

iNEMO Engine Lite

Overview and download instructions



iNEMO[®]

iNEMO Engine sensor fusion suite

Multi-axis sensors

iNEMO demonstration board

- Augmented reality
- Enhanced pointing
- Pedestrian navigation
- Motion gaming
- Wellness
- Motion tracking

The complex block features a central blue sphere with a glossy finish. Inside the sphere, the text 'iNEMO Engine sensor fusion suite' and 'Multi-axis sensors' is displayed. Below the text, there are images of four STMicroelectronics sensors (iNEMO100, iNEMO100A, iNEMO100B, iNEMO100C) and an 'iNEMO demonstration board'. Surrounding the sphere are six circular icons, each with a small image and a text label: 'Augmented reality' (hand holding a phone), 'Enhanced pointing' (hand pointing at a screen), 'Pedestrian navigation' (hand holding a phone with a map), 'Motion gaming' (two people playing), 'Wellness' (person exercising), and 'Motion tracking' (person walking).

iNEMO software libraries

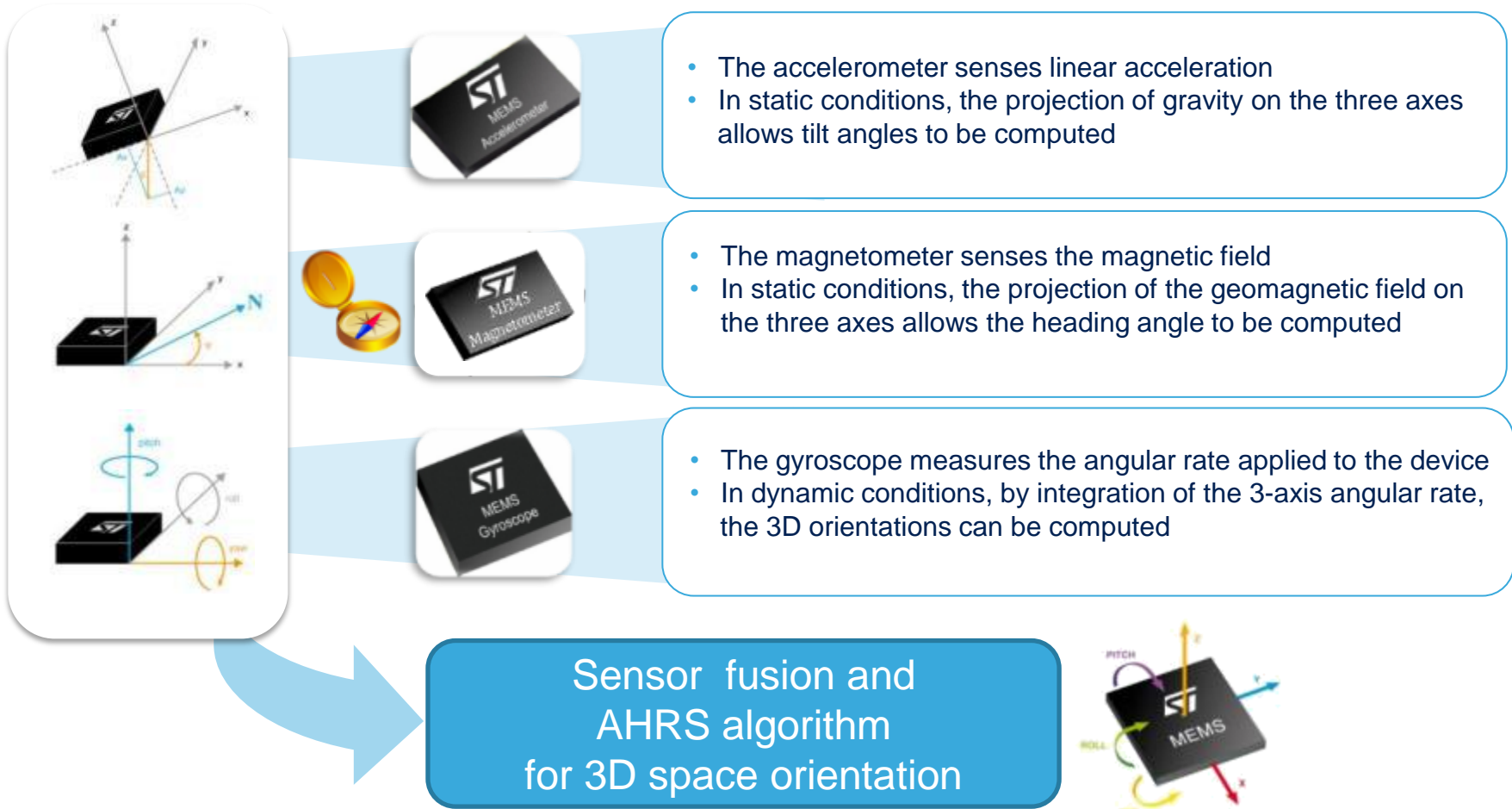
- iNEMO software libraries, based on the Kalman filter theory applied to MEMS sensor fusion, are divided into two categories:
 - [iNEMO Engine Lite](#), a free source code software library
 - [iNEMO Engine Pro](#), a compiled software library
- These engines fuse accelerometer, gyroscope and magnetometer data to deliver accurate and reliable motion-sensing information that is easy to integrate into smart consumer devices

