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STM32 – Accelerometer

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MEMS accelerometer

- Connected to the I²C bus
 - address: 010100+ 0 → 0101000 (7 bit address)
 001100+ 0 → 0011000
 - slave
- [LIS2DE]
[LIS2DE12]
Possible board variants
- **Write protocol:**
Write register sub-address, register content in a single operation
 - **Read protocol:**
 - 1) Write register sub-address
 - 2) Read register content
 - **Multiple read protocol:**
 - 1) Write sub-address of the first register to be read, with MSB set to '1'
(refer to datasheet page 22 – auto-increment)
 - 2) Read multiple registers (in sequence)



Read the **acceleration**
measured by the accelerometer
and send it to a remote terminal
every 1 second.



Aim of the project

Identify which accelerometer is installed on your board. You can exploit the return value of the `HAL_I2C_Master_Transmit()`.

Acquire the x, y, z acceleration and send the 3 values to a remote terminal, about every 2 seconds.

The value of acceleration must be expressed in *g*, with a precision of *0.01 g* and the correct sign.

The full-scale range must be $\pm 2 g$.

The output format of the data must be like the one in the example:

X: +0.05 g

Y: -0.22 g

Z: +1.00 g



Project hints

- Configure the microcontroller to enable the I2C1 peripheral, as in slides 09.
- Initialize the accelerometer setting the correct registers to enable normal mode operation, with all 3 channels active, 1 Hz update rate, no high pass filter and $\pm 2g$ Full Scale range. Refer to the datasheet.
- Acquire the acceleration values of all 3 axis every second and send it to the PC using UART. Use the while(1) loop and HAL_Delay().
- Compile the code



Read the **acceleration**
measured by the accelerometer
and send it to a remote terminal
every 1 second.

Using timer interrupts and UART DMA.



Project hints

- Start from the previous project.
- Use a timer to generate an interrupt every second.
- Within the timer callback, acquire the acceleration values of all 3 axis. Send all the data to the PC via UART using DMA in a single operation. See slides 06 for the correct setup.
- Compile and debug the code



Read the **acceleration**
measured by the accelerometer
and send it to a remote terminal
every 1 second.

Using timer interrupts, I²C DMA and UART DMA.



Project hints

- Start from the previous project. Setup the I2C1_RX DMA and enable I²C interrupts.
- In the timer callback, acquire the data from the device exploiting the auto-increment feature of the sub-address (see LIS2DE datasheet, page 22). Perform an I²C read with DMA to read in a single operation the OUT_X, OUT_Y and OUT_Z registers.
How many bytes to you have to transfer?
- Within the **HAL_I2C_MasterRxCpltCallback** create the string and send it to UART, again using a single DMA Transmit operation.
- Compile the code