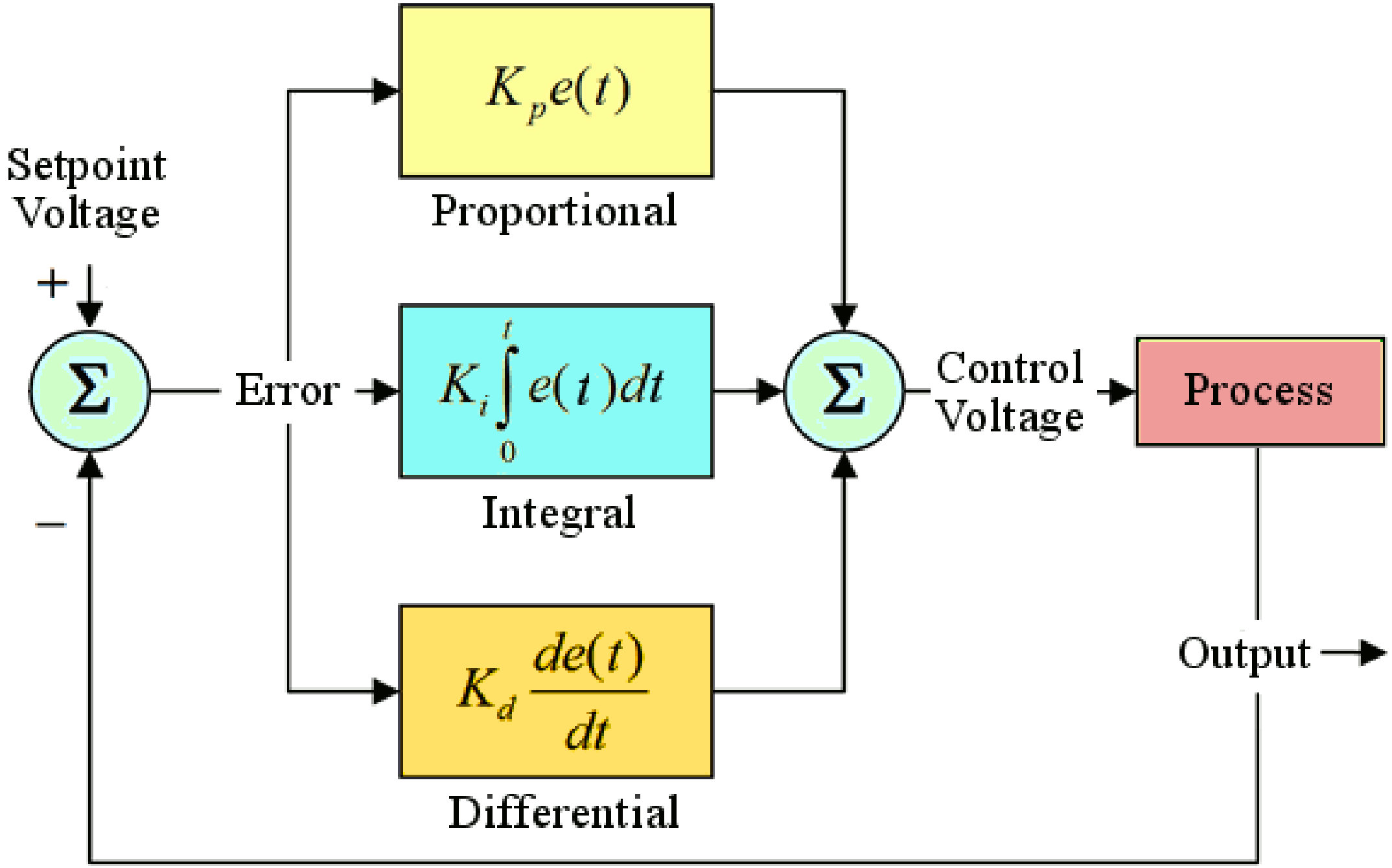


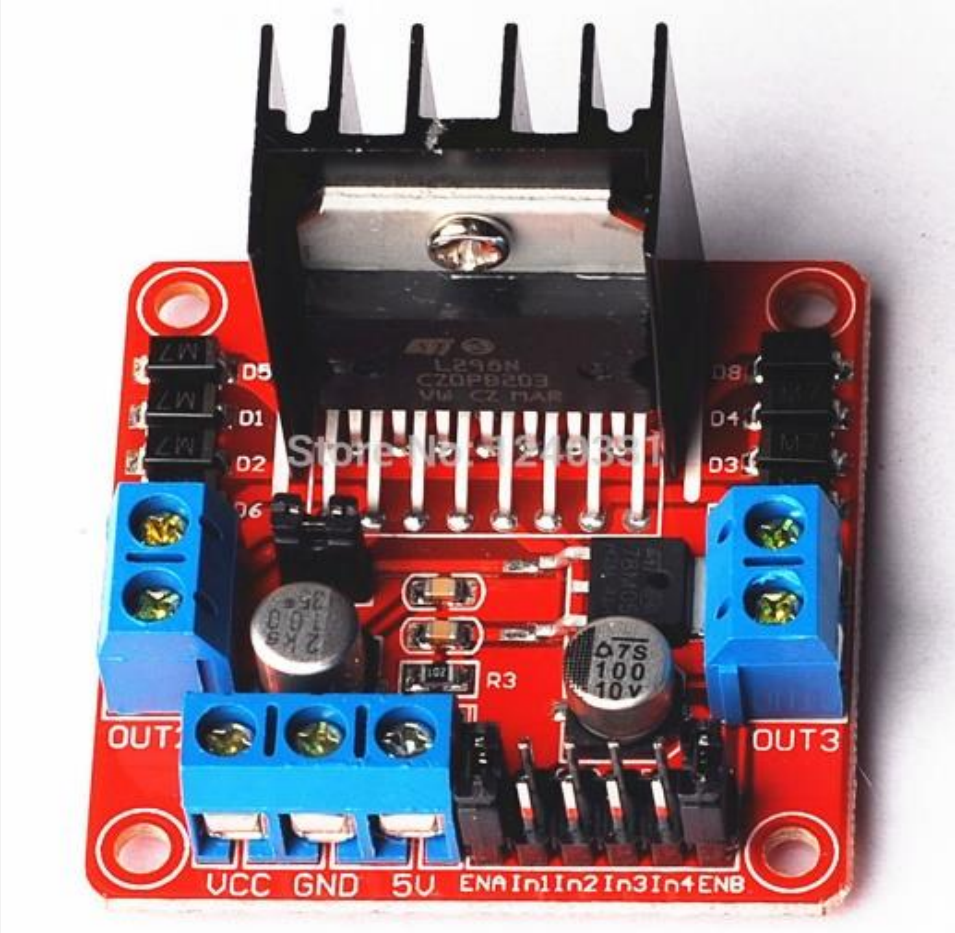
UNISCO I DATI CALCOLATI UTILIZZANDO IL FILTRO COMPLEMENTARE

$$\theta_{filter} = \alpha \cdot \left(\theta_{filter} + \left(\dot{\theta_{gyro}}(t) \cdot t_{sample}\right)\right) + (1 - \alpha) \cdot \theta_{accel}$$