Both software are based on data-fusion algorithms for multiple-sensor output processing and address motion-detection applications

This presentation focuses on **iNEMO Lite**

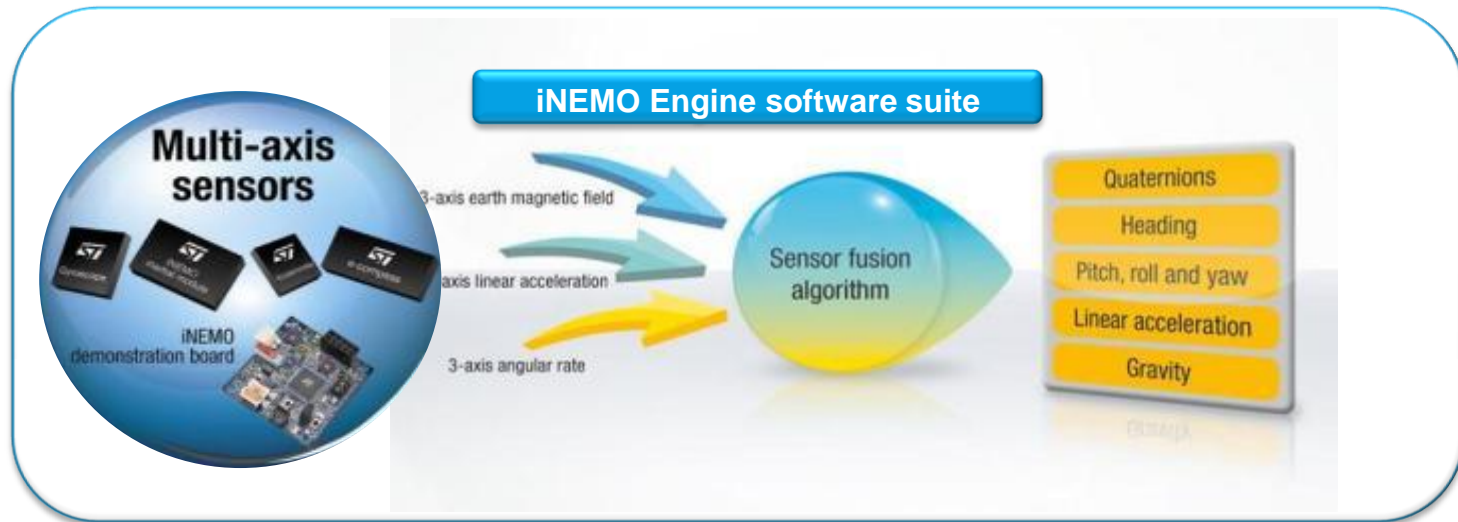
Part number	Description
iNEMOEngine_LI3	iNEMO Engine Lite, platform independent, source code for STM32 and for customizable HW/SW solutions
iNEMOEngine_PAAP	iNEMO Engine Pro, Android platform ARMEABI
iNEMOEngine_PI3P	iNEMO Engine Pro, platform independent, for STM32
iNEMOEngine_PW8	iNEMO Engine Pro, platform independent, for STM32 (supported by Windows 8 sensor class)

Sensor fusion for 3D space orientation



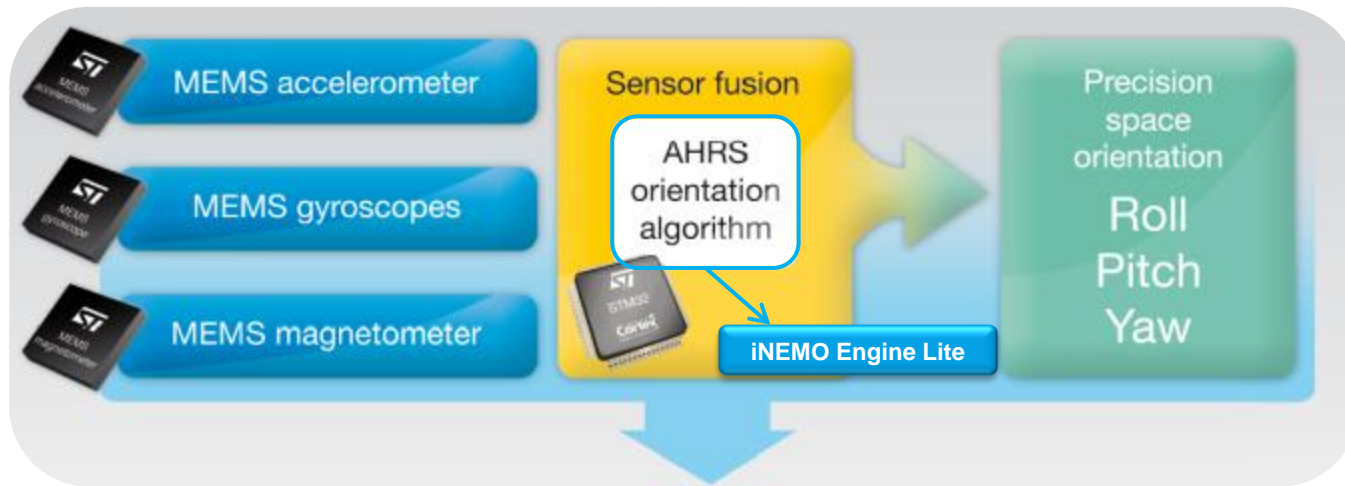
iNEMO Engine Lite

- Based on the Kalman filter theory, ST's iNEMO Engine Lite sensor fusion software integrates readings from multiple sensors (3x gyroscopes, 6x geomagnetic modules) – it is mounted on the STEVAL-MKI062V2 iNEMO demonstration board and processed by an on-board STM32 microcontroller
- ST offers an open source version of iNEMO Lite that can be used with the STEVAL-MKI062V2 demonstration board, but can also be adapted to your own application using ST's multi-axis sensors (iNEMO inertial modules or a combination of accelerometer, gyroscope and magnetometer)



iNEMO enables new applications

- The combination of software (iNEMO Engine Lite) and hardware (STEVAL-MKI062V2 or other MEMS sensors) guarantees the high accuracy required by the most demanding applications, such as augmented reality, image stabilization, human machine interfaces, body movement recognition and robotics



Robotics



Inertial body motion reconstruction (iBMR)

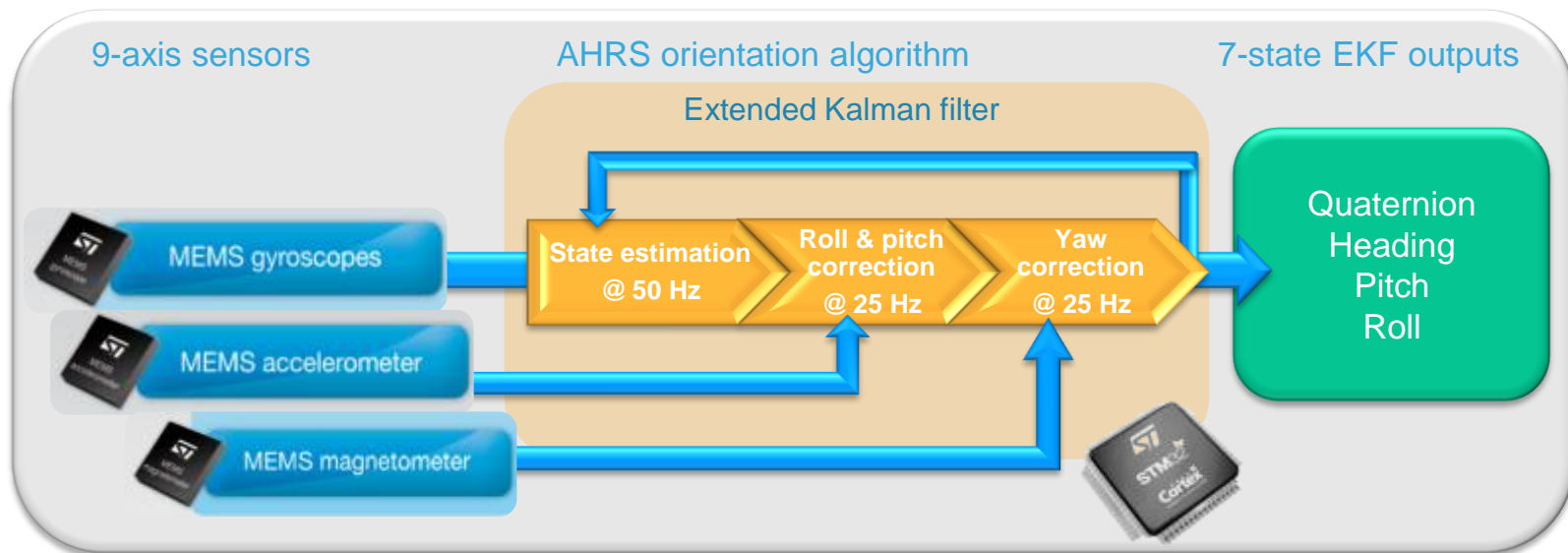


Point of interest (POI) and location-based services (LSB)



Extended Kalman filter (EKF)

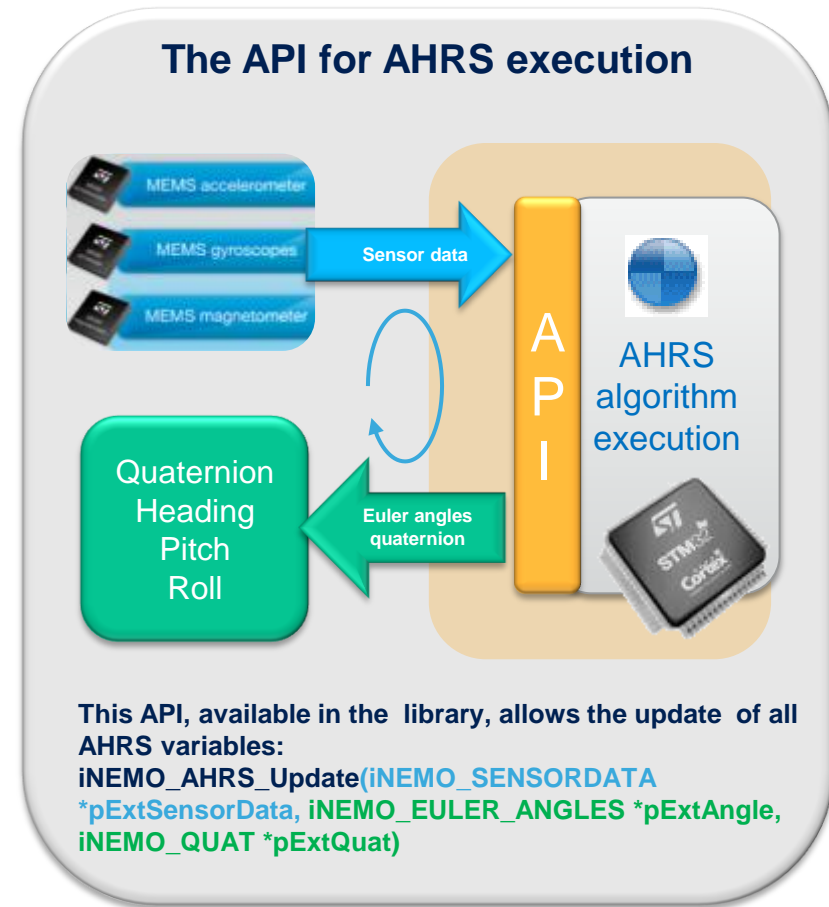
- Sensor fusion is implemented using an embedded extended Kalman filter (EKF) to provide drift-free 3D space orientation running on the STM32 microcontroller
- The EKF adjusts the three sources of data (gyro, accelerometer, magnetometer) to fuse them in the best way
- The EKF estimates the four quaternion and the three gyro biases (7-state EKF)
- Acceleration data is used to correct roll and pitch angles, and magnetic field data improves yaw angle



iNEMO Engine Lite – key features


7

- Accurate motion tracking
- Reliable compass heading for accurate navigation
- 7-state extended Kalman filter
- Outputs:
 - Quaternion
 - Heading, pitch and roll
- Max ODR (EKF frequency) up to 100 Hz
- System requirements:
 - 7-Kbyte Flash memory
 - 5-Kbyte RAM (dynamically allocated)
- Source code for STM32F103 microcontrollers
- Double option for memory allocation, with or without FreeRTOS



The iNEMO demonstration board

- iNEMO Engine Lite was developed around the STEVAL-MKI062V2 demo board as the embedded AHRS algorithm for the on-board STM32F103 microcontroller
- The library is compatible with all STM32 hardware platforms

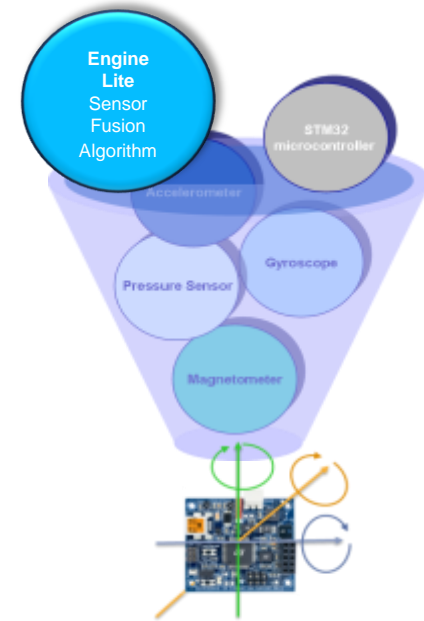


10 Degrees of freedom

3x Accelerometer
3x Gyroscope
Pressure Sensor
3x Magnetometer

STMicroelectronics **iNEMO™**

iNEMO STEVAL-MKI062V2 demo board, combines 9-axis motion MEMS with pressure and temperature sensors and a 32-bit MCU. The system provides 3-axis sensing of linear, angular and magnetic motion, complemented with altitude and temperature readings, representing ST's 9-axis/10 degrees of freedom platform.



Awards won by STEVAL-MKI062V2

<p>The Wall Street Journal Technology Innovation Award 2010</p> 	<p>Computerworld Honors Program 2011 Emerging Technology Laureate</p> 
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iNEMO Engine Lite inside Suite 2.3.0

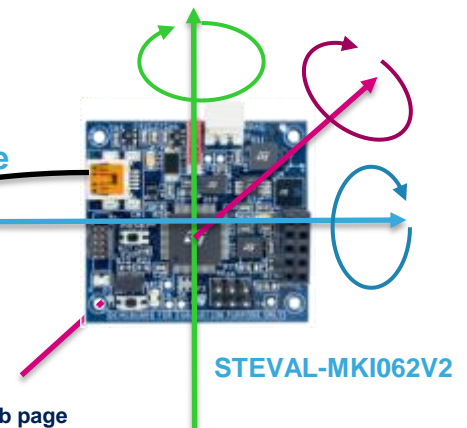
iNEMO Engine Lite is included inside the iNEMO Suite 2.3.0* as the source code of the AHRS library – this suite includes:

- GUI (graphical user interface) for smart interaction with the board and display of sensor data
- DFU (device firmware upgrade) for firmware upgrading
- SDK (software development kit) for high communication level
- TCP/IP integrated protocol for remote connection and data streaming



SDK setup

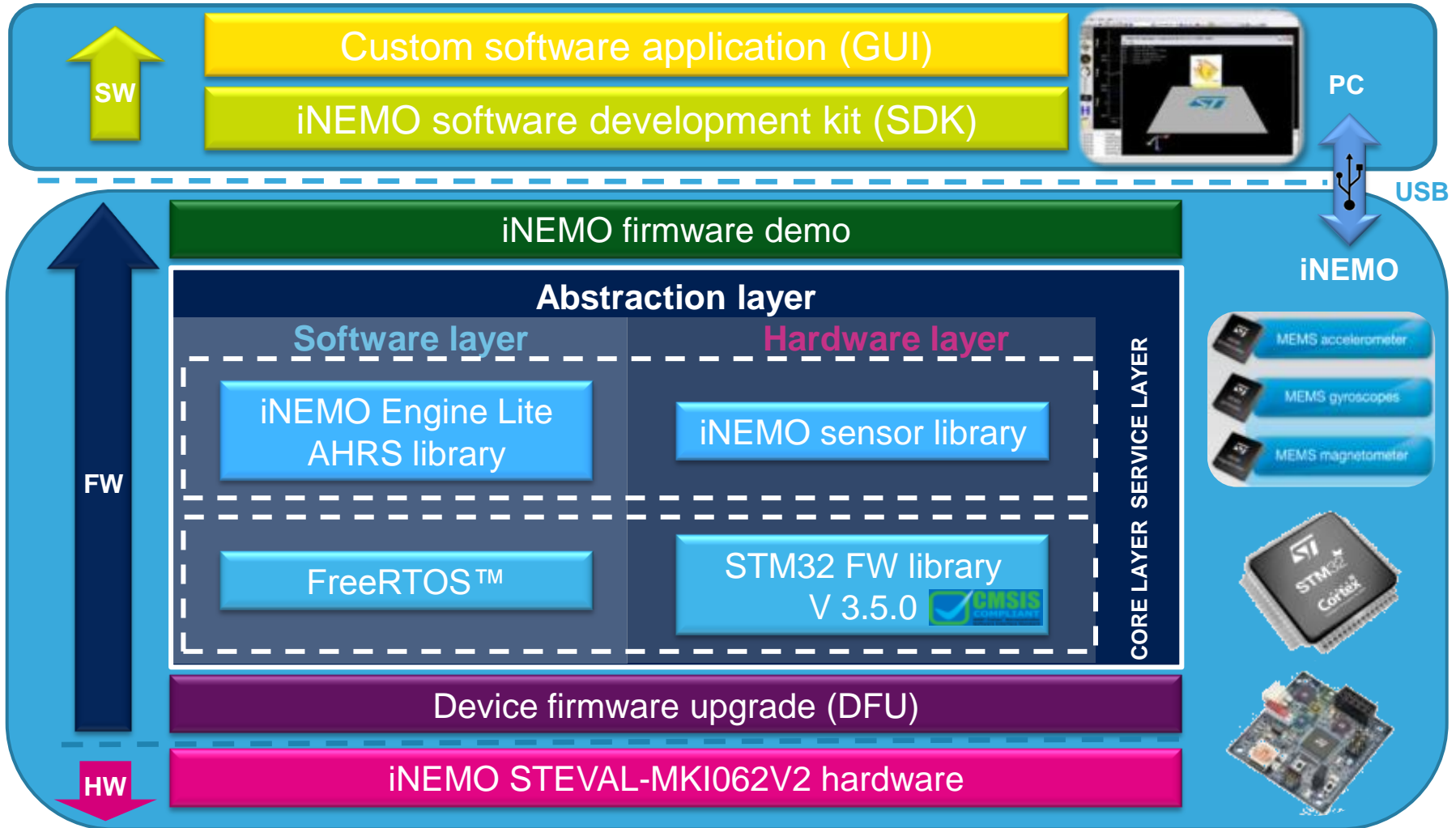
USB cable



STEVAL-MKI062V2

*Suite 2.2.0 with compiled AHRS algorithm, as reference version for running projects, is still available on the STEVAL-MKI062V2 web page

FW/SW architecture of Suite 2.3.0



Engine Lite Suite 2.3.0 and download (1/2)

In accordance with ST's policy on **Trade Compliance** for the use of export controlled software IPs, during the registration phase, please provide the requested information in the **End Use Certification (EUC)** section before submitting your download request.

Click on "ASK YOUR COPY" button available at: www.st.com/inemo-enginelite

Step 3 - Declaration
Read the **declaration** carefully, sign in with your complete **name** and **title**, read and accept the **software license agreement** and submit your request

Step 1 - Section A
Fill in the **requestor data**, **project description** and **end user fields**

Step 2 - Section B
Select the **end use segments** and **nature of business**

Software download request INEMO Engine_Lite

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A. PARTIES

1. DOWNLOADER OR REQUESTOR * is a mandatory field

Firstname Lastname *
Full Address *
Country * Select Country
Company *
e-mail address * (corporate email is preferred)
Office or Mobile Phone number
Project description *

Targeted Operating Systems Windows 8

2. END USER (if different from the above)

Firstname Lastname
Address
Country Select Country

> Next

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I have read and I accept the License Agreement

TITLE OF SIGNATORY DATE 15 March 2012

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B. END-USER DETAILS

1. DUAL USE ITEMS

1.1. DUAL USE ITEMS	1.2. DESCRIPTION	1.3. QUANTITY
INEMOEngine_Lite	ARM9 source code	1 copy for single user

2. END USER (s)

Please, choose one or more End Users

Augmented Reality
Automotive
Computer
Consumer
Factory Automation
Gaming
Healthcare
Industrial
Navigation
Robotics
Others

3. NATURE OF BUSINESS OF THE END USER

Please, choose one or more End Users

Commercial
Demonstrable
University
Others

> Next

Engine Lite Suite 2.3.0 and download (2/2)

After you have filled in all fields, ST will process your request, and in a few days you will receive an e-mail with a personalized download link.

If approved

From: STMicroelectronics <noreply@st-registration.com>
Subject: iNEMO Lite Registration Form

Dear Customer,

you have submitted a download request for iNEMO Lite. Your request is pending approval.

The iNemo fusion engine allows you to improve the accuracy and reliability of motion-sensing information using ST's [accelerometers](#), [gyroscopes](#) and [magnetometers](#).

Thank you very much for you interest in our products.

Yours sincerely,
STMicroelectronics

From: STMicroelectronics <noreply@st-registration.com>
Subject: Your iNEMO Lite download

Dear Customer,

your download request for iNemo Lite has been approved

You may download the software following [this link](#)

Please note that this link is personalized and is valid for one download only. Make sure to create a backup copy of the installation package once downloaded. When installing and before using the software you will have to accept the [licence agreement](#).

Thank you very much for you interest in our products.

Yours sincerely,
STMicroelectronics

Before clicking on the download link, please follow these instructions:

1. Check your browser settings (disable popup-blocker, set the appropriate security and proxy settings)
2. Remember that download link is valid once only, for this reason save the zip file in your PC as first action

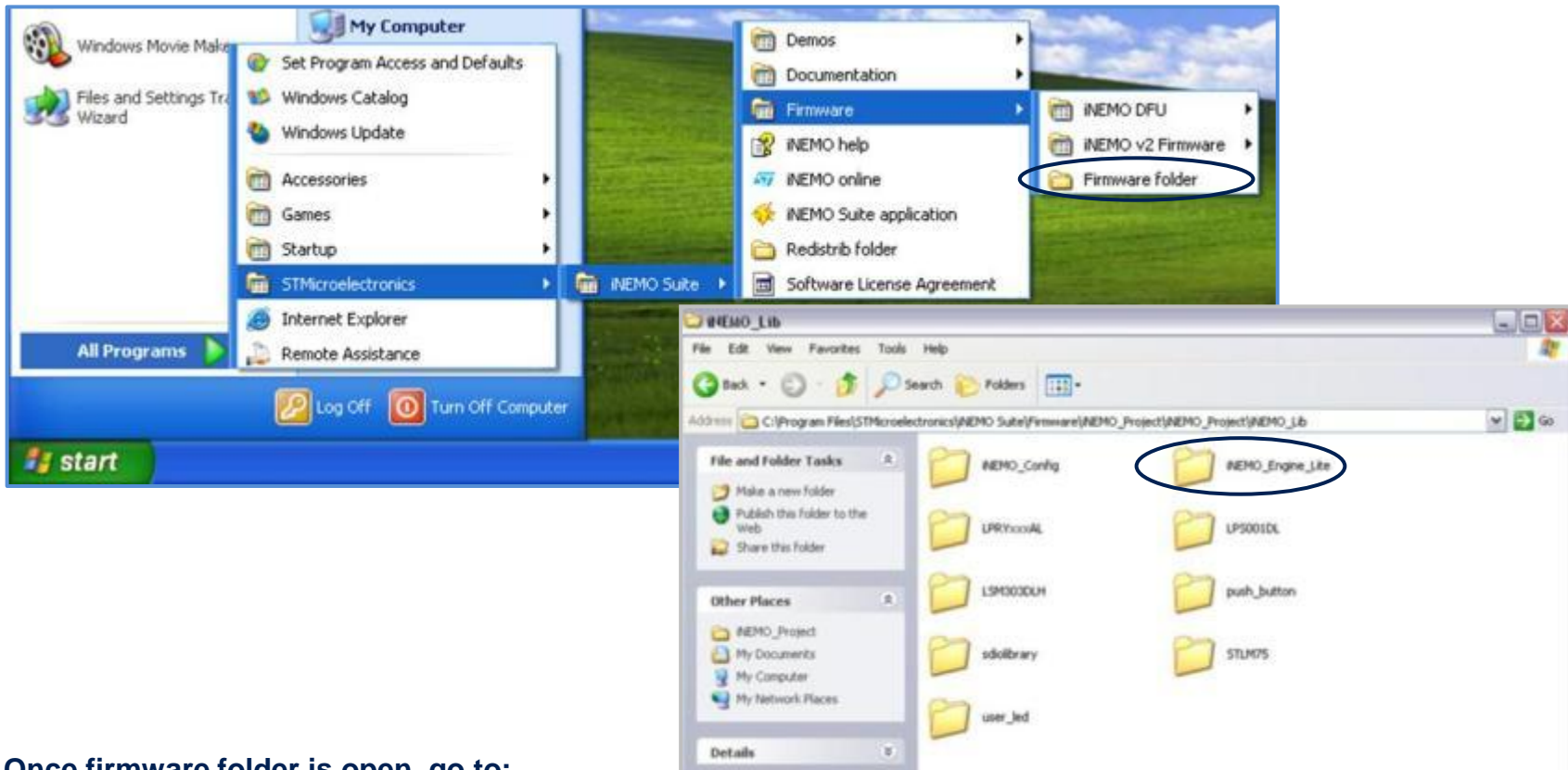
If rejected

[Contact your local sales representative](#)

How to find iNEMO Engine Lite

After installation, Engine Lite source code is available inside the Suite 2.3.0. at:
`STMicroelectronics\iNEMO Suite\Firmware\iNEMO_Project\iNEMO_Project\iNEMO_Lib\iNEMO_Engine_Lite`

or directly from Windows Start under: `Programs/STMicroelectronics/ iNEMO Suite/ Firmware/ Firmware folder`



Once firmware folder is open, go to:
`iNEMO_Project\iNEMO_Project\iNEMO_Lib\iNEMO_Engine_Lite`

Web pages and technical support

iNEMO Engine Lite (iNEMOEngine_LI3) SW download: <http://www.st.com/inemo-enginelite>

iNEMO demonstration board (STEVAL-MKI062V2): <http://www.st.com/internet/evalboard/product/250367.jsp>

iNEMO Inertial Modules: <http://www.st.com/inemo>

MEMS: <http://www.st.com/mems>

For technical support, click on green icon available in the product folders:

[ONLINE SUPPORT](#)

STe2eCommunities and FAQ at myST.com

iNEMO Engine Lite and STEVAL-MKI062V2 STe2eCommunities:

<https://my.st.com/public/STe2ecomunities/mcu/Lists/STM32F%20MEMS%20%20iNEMO/AllItems.aspx>

STEVAL-MKI062V2 FAQs: <https://my.st.com/public/FAQ/faq.aspx?level=3&objectid=1116&type=product>

www.st.com/inemo-enginelite



or with your smartphone:

