Drive for better vision

Nasdaq : HIMX

Himax WiseEye™ Ultralow Power AI Sensing

Enhancing User Experience with Ultra-low Power Computer Vision

Motion Detection
People Sensing
Face Detection
People Counting
Palm Vein Identification
Face Recognition
Activity Recognition
Autonomous Driving
Realistic Content Generation

WiseEye Solution

1 mW
10 mW
100 mW
500 mW
1000 mW
10 W
1000 W

Endpoint AI
Edge AI
Cloud AI
Gen AI

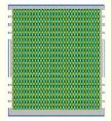
Himax

WiseEye™ Ultralow Power AI Sensing Solution

WiseEye module

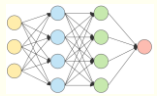
Himax

WiseEye™ Business Models



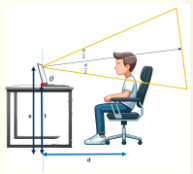
Ultra low power image sensor
- µW to mW Always On modes
- Low latency & flexible operation

WiseEye™ AI Processor for Endpoint AI
- Highly efficient AI processor platform
- Integrated accelerators and security



WiseEye™ AI Models
- Model development and training
- Dataset optimization

WiseEye™ SDK and H/W support
- Driver, Schematic EE support
- SDK and system integration team support



UX and Validation Test
- Corner case study and test
- Test tools for production and validation test

- Turnkey Solution Provision
  - Himax vision module
  - Integrated Himax's FW and HW
  - Validation tests
- SDK and HW support
  - Software development kit by FAE
  - Schematics review
  - Tutorials on FW integration
- Open-Source Resources
  - SDK on GitHub
  - Himax EVK at Digi-Key
  - EVK provided by partner

High

Himax Involve-ment

Low

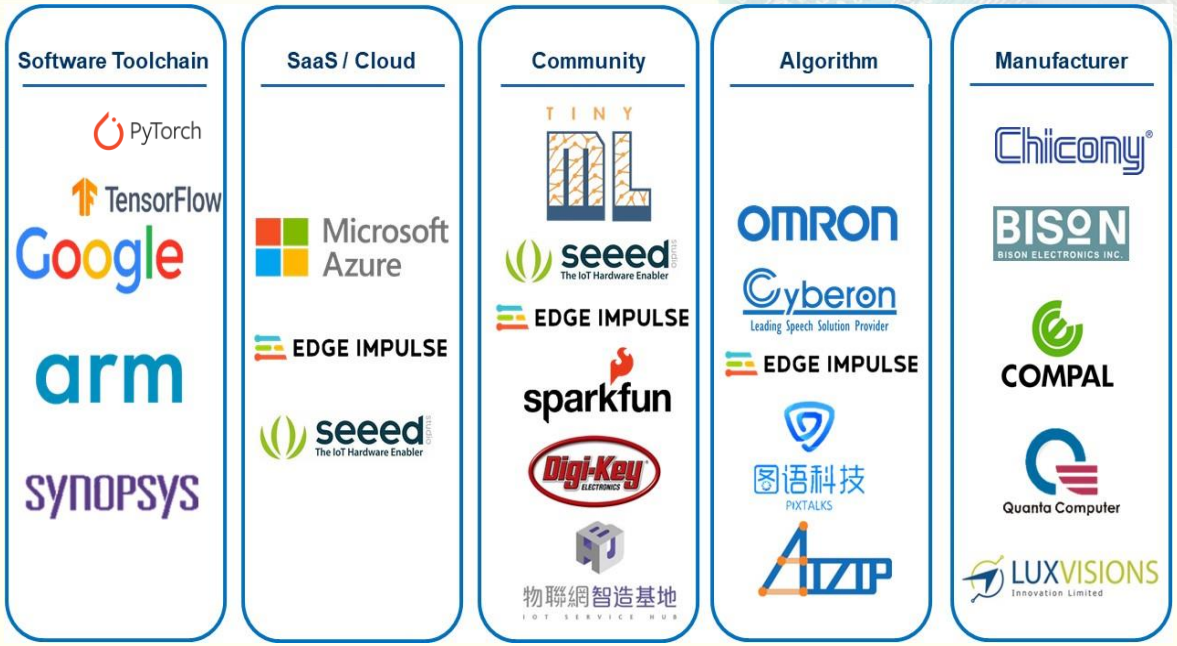
WiseEye Ecosystem and SDK support

- Software Development Toolkit
  - Himax WE2 SDK
  - ARM Toolchain and Vela Compiler
  - Nvidia Tao Toolkit
  - Edge Impulse Model Development Platform
- Model Zoo
  - Himax Production Quality models
  - Nvidia Tao Open-source models
  - Seeed SenseCraft models

