HSA Project: Hand-Gesture-Controlled Obstacle Avoiding Robot with Haptic Feedback

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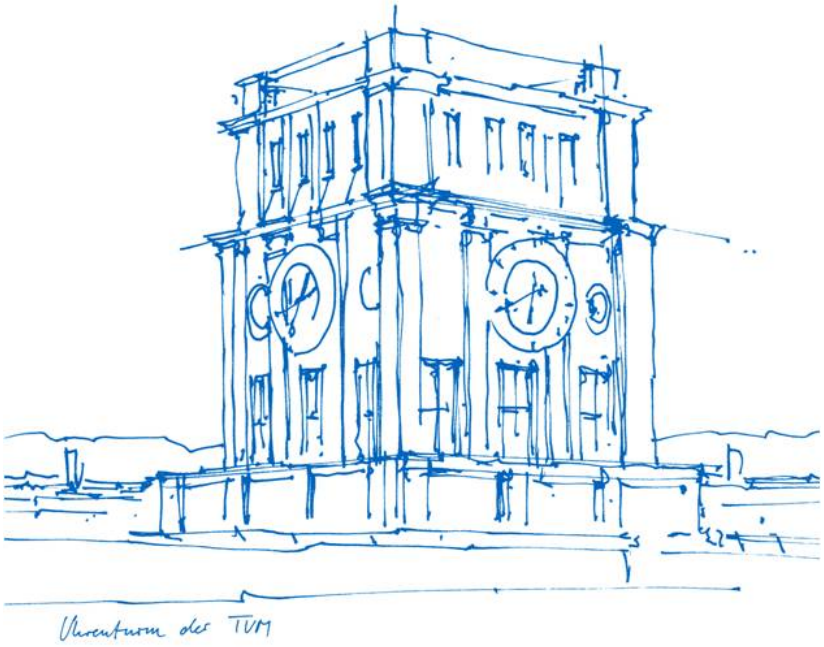


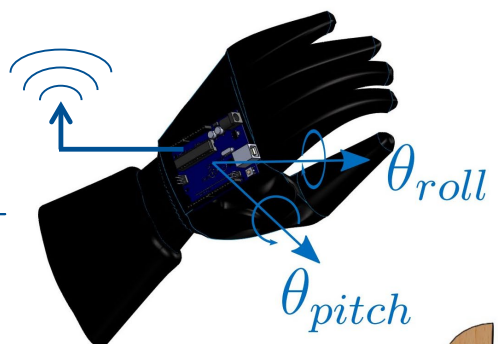
Hardware

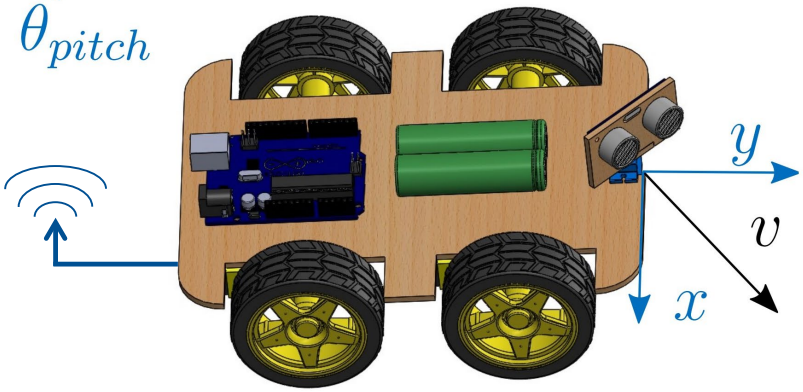
MCU (Atmega328P)

Radio TX/RX module

6Dof IMU

Vibration Motor





MCU (Atmega328P)