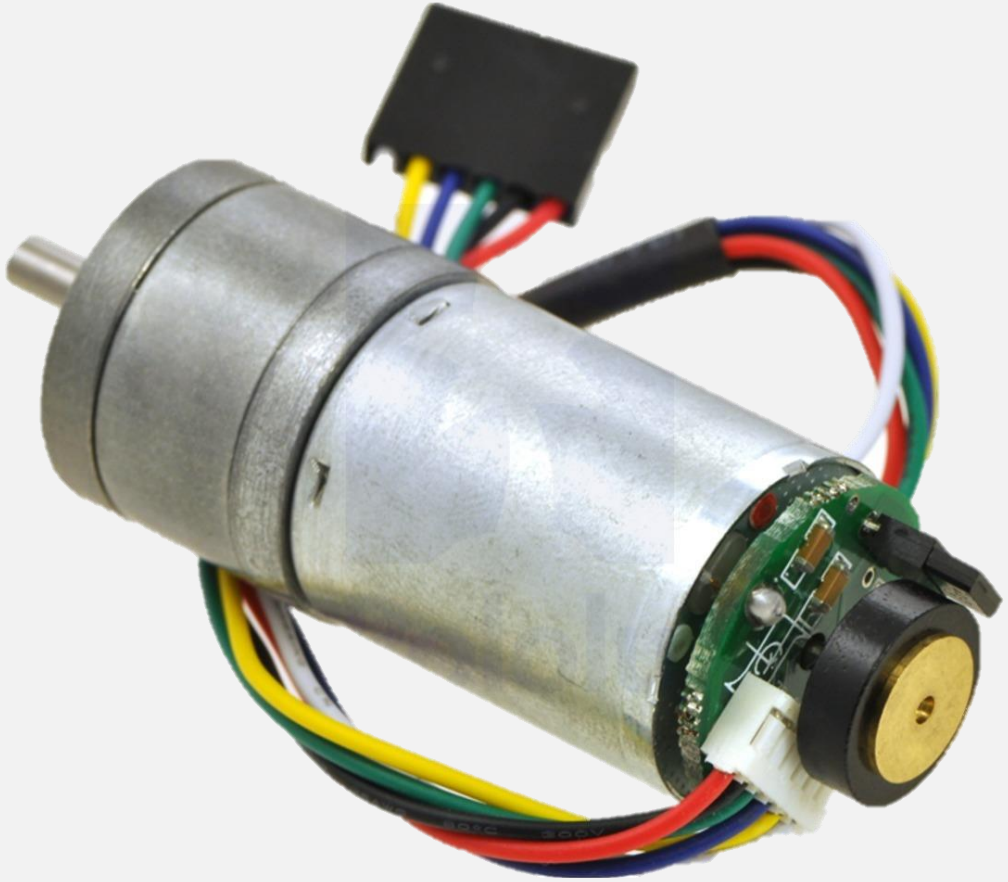



Complementary Filter
Gyroscope Data
Accelerometer Data
Angle (°)
Time (s)
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
0
2
4
6
8
10
12
14


$K_p e(t)$
Proportional
Setpoint
Voltage
+
−
Σ
Error
$K_i \int_0^t e(t)dt$
Integral
Σ
Control
Voltage
Process
$K_d \frac{de(t)}{dt}$
Differential
Output

