ISM330DHCX
iNEMO™ inertial module
Evaluation tools and GUI for Machine Learning
ISM330DHCX quick prototype

Two solutions to capture and process data

- STM32 Nucleo with Expansion board tool & Unicleo GUI
- STWIN kit

STM32 NUCLEO with EXPANSION
X-NUCLEO-IKS02A1

Software package:
UNICLEO GUI with X-CUBE-MEMS1
UNICO GUI for MLC development

STEVAL-STWINKT1
ISM330DHCX performance evaluation

Form Factor Tool & GUI to capture and process data

Professional MEMS motherboard
STEVAL-MKI109V3

Software package: UNICO-GUI
- Linux → STSW-MKI109L
- Mac OS X → STSW-MKI109M
- Windows → STSW-MKI109W

Evaluation board (adapter)

DIL24 adapter board
STEVAL-MKI207V1
STEVAL-MKI210V1K
ISM330DHCX form factors & GUI
Decision tree creation process

**WHAT**
- Capture data
  - Accelerometer
  - Gyroscope
  - External sensors
- Label data
  - Filters
  - Features
- Build decision tree
  - Classification
  - Results
- Embed decision tree
- Process new data
  - Real-time test

**HOW**
- Unicleo-GUI
- Unico-GUI

**SW**
- Unicleo-GUI
- Unico-GUI
- AlgoBuilder

* External tools for building decision tree:
  - Weka, RapidMiner, MATLAB, Python
ISM330DHCX
STM32 Nucleo with expansion board

**WHAT**
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**HOW**
- STM32 Nucleo board*
  - Expansion board: X-NUCLEO-IKS02A1
- **Unico GUI**
- STM32 Nucleo board*
  - Expansion board: X-NUCLEO-IKS02A1

**SW**
- • Unico GUI
- • X-CUBE-MEMS1

**Unico GUI** **

** External tools for building decision tree:
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* Refer to product specification: NUCLEO-F401RE, NUCLEO-L152RE, NUCLEO-L476RG, NUCLEO-L073RZ
With STM32CubeMX SW support
ST sensor tools

Decision tree creation process – Dataset & label

Capture data

1. Import .csv files in Unico
2. Assign label (class) to the files
3. When all files are imported, start MLC configuration:
   - sensors setup (ODR, FS, etc)
   - windows length
   - filters and features
4. Generation of .arff file

Label data

From Logs in .csv files to .arff file generation

Unico-GUI

a) Professional MEMS tool motherboard

b) STM32 Nucleo board with expansion

Unicleo-GUI

Unico-GUI

MLC development tool
ST sensor tools
Decision tree creation process – build & embed

### Build decision tree

1. Import .txt file in Unico
2. Assign values to the classes
3. Meta-classifier configuration (if needed)
4. Generation of .ucf/.h file

### From .arff file to Decision Tree generation in .txt file
(only for Weka/RapidMiner copy the content in .txt file)

### Embed decision tree

1. Import .txt file in Unico
2. Assign values to the classes
3. Meta-classifier configuration (if needed)
4. Generation of .ucf/.h file

### From .txt file to .ucf/.h file generation
ST sensor tools
Real-time test with trained decision tree

- Test the Decision Tree on STM32 Nucleo board with expansion using USB cable
- Test the Decision Tree on Professional MEMS board using USB cable
- PC application for advanced development level

Import .ucf file to configure the device
AlgoBuilder is a graphical design tool to build and use algorithms

AlgoBuilder GUI uses the outputs from MLC and FSM to allow you to build more complex projects

An existing MLC / FSM configuration (.ucf file) can be implemented
Explore MLC examples and resources

- Decision tree examples are available online at the dedicated GitHub project for Machine Learning Core

https://github.com/STMicroelectronics/STMems_Machine_Learning_Core
MEMS and sensors Community

- The latest information on MEMS product (HW, SW, tools) and reference designs
- Join the community to…
  - …share ideas and find sparks!
  - …find potential customers

Q&A: Do you have a technical question? Ask here!
• Join us in 3 steps!

1. Register (if you do not already own an account)

2. Join MEMS and Sensor community becoming a follower
   https://community.st.com/s/group/0F90X000000AXsjSAG/mems-and-sensors

3. Post your company competence / competitive advantage!

Refer to the MEMS and Sensor community or Q&A section for questions and updates. Our experts are there to help you!
Thank you