Radio TX/RX module

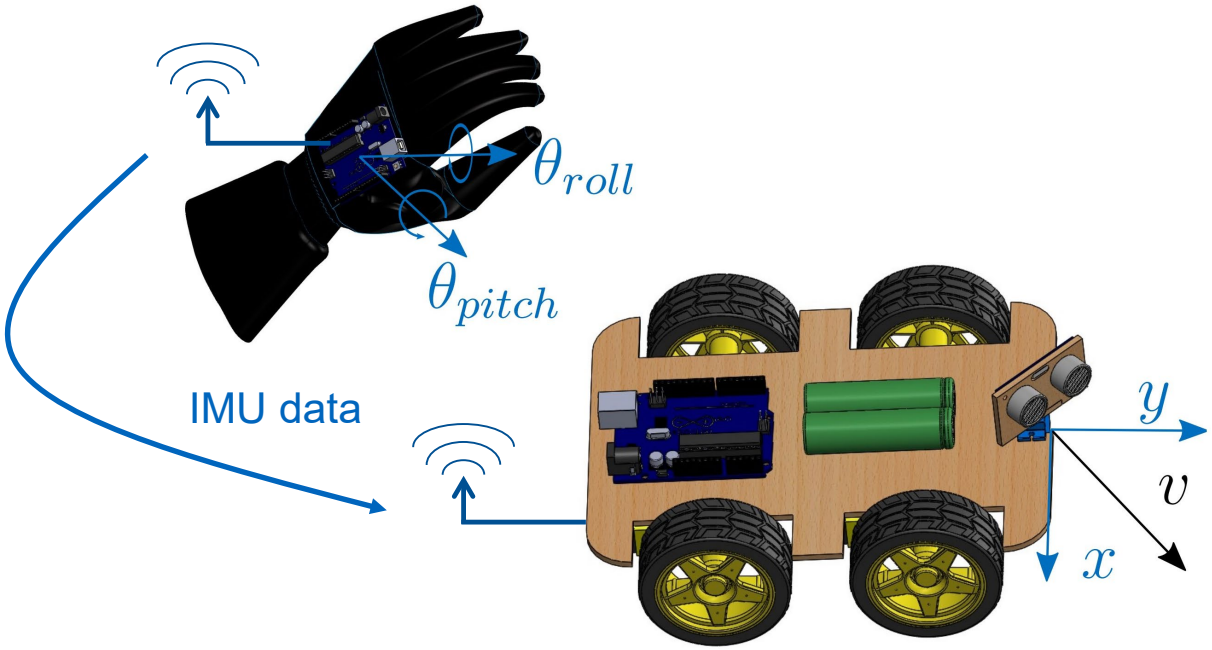
Ultrasonic sensor

Infrared sensors

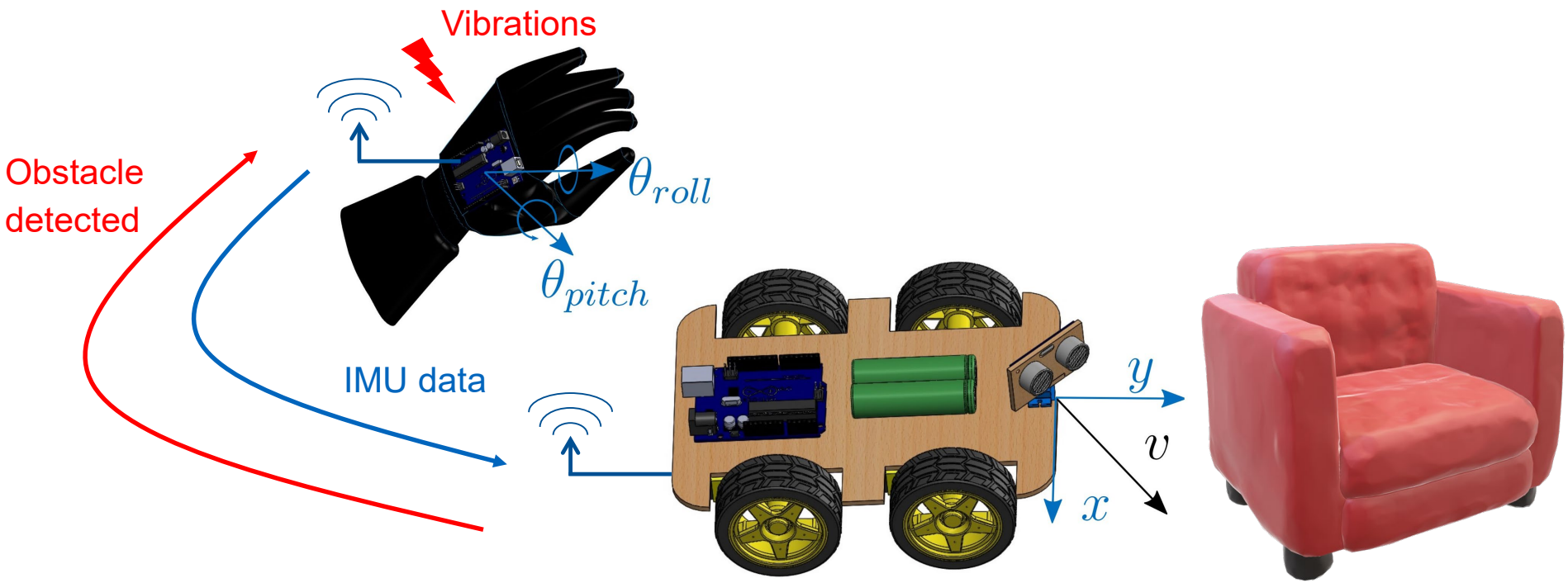
Servo

Gear Motors H-Bridge

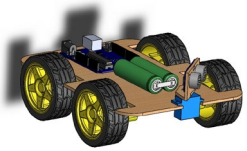
