InvenSense

Software Metrics

For

ICM-20602 eMD

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2 OVERVIEW

The purpose of this document is to give a set of metrics for the ICM-20602 eMD Developer Kit as described in Software User Guide For ICM-20602 eMD.

3 METRICS

3.1 FIRMWARE VERSION

The following set of metrics applies to firmware **1.7.0**

3.2 FREQUENCIES

The table below sums up the achievable frequency for each sensor:

Sensor	Reporting Frequencies (Hz)		Reporting mode	Required Accel frequency (Hz)	Required Gyro frequency (Hz)
	20602				
	Min	Max			
Raw Accelerometer	4	1000	*Continuous*	=	x
Accelerometer	4	1000	*Continuous*	=	x
Raw Gyroscope	4	1000	*Continuous*	x	=
Gyroscope	4	1000	*Continuous*	x	=
Uncal Gyroscope	4	1000	*Continuous*	x	=
Raw Temperature	4	1000	*Continuous*	x	x
Raw Magnetometer	4	100*	*Continuous*	x	x
Magnetometer	4	100*	*Continuous*	x	x
Uncal Magnetometer	4	100*	*Continuous*	x	x
Gravity	50	1000	*Continuous*	=	=
Linear Acceleration	50	1000	*Continuous*	=	=
Game Rotation Vector	50	1000	*Continuous*	=	=
Geomag Rotation Vector	4	100*	*Continuous*	=	x
Rotation Vector	50	1000	*Continuous*	=	=
Orientation	50	1000	*Continuous*	=	=
SMD			*One shot*	50	x
Step Detector			*One shot*	50	x
Step counter			*One shot*	50	x
Tilt			*One shot*	50	x
Pickup			*One shot*	56.25	x
BAC			*One shot*	50	x
WOM			*One shot*	x	x

'=' means that the accel frequency will be the same as the corresponding sensor.
'x' means that it doesn't use the accel.

'*' The AK09912 and AK09911 max reporting frequency is 100Hz, but the AK09915 magnetometer can reach 200Hz.

3.3 CODE SIZE BREAKDOWN

The code size breakdown below is computed from the binary image built with IAR 7.30 compiler for a Cortex-M4 (+ FPU) with medium optimization.

Flash footprint (Ko)	20602 LITE	20602 FULL
TOTAL - Application (board dependent) - ICM drivers - Algorithms library	**64.06** 51.92 12.04 14.19 (only calibration and orientation algorithms are provided)	**92.84** 34.1 31.67 26.96

3.4 MIPS

The following section analyses the CPU resources needed in order to retrieve and process sensor data then to inform upper layers. Indeed, the measurement concerns the ICM-20602 driver.

To get the MIPS value, we measure the time spent in the driver during 30s/sensor based on the FULL-example. This measurement does not take into account the time spent in application and in the ST low level drivers execution, especially the SPI/ I2C and UART communication time.

Note : The below measurements were obtained using IAR 7.30 compiler with medium optimization and an STM32F411 Cortex-M4, MCU clock frequency 100MHz, 125 DMIPS – 1.25 DMIPS/MHz.

Detailed calculation example:

- Raw Accelerometer
  - Time spend in the driver : t = 20.89µs
  - Clock cycle number : ck_cycle_nb = t x MCU ticks = 2089
  - D-instructions per event : di_per_event = ck_cycle_nb x 1.25 CPU DMIPS/MHz = 2611

Sensor	DMIPS @ 1KHz	DMIPS @ 100Hz
Raw accelerometer	2.61	0.26
Raw gyroscope	2.68	0.27
Raw magnetometer connected to the MCU	1.78	0.18
Accelerometer	4.66	0.47
Gyroscope	3.98	0.4
Magnetometer	3.77	0.38
Uncalibrated Gyroscope	3.86	0.39
Uncalibrated Magnetometer	3.65	0.37
Linear Acceleration	12.89	1.29
Gravity	12.65	1.26
Game rotation vector	12.3	1.23
Rotation vector	26.2	2.62
Geomagnetic rotation vector	-	2.18