

STM32Cube function pack for STM32WB with BLE connectivity and environmental and motion sensors

Application	FP-SNS-MOTENVWB1		
Middleware	BLE	MotionFX/AR	MotionCP/GR
	MotionID/PM		
Hardware Abstraction	STM32Cube Hardware Abstraction Layer (HAL)		
Hardware	STM32 Nucleo expansion boards X-NUCLEO-IKS01A3 (Sense)		
	STM32 Nucleo development board P-NUCLEO-WB55.Nucleo		



Features

- Complete firmware to develop an IoT node with BLE connectivity, environmental and motion sensors
- Middleware libraries for sensor data fusion and accelerometer-based real-time activity recognition
- Compatible with [STBLESensor](#) applications for Android/iOS to perform sensor data reading and motion algorithm features demo
- Sample implementation available for the [X-NUCLEO-IKS01A3](#) connected to a [P-NUCLEO-WB55](#)
- Easy portability across different MCU families, thanks to [STM32Cube](#)
- Free, user-friendly license terms

Description

The [FP-SNS-MOTENVWB1](#) function pack for [STM32Cube](#) lets you connect your IoT node to a smartphone via Bluetooth Low Energy (BLE) and use a suitable Android or iOS application such as the [STBLESensor](#) app to view real-time motion and environmental (temperature, relative humidity, carbon monoxide) sensor data.

This package also enables advanced functions such as the sensor data fusion and accelerometer-based real-time activity recognition.

Together with the suggested combination of [STM32WB](#) and other ST devices, it can be used to develop specific wearable and environmental applications, or smart things applications in general.

The software runs on the STM32WB microcontroller and includes all the necessary drivers to recognize the devices on the STM32WB55 Nucleo development board ([P-NUCLEO-WB55](#)) and [X-NUCLEO-IKS01A3](#) expansion board.

Product summary	
STM32Cube function pack for STM32WB with BLE connectivity and MEMS sensors	FP-SNS-MOTENVWB1
Motion MEMS and environmental sensor expansion board for STM32 Nucleo	X-NUCLEO-IKS01A3
Bluetooth 5 and 802.15.4 Nucleo Pack including USB dongle and Nucleo-68 with STM32WB55 MCUs	P-NUCLEO-WB55
BLE sensor application for Android and iOS	STBLESensor

1 Detailed description

1.1 What can you do with STM32Cube function packs?

STM32Cube function packs leverage the modularity and interoperability of STM32 Nucleo and X-NUCLEO boards together with STM32Cube and X-CUBE software to create function examples for some of the most common use cases of different application technologies.

These software function packs are designed to exploit the underlying STM32 ODE hardware and software components as much as possible to best satisfy the requirements of final user applications.

Moreover, function packs may include additional libraries and frameworks that are not present in the original X-CUBE packages, thus enabling new functionalities allowing real and usable system for developers.

1.2 What is STM32Cube?

STM32Cube is a combination of a full set of PC software tools and embedded software blocks running on STM32 microcontrollers and microprocessors:

- [STM32CubeMX](#) configuration tool for any STM32 device; it generates initialization C code for Cortex-M cores and the Linux device tree source for Cortex-A cores
- [STM32CubeIDE](#) integrated development environment based on open-source solutions like Eclipse or the GNU C/C++ toolchain, including compilation reporting features and advanced debug features
- [STM32CubeProgrammer](#) programming tool that provides an easy-to-use and efficient environment for reading, writing and verifying devices and external memories via a wide variety of available communication media (JTAG, SWD, UART, USB DFU, I2C, SPI, CAN, etc.)
- STM32CubeMonitor family of tools ([STM32CubeMonRF](#), [STM32CubeMonUCPD](#), [STM32CubeMonPwr](#)) to help developers customize their applications in real-time
- [STM32Cube MCU and MPU packages](#) specific to each STM32 series with drivers (HAL, low-layer, etc.), middleware, and lots of example code used in a wide variety of real-world use cases
- [STM32Cube expansion packages](#) for application-oriented solutions

1.3 How does this function pack complement STM32Cube?

This software extends [STM32Cube](#) by providing a board support package (BSP) for the [X-NUCLEO-IKS01A3](#) expansion board and middleware components for communication with other Bluetooth low energy devices and for sensor data fusion.

The MotionFX filtering and predictive suite uses advanced algorithms to intelligently integrate multiple MEMS sensor outputs regardless of environmental conditions, in order to achieve optimal performance. Real-time motion sensor data fusion is set to increase accuracy, resolution, stability and response time.

The MotionAR real-time software acquires data from the accelerometer to recognize user activities. The software can also be combined with other human motion recognition algorithms and can significantly improve user experience in advanced motion-based applications in consumer, computer, industrial and medical fields.

The MotionCP real-time software acquires data from the accelerometer and recognizes the board position (on desk, on head, near head, shirt pocket, trouser pocket and swinging arm).

The MotionGR real-time software acquires data from the accelerometer and recognizes user gestures (pick-up, glance and wake-up).

The MotionID real-time software acquires data from the accelerometer to recognize user motion intensity. This software can be combined with other human motion recognition algorithms to significantly improve user experience in advanced motion-based applications in the consumer, computer, industrial and medical fields.

The MotionPM real-time software acquires data from accelerometer and counts the number of steps and related frequency.

Activity recognition, motion intensity recognition, carry position and gesture recognition are managed through special software designed for mobile and wearable applications. Their algorithms work with accelerometer data only to facilitate low power consumption strategies commonly required in these applications, in compliance with Bluetooth specifications core 5.0 embedded in the [P-NUCLEO-WB55](#).

The provided drivers abstract low-level hardware details, so middleware components and applications can access the sensors in a hardware-independent manner.

The package includes a sample application to transmit the values read from all the sensors (temperature, humidity, pressure, accelerometer, magnetometer, gyroscope) to a Bluetooth low energy-enabled device such as an Android™ or iOS™-based smartphone.

The [STBLESensor](#) Android/iOS application (available at their respective stores) displays the values read from accelerometer, magnetometer, gyroscope, temperature, humidity and pressure sensors.

Revision history

Table 1. Document revision history

Date	Version	Changes
09-Jul-2019	1	Initial release.

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