System Operation



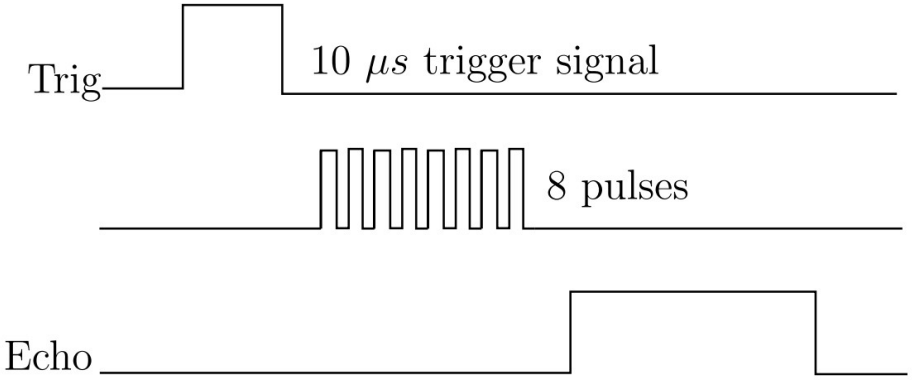
System Operation

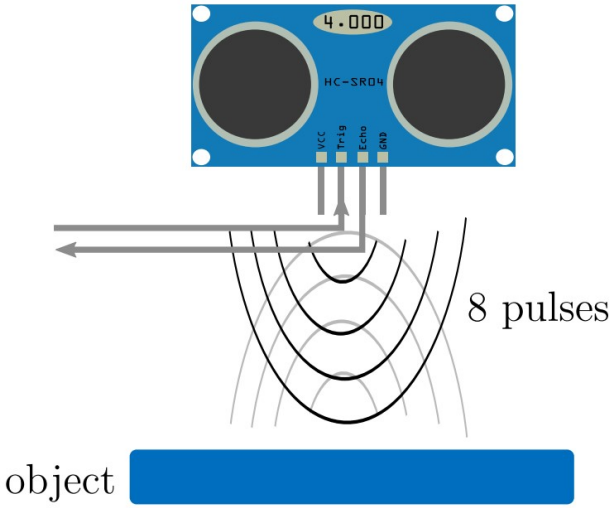


Controlled Unit: Obstacle Avoiding Robot

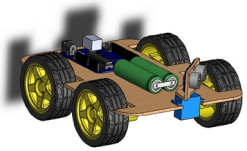


Ultrasonic sensor:

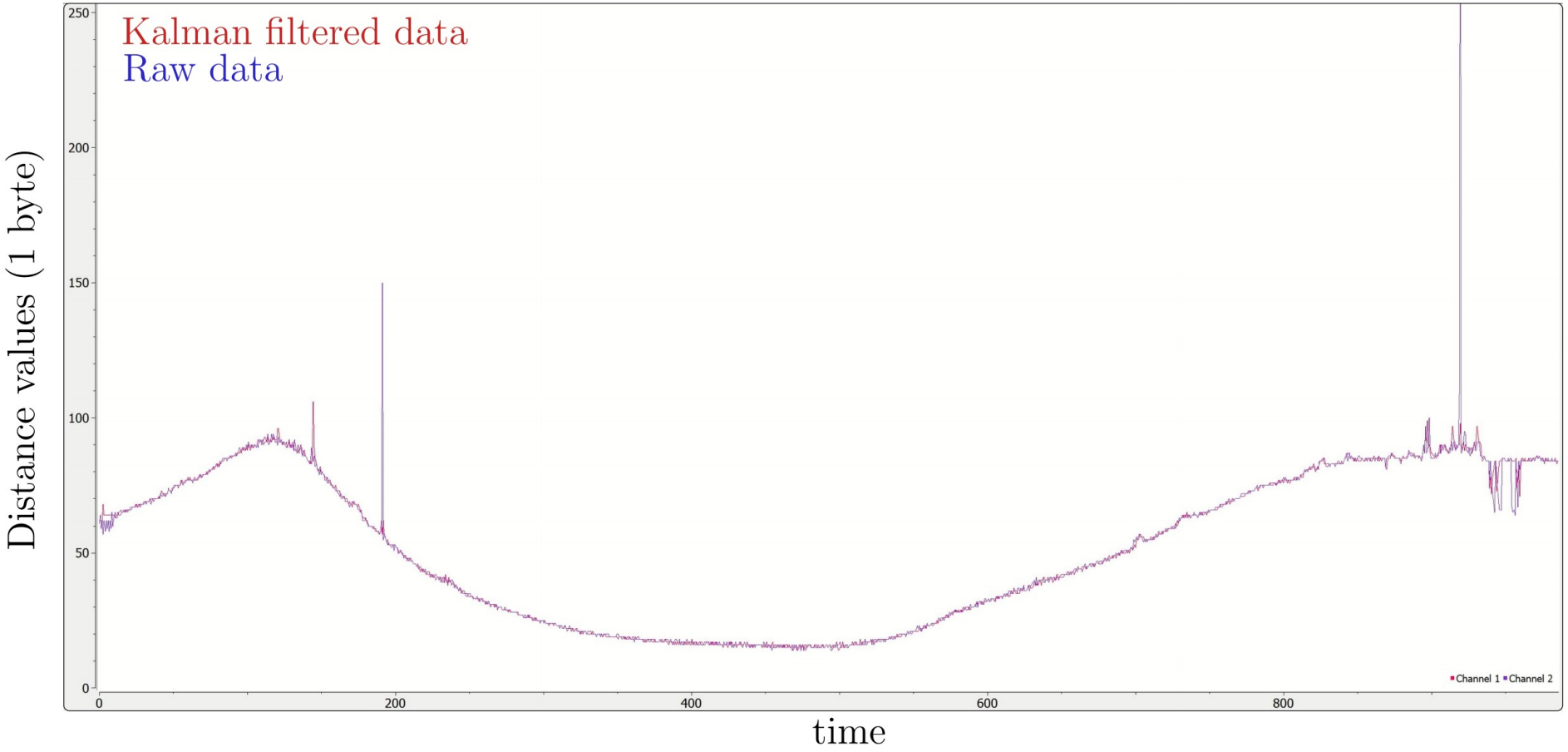




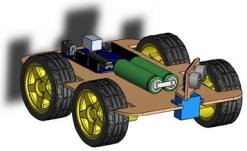
Controlled Unit: Obstacle Avoiding Robot