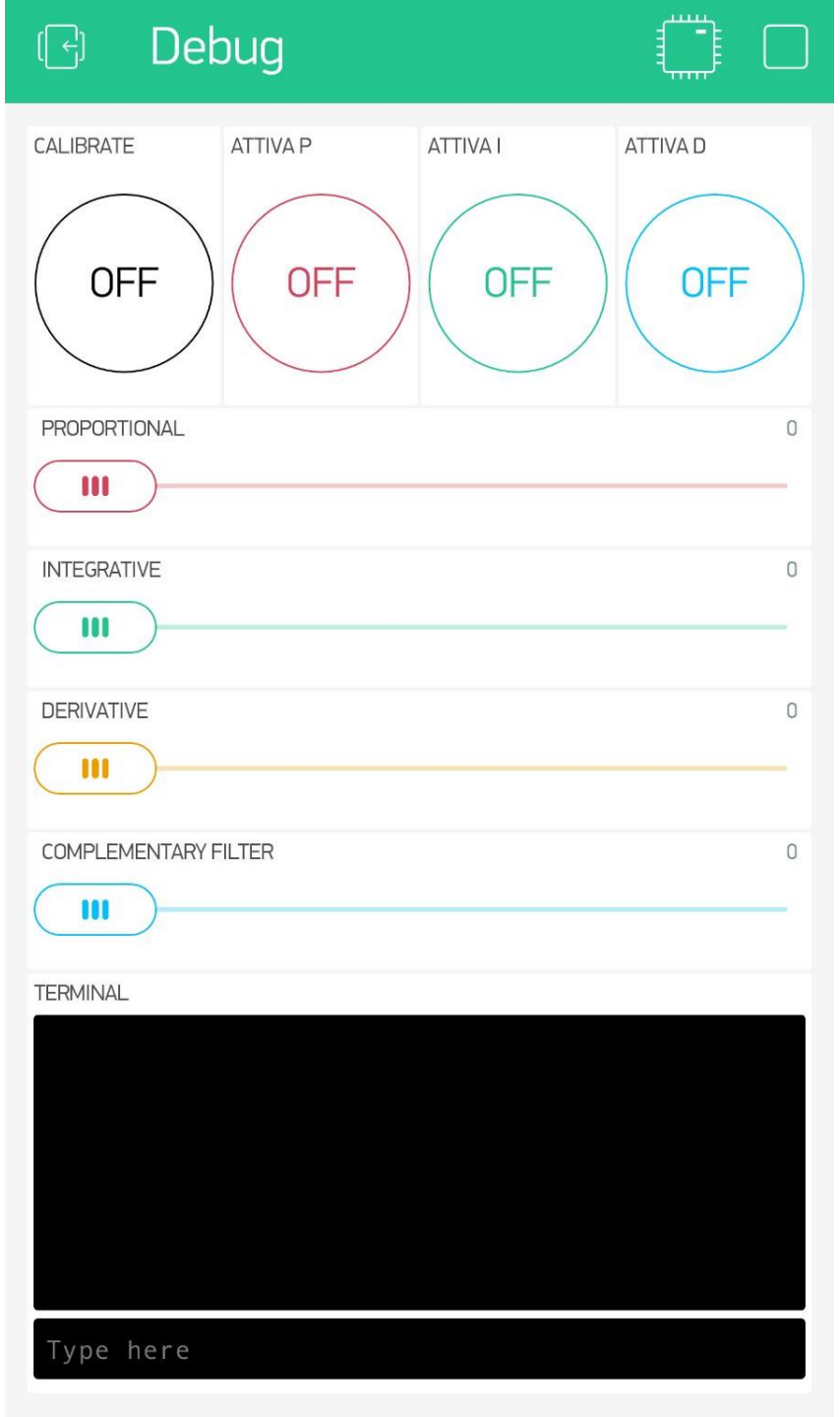


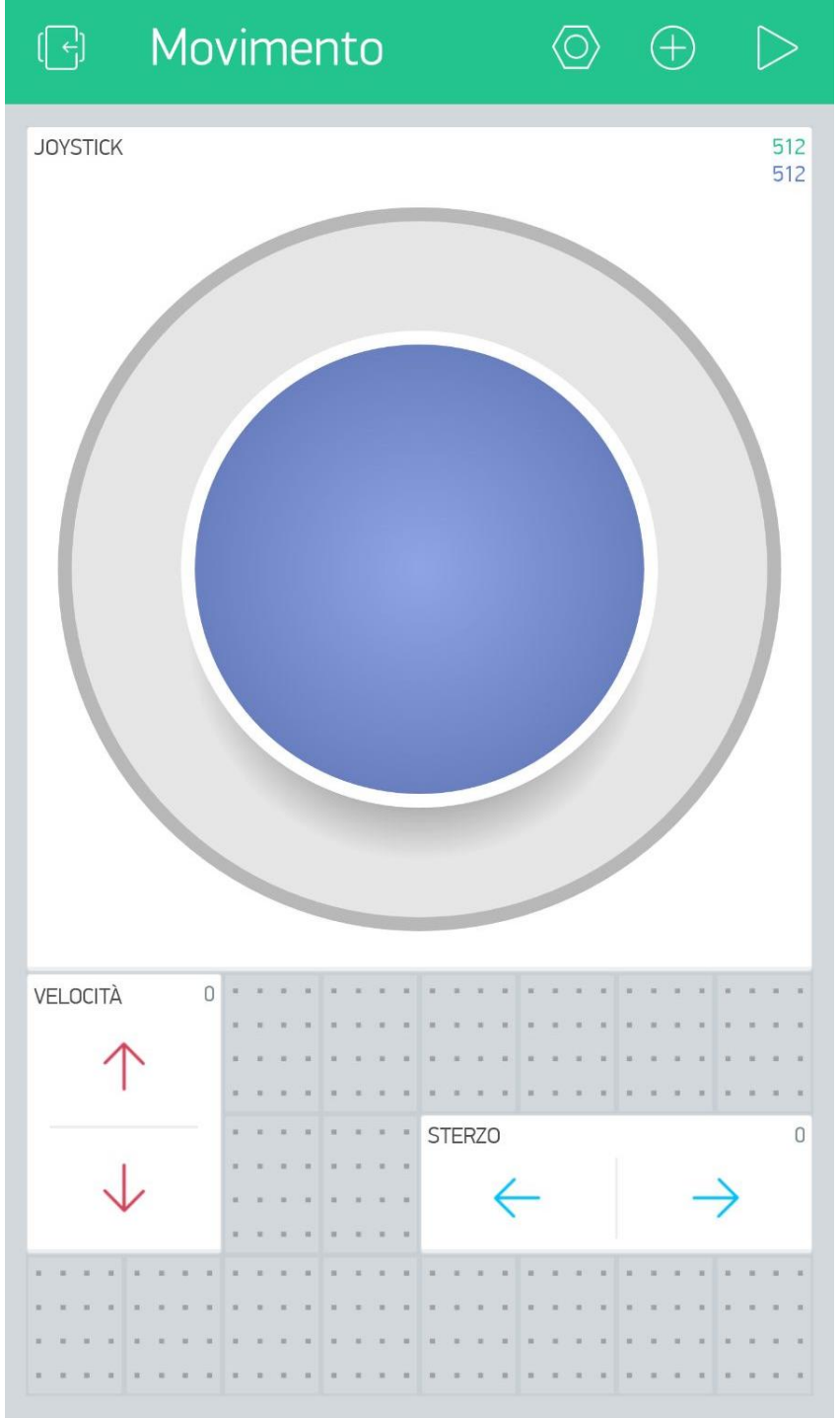
L298N



Motore DC Pololu 12V

Bluetooth™


Debug
CALIBRATE
OFF
ATTIVA P
OFF
ATTIVA I
OFF
ATTIVA D
OFF
PROPORTIONAL
0
INTEGRATIVE
0
DERIVATIVE
0
COMPLEMENTARY FILTER
0
TERMINAL
Type here


Movimento
JOYSTICK
512
512
VELOCITÀ
0
STERZO
0