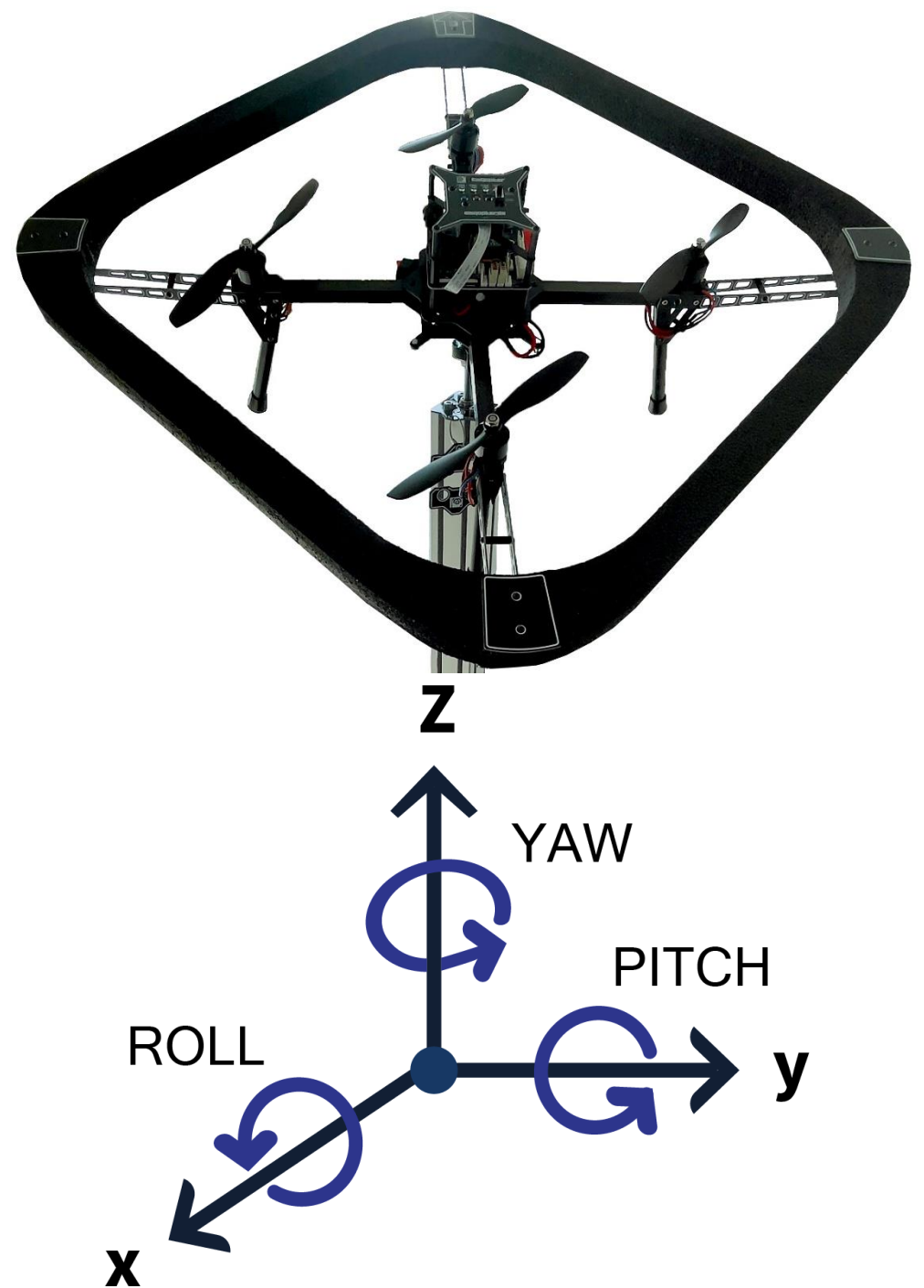


3DOF control

Control of three degrees of freedom

Lesson 9



Contents



- 3DOF control
- Safety briefing
- Exercises & tips

Time scope: approx. 1-3 hours



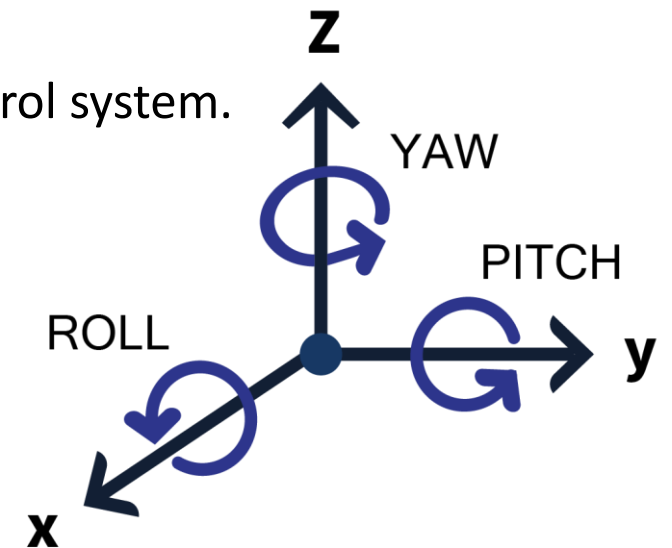
3DOF control



3DOF control:

- **DOF** = Degree of Freedom
- **3DOF control (*Roll, Pitch, Yaw*)** is the complete attitude control of a quadrocopter that enables it to fly.
- A quadrocopter that controls stably in 3DOF configuration can also fly with almost the same controller.
- The **only difference** is that remote control and throttle fusion are still missing
→ The throttle must be controllable in flight.

Of course, this regulation must not have a negative influence on the control system.





Necessary hardware:

- EMQ3000
- Mini-USB cable for power and flashing
- Mini-USB cable for communication: USART to PC
- QCS in 3DOF control mode

Necessary software:

- AVR Studio 32 installed (with toolchain and flip driver)
- EMQ_Framework (AVR-Code)
- **Documents:**
 - EMQ_Framework.pdf
- Qt Creator 2.0.1 and Qt 4.7.0 (32bit)
- EMQt_Framework\quatplay\quatplay.pro (Code)

Safety briefing



Safety briefing:

- Before starting the motors, always check that everything is tight:
This applies to all screws, motors, booms, Y-parts, knurled screws, etc.
- **ONLY** connect the power supply unit and start the motors with the authorisation of the supervisor.
- Keep your distance. Warn neighbours. Exercise caution. Have the on/off button ready (finger over it)!



Emergency stop options:

- On/Off button
- Switch off or disconnect the power source
- Disconnect **I2C** cable (pull out)
- Switch off **MCU** (disconnect USB cable)

Exercises



Exercise:

Extend your program in such a way that it is possible to control the three rotational degrees of freedom so that the quadrocopter could take off and fly stably. Use the 3DOF mode for testing.

IMPORTANT SAFETY NOTE:

Before you start the 3DOF setup, all PID parameters must be **halved**. The 3DOF structure must also be held firmly with one hand (by the frame or legs) during launch. When holding on, ensure that there is no risk of being hit by the rotors!

For your own safety and the safety of others, a supervisor **MUST** be consulted before starting. The 3DOF-QCS superstructures are not toys and can cause serious injury if used improperly.