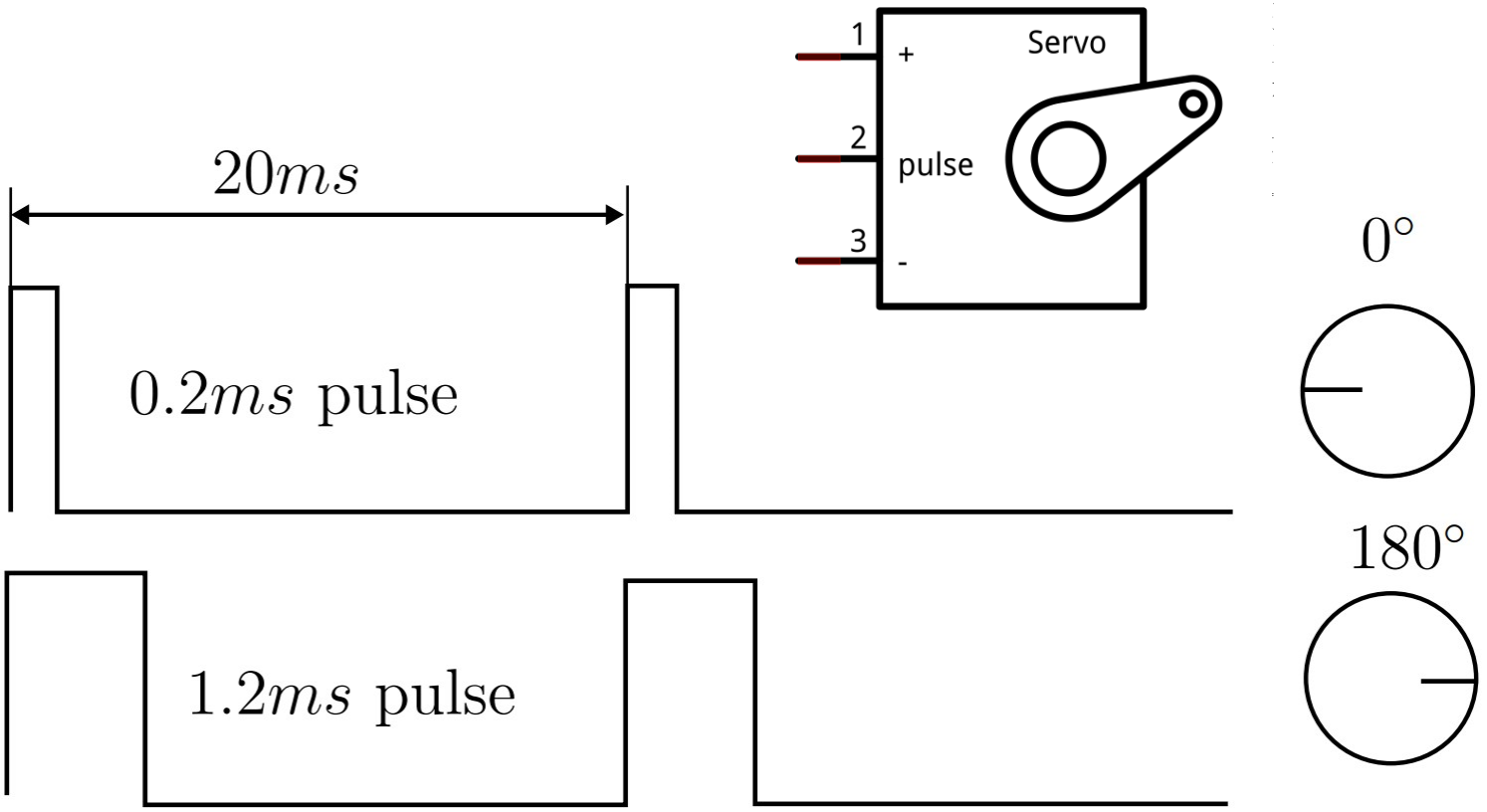
Ultrasonic sensor:



Controlled Unit: Obstacle Avoiding Robot



Servo:



Control Unit: Smart Hand

Inertial Measurement Unit

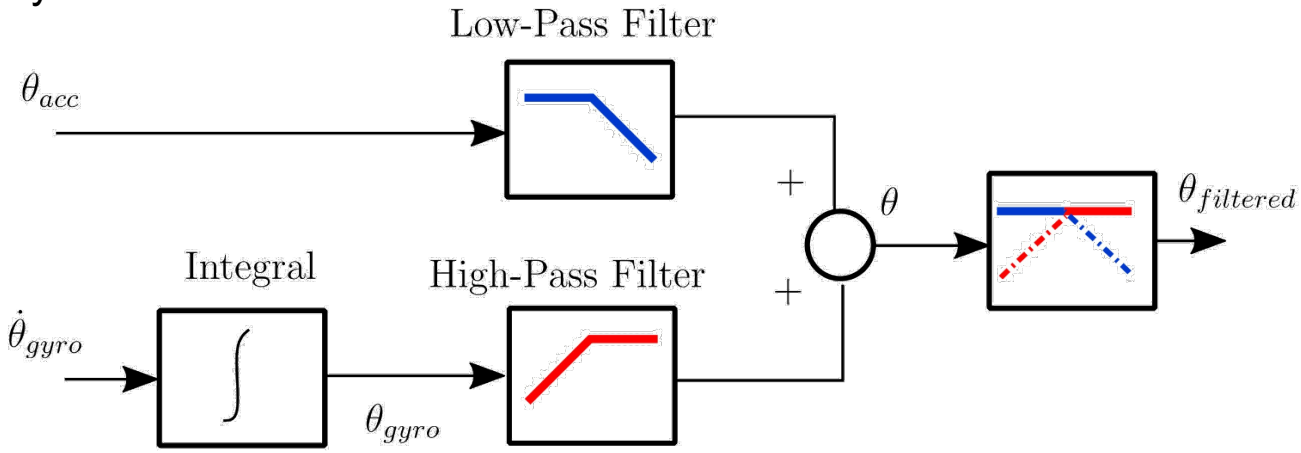
Angle from accelerometer data:

$$\theta_{acc\,x,y} = \arctan(\frac{a_{x,y}}{a_z}).$$

Angle from the gyroscope data:

$$\theta_{gyro\,x,y} = \int \dot{\theta}_{gyro\,x,y} dt.$$

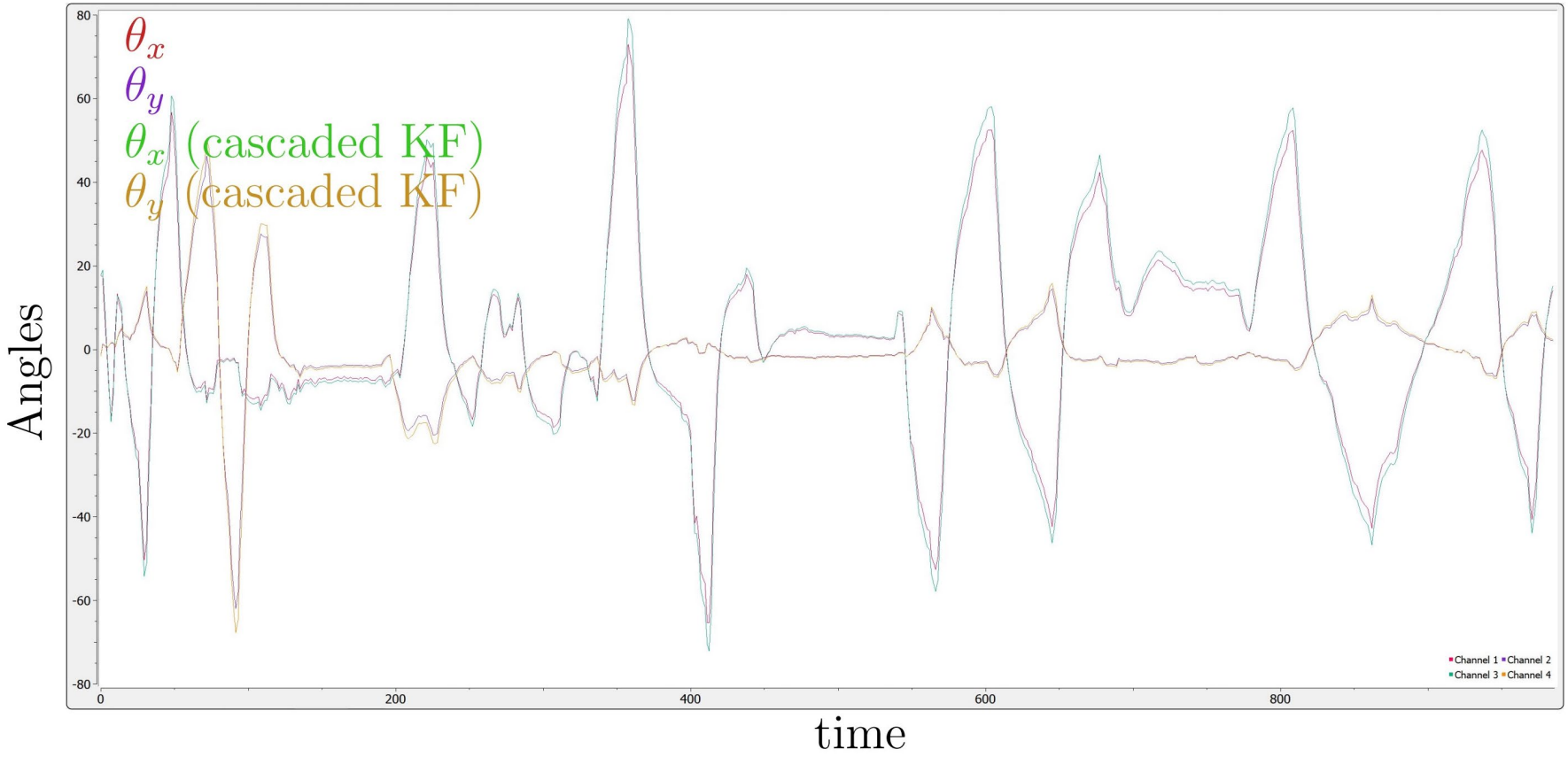
Complementary filter:



Control Unit: Smart Hand

Inertial Measurement Unit

Complementary vs. cascaded complementary and Kalman filtering



Thank you for your attention !