



cea

leti



# $\mu$ WAI

PATENTS  
10  
PATENTS

## Unlocking devices upon face recognition for a few additional micro watts

### What is $\mu$ WAI?

CEA-Leti's autonomous imager  $\mu$ WAI activates any device upon recognition of a specific pattern—e.g., unlocking a smartphone upon the recognition of a face. It is the first highly efficient, compact and ultra-low power smart awoken system designed for everyday small appliances:

- Consuming 10,000  $\times$  less than low-power camera plus processor set
- Highly compact: €1 coin
- Privacy-compliant AI-based recognition: near human detection performance (95%)
- wide operating lightening condition
- "Always-on" CR1025 Battery lifetime: 5 years
- 3-6  $\mu$ W operation

### Applications

- **Mobile devices:** automatic switching, face identification
- **Smart home:** contact-less smart switches of household appliances, sport and entertainment devices
- **Smart building/smart home:** face recognition, people counting, alarm triggering
- **Automotive:** in cabin situation awareness, driver identification
- **Automotive:** out cabin parking situation awareness, smart door unlocking system

## What's new?

$\mu$ WAI features a novel readout and processing architecture co-designed with an optimized algorithmic pipeline providing ultra-low power wake-up modes and compact silicon implementation.

It is the first smart image sensor jointly featuring:

- Auto-exposure for all lightening condition and 88dB dynamic range,
- Motion detection and feature extraction for event based functioning,
- AI-based object recognition triggering highly reliable identification.

These key features enable highly reliable decision taking for few tens of pJ/pixel/frame, outperforming the best "off-the-shelf" solutions.

## What's next?

The core of CEA-Leti's autonomous imager is its recognition engine. CEA-Leti's team is working hand in hand with an industrial partner towards the development of specific smart imager products.

This technology can be applied to other use cases, leveraging the institute expertise in integrating a compact recognition engine within a smart image sensor. CEA-Leti tailors competitive solutions to meet the requirements of its partners.

## Publication

Presentation at the highly selective VLSI 2020 conference:

A. Verdant et al., "**A 3.0  $\mu$ W @5 fps QQVGA Self-Controlled Wake-Up Imager with On-Chip Motion Detection, Auto-Exposure and Object Recognition**",

2020 IEEE Symposium on VLSI Circuits, Honolulu, HI, USA



## Interested in this technology?

Contact:

**Antoine Dupret**

[antoine.dupret@cea.fr](mailto:antoine.dupret@cea.fr)

+33 689 875 848

**CEA-Leti, technology research institute**

17 avenue des Martyrs, 38054 Grenoble Cedex 9, France

[cea-leti.com](http://cea-leti.com)

   @CEA-Leti

 **Research**  
for industrial  
innovation