LSM6DSRX

iNEMO® 6-axis inertial module with Machine Learning Core

Digital motion sensor with Machine Learning Core, programmable finite state machine and advanced motion recognition for high-accuracy applications

The LSM6DSRX is a system-in-package IMU featuring a 3D digital accelerometer and a 3D digital gyroscope with an extended full-scale range for the gyroscope, up to 4000 dps, and high stability over temperature and time.

The LSM6DSRX contains a Machine-Learning Core (**MLC**), based on decision-tree classifier, able to classify motion data on known patterns. The MLC can interact with the integrated finite-state machine (**FSM**) which can run simple algorithms for custom movement recognition.

Combining MLC and FSM relieve the first stage of activity tracking from the main processor saving energy and accelerating motion-based applications result.

KEY FEATURES
- (MLC) for advanced motion recognition and classification
- (FSM) up to 16 custom movement recognition in low power mode
- High stability over temperature (±0.1 mg/°C, ±0.005 dps/°C)
- Sensor hub for 4 external sensors
- Smart FIFO sensor with up to 9 kbytes
- SPI/I²C and MIPI I3C℠ serial interface
- Real dual core processor

TARGET APPLICATIONS
- Augmented/virtual reality
- Drone flight controls
- Dead-reckoning navigation system
- Motion tracking for cleaning robots and mowers
- Optical image stabilization for camera applications

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Advanced features

A highly accurate motion sensor in time and temperature, the LSM6DSRX processes AI motion data in an embedded dedicated logic. Moreover, thanks to the LSM6DSRX's synergic approach, AI pre-processing combined with an STM32 solution can be envisioned.
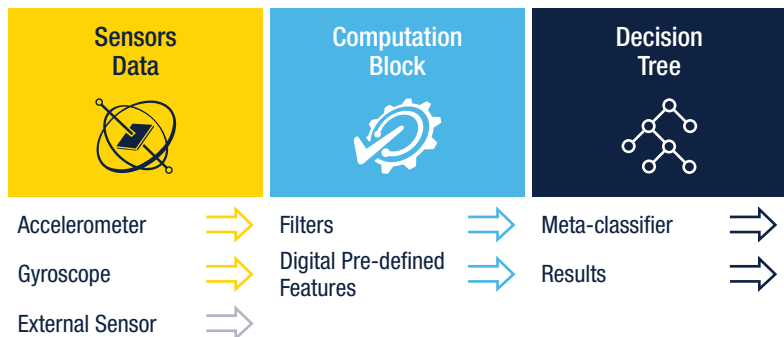
The (MLC) processing capability allows moving some algorithms from the application processor to the sensor, enabling consistent reduction of system power consumption. The MLC can work in conjunction with the integrated finite-state machine logic to handle simple repetitive algorithms like counting steps, hits or rotations at a negligible current consumption compared to a microcontroller implementation.
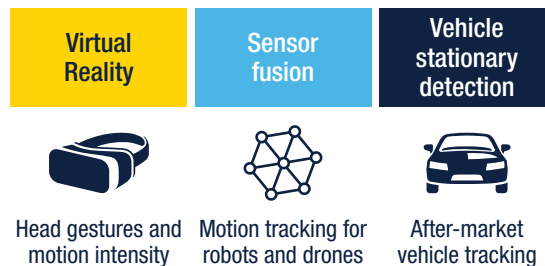
The support for native free-fall, wakeup, 6D/4D orientation, click and double-click interrupts allows a wide variety of applications in addition to activity tracking add. The second core can be used for optical image stabilization (OIS). In addition to a complete documentation package, MLC examples and software GUI (Graphical User Interface), ST offers a complete development ecosystem for evaluating the implementation of custom algorithms.

Machine Learning Core

Sensors Data	Computation Block	Decision Tree
Accelerometer ⟹	Filters ⟹	Meta-classifier ⟹
Gyroscope ⟹	Digital Pre-defined Features ⟹	Results ⟹
External Sensor ⟹		

Application Examples

Virtual Reality	Sensor fusion	Vehicle stationary detection
Head gestures and motion intensity	Motion tracking for robots and drones	After-market vehicle tracking

Ordering code

Part Number	Packing
LSM6DSRXTR	Tape & Reel

Evaluation tools

Usage	Part Number	Description
Prototype	NUCLEO-F401 or NUCLEO-L152RE or NUCLEO-L476RG or NUCLEO-L073RZ	STM32 Nucleo board
	STEVAL-MKI195V1	Adapter board (socket DIL24)
	X-NUCLEO-IKS01A3	STM32 Nucleo Expansion Board
	X-CUBE-MEMS1	Expansion Software package
	UNICLEO-GUI, UNICO-GUI	Graphical user interface (GUI) for MLC development
Performance evaluation	STEVAL-MKI109V3	Professional MEMS tool motherboard
	STEVAL-MKI195V1	Adapter board (socket DIL24)
	UNICO-GUI	Software package for the Professional MEMS tool motherboard

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