ML Toolchain

TensorFlow · NVIDIA TAO · EDGE IMPULSE · seeed studio

Himax Ecosystem Partnerships



AI Processor

Ultralow power for always-on, Cortex-M55 MCU + Ethos-U55 microNPU

WiseEye1 ***WiseEye2***

50GOPs	2.5MB	15GB/s	640 x 480	1.2mW
Maximum Performance	**SRAM Density**	**Memory Throughput**	**Maximum Resolution**	**Power Consumption**
400MHz Cortex-M55 ML MCU 150MHz Cortex-M55 ML MCU 400MHz Ethos-U55 microNPU	512KB I/D TCM 2.0MB System memory	400MHz SRAMs 100MHz QSPI Flash (ext.)	VGA/QVGA	TFLM Person Detection 96x96 image size 250KB weights/ OPs 60M VGA 1FPS Ave. power consumption: *1.2mW* Deep power-down: *1μA* Model inference time: *1.1ms*

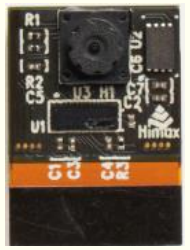
Image Sensor

Ultralow power for always-on, QVGA / VGA / HD hybrid

0.30 mW	0.40 mW	0.66 mW
QVGA *HM01B0*	**VGA** *HM0360*	**HD Hybrid** *HM11B1*
320x240 AONV Sensor 0.30mW @ QVGA 3FPS 3.6mW @ Full 60FPS 3.6μ FSI technology DVP interface (AONV)	640x480 AONV Sensor 0.40mW @ QVGA 3FPS 14.5mW @ Full 60FPS 3.6μ BSI technology DVP interface (AONV)	1280x800 RGB/AONV Hybrid Sensor 0.66mW @ QQHD 3FPS < 50mW @ HD 60FPS (MIPI) 1.12μ Stacked BSI technology SDI interface (AONV) MIPI CSI2 interface (RGB)

Turnkey Module

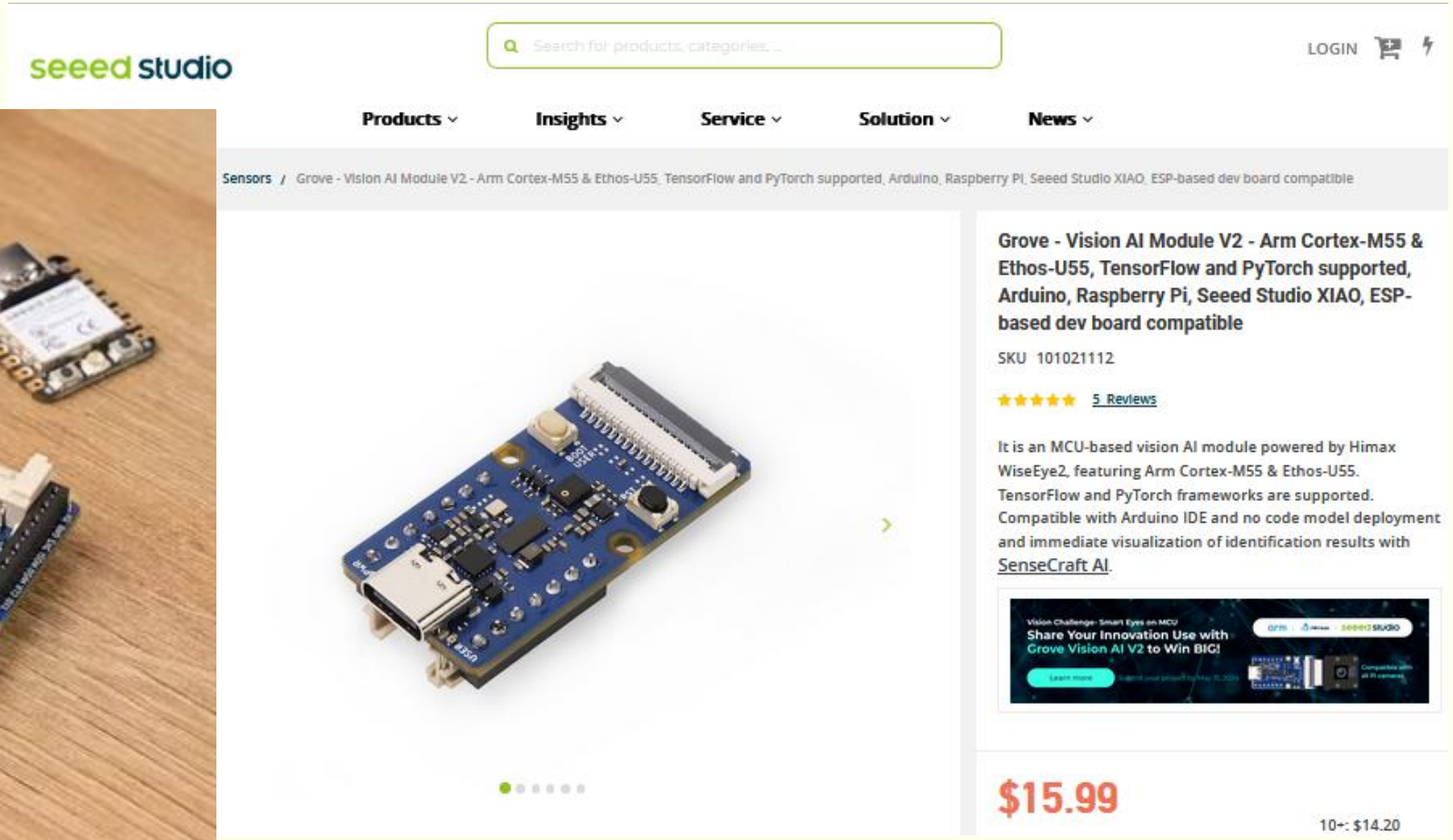
Production-ready module, camera + AI processor + ML models integration



VGA	VGA (IR cuter)
WiseEye2 *ISM028-03M0098*	**WiseEye2** *ISM028-03M0198*
20.5mm x 21.5mm x 4.92mm 640x480 AONV Sensor FOV 129.4°(D) x 98.1˚ (H) x 71.8˚ (V)	20.5mm x 21.5mm x 4.92mm 640x480 AONV Sensor FOV 129.4°(D) x 98.1˚ (H) x 71.8˚ (V) Lens with IR cuter
Human Body Detection Face Detection Head Pose (yaw, pitch, roll)	Occupancy detection for parking

User-Friendly Dev. Board (by Partner *Seeed Studio*)

Source: https://www.seeedstudio.com/Grove-Vision-AI-V2-Kit-p-5852.html



Combination of tinyML at the edge and LLMs

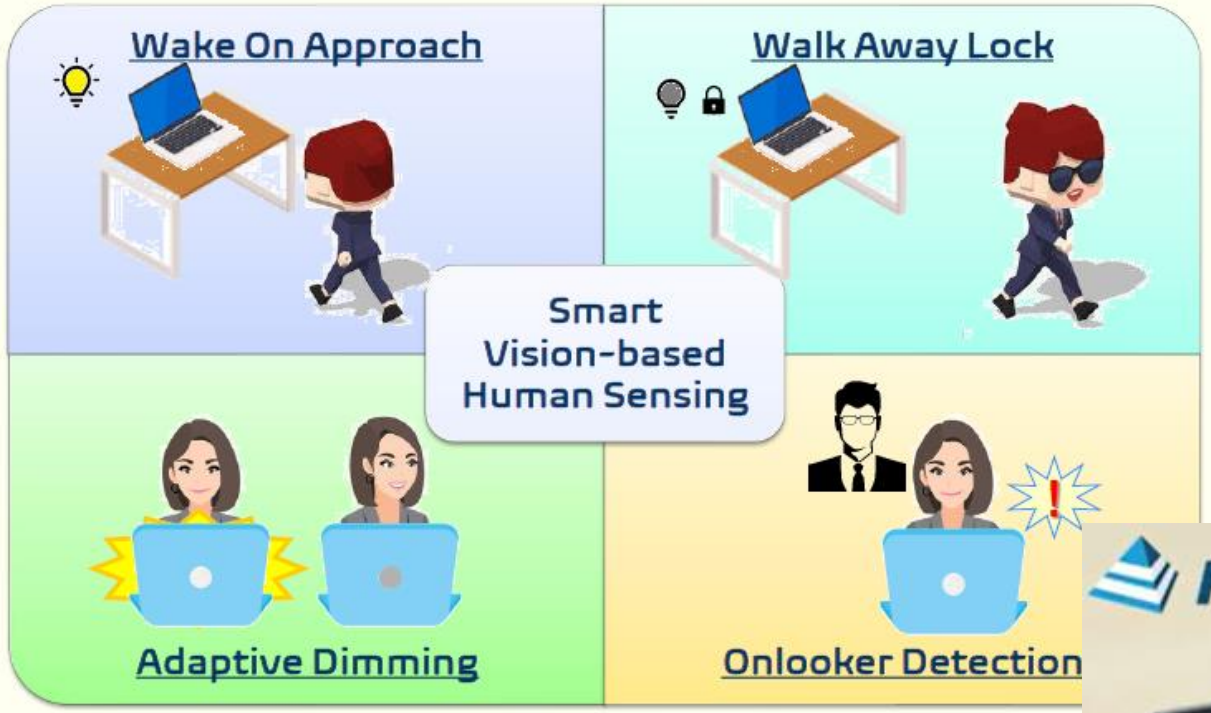
SenseCAP Watcher marks a major milestone in revolutionizing space management by identifying, monitoring and even interacting with objects of interest.

Learn more:

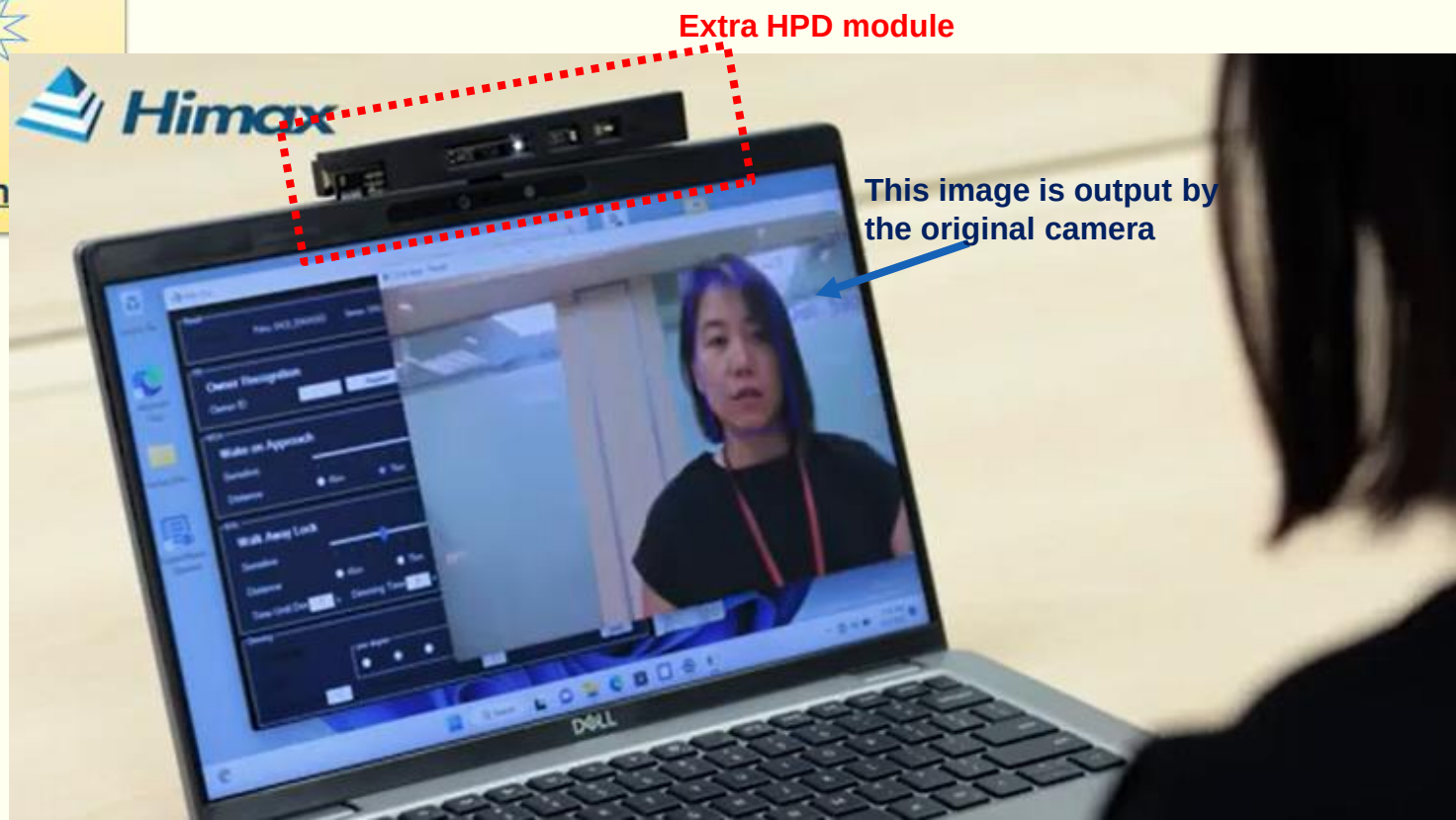
https://youtu.be/mduUpYa4FVo?si=VQjHkvxOlXMILxr9

https://www.youtube.com/watch?v=l_IO-WxA_XA&t=2s

Application and Use Case
WiseEye2



Video: https://www.youtube.com/watch?v=6q3JIjkII3g



Himax has collaborated with global brands such as Dell integrated Himax camera module (incl. processor, image sensor and algorithm) into the laptop itself.

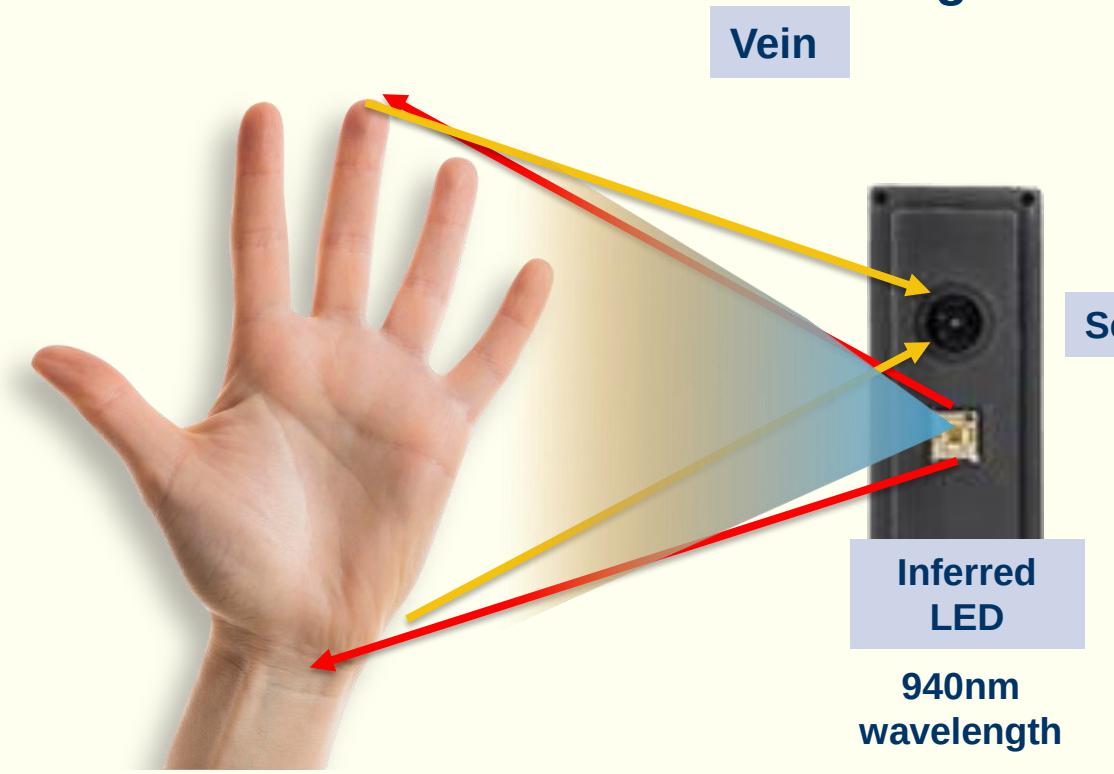
Contactless Palm Vein Authentication

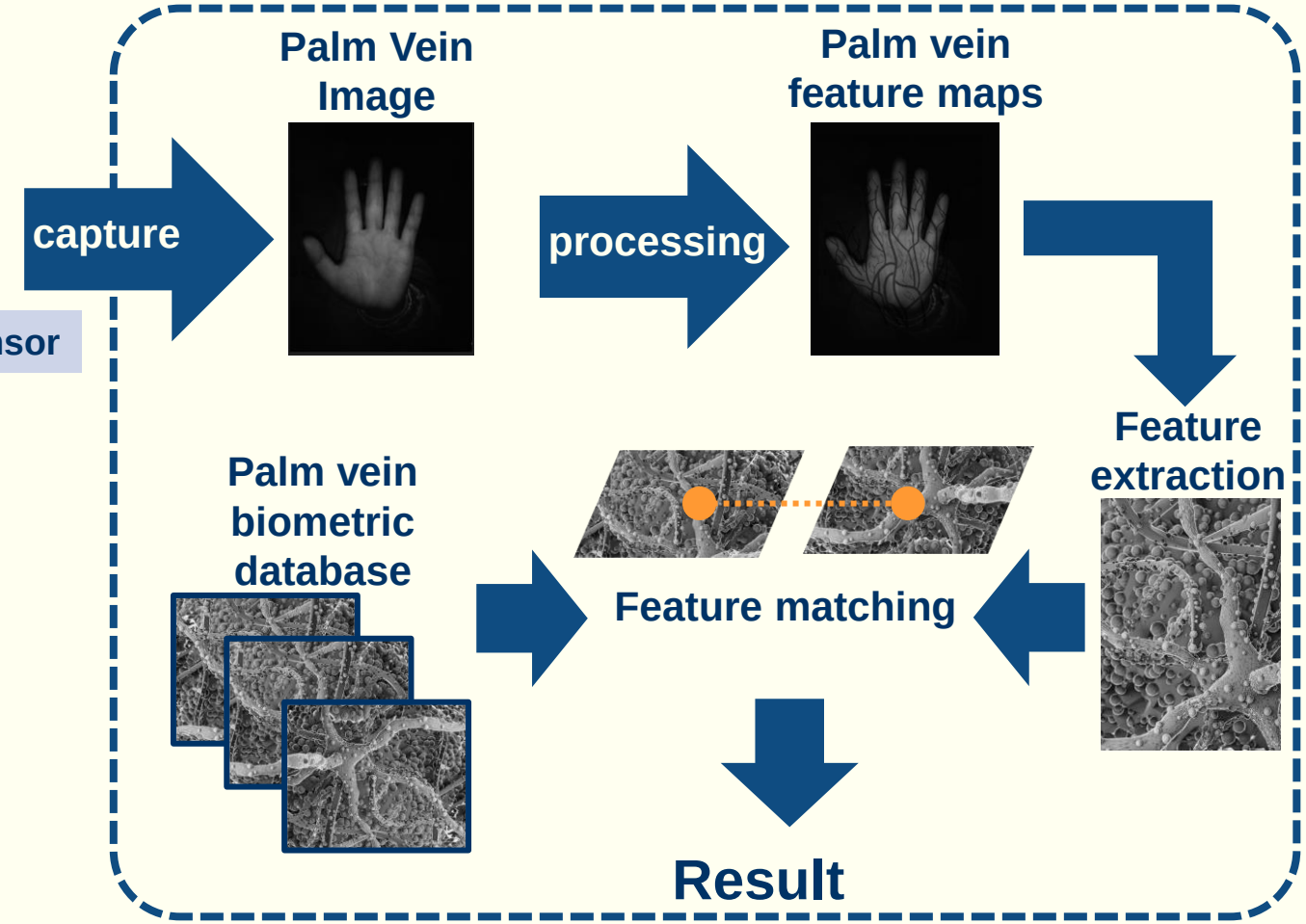
Video: https://www.youtube.com/watch?v=tLR3r4hdfNs

- True Acceptance Rate: >97%
- False Acceptance Rate: $<10^{-6}$
- Liveness Detection Accuracy: >99%
- Angle Range (Z axis)
  - -90° to +90°
  - XY axis: <25°

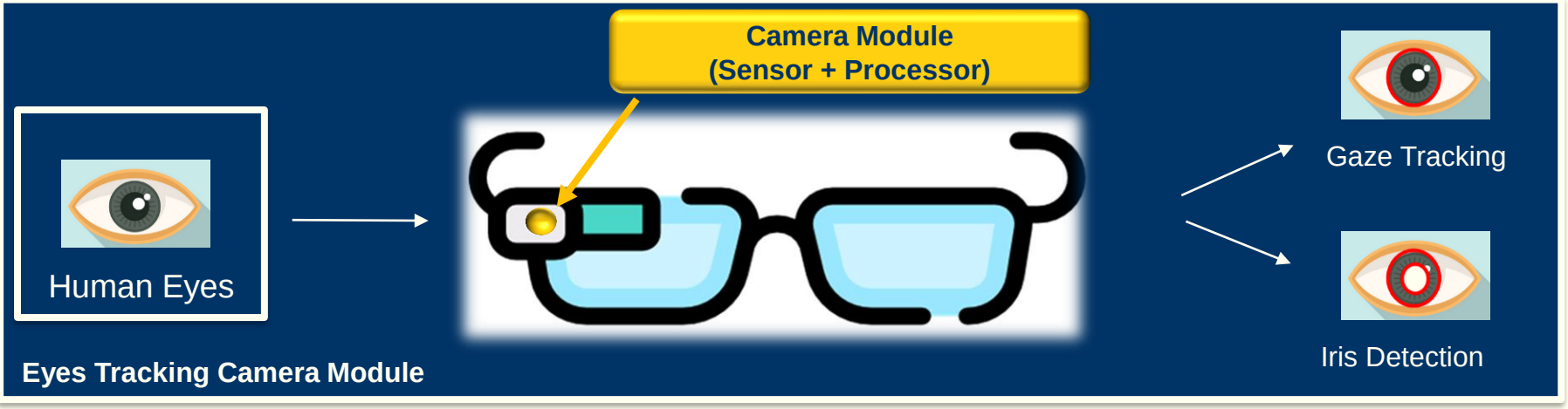
Palm Vein Recognition Processing

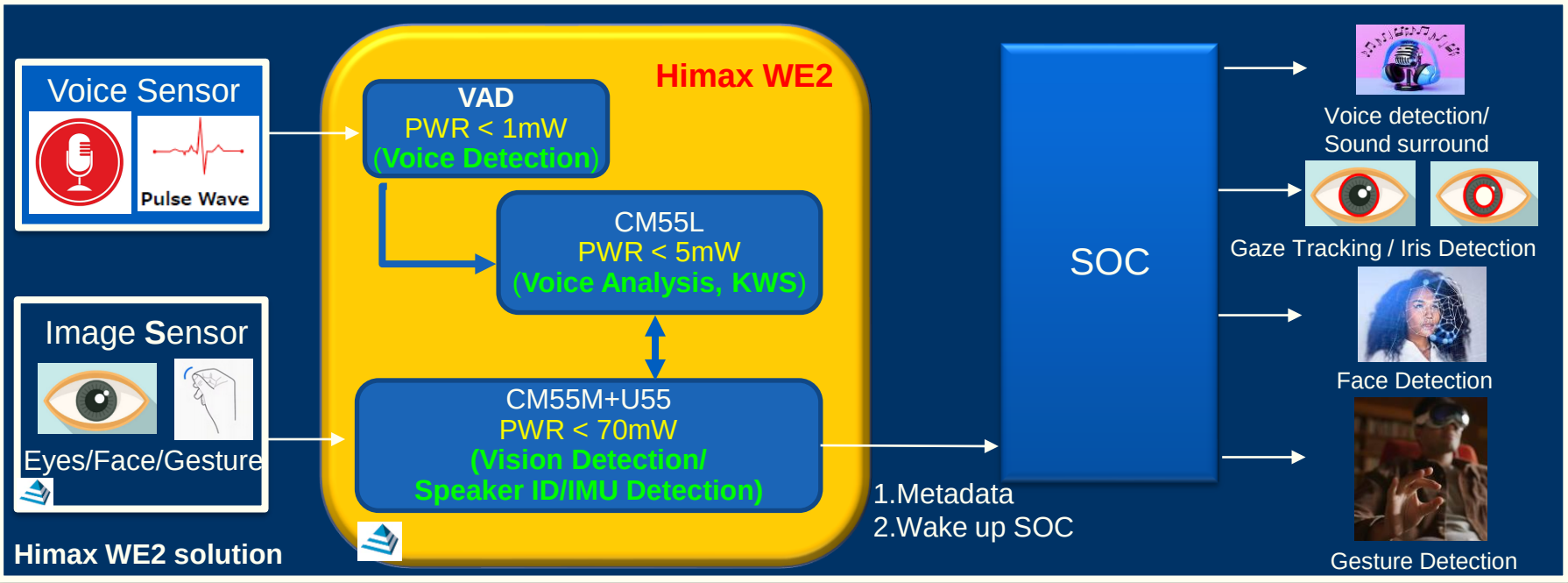
Vein image created when Hemoglobin in blood vessels absorbs infrared light

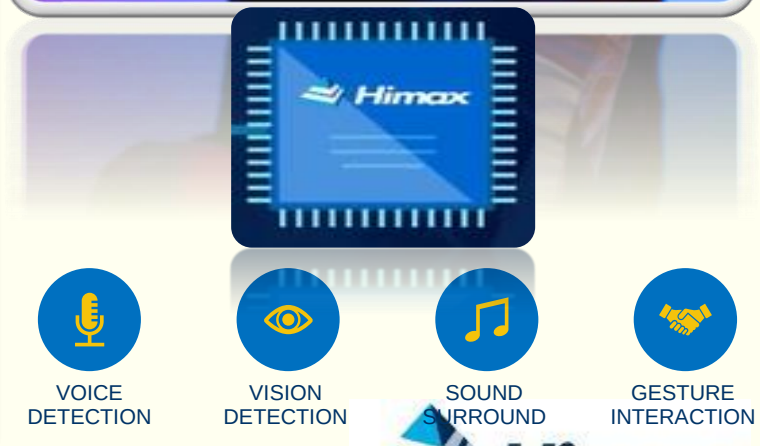




Eyes/Face Tracking & Gesture Interaction In Wearable Devices

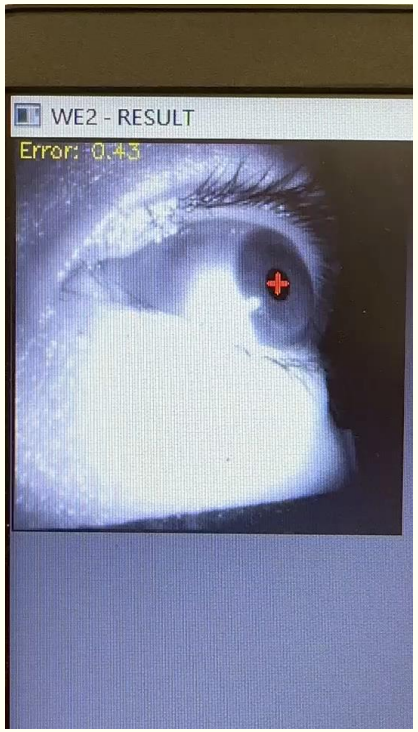






WiseEye2 Eyeball Tracking Solution

- Supports eye tracking, voice recognition, and gesture control for seamless human-computer interaction.
- Achieves highly accurate eye tracking with an error deviation of less than 1 degree.

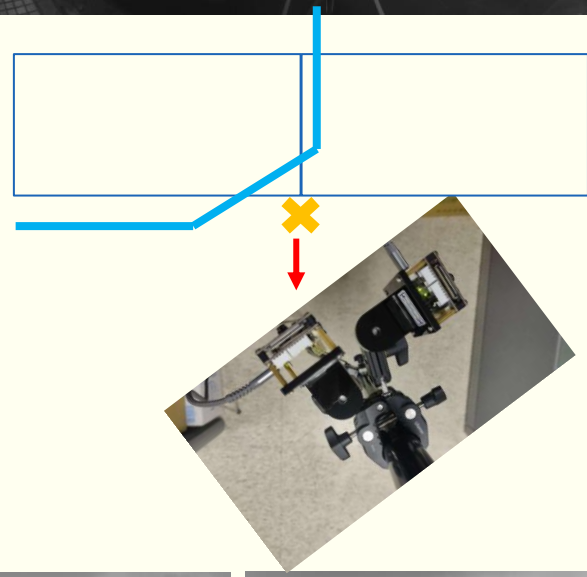


Ganzin Eyeball Tracking Algo.+ Himax WiseEye2 Processor

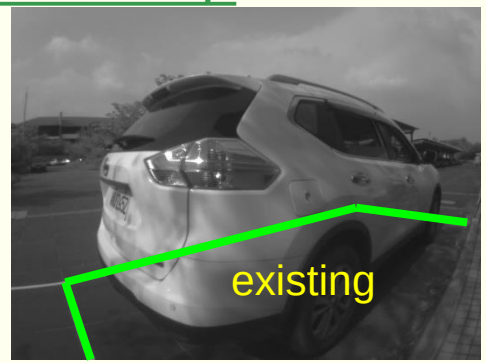
Demo kits	WiseEye2 + HM11B1
Optical Size	1/11”
Resolution	1280 * 800
Shutter type	Rolling Shutter
Frame rate	30fps
Power consumption	WE2 Power < 70mW (CM55M+U55) HM11B1 Power < 26.67mW
D/H/V FOV	76.16° / 68.65° / 41.99°
WE2 Package Size (X*Y)	WLCSP65: 5.6 * 2.3 mm^2 QFN88: 8 * 12 mm^2 LQFP128: 16 * 16 mm^2
Sensor Package Size (X*Y)	Bare Die: 2.3 * 1.5 mm^2

Smart Parking: Imaged-Based AI Vehicle Occupancy Senor

- Replace high power Radar by imaged based AoS low power sensor for parking pay station
- Upon parking, high power MPU+FHD image sensor will be triggered by WiseEye™
- System works by utilizing license OCR plate recognition technology to check-in cars as they enter, and to check-out cars as they leave
- Capture conditions:
  - Distance X is less than 20cm between car and parking line
  - Set the sensor at the height of 110-120cm
  - Suggested HFOV=100°, VFOV=74°
- Algorithm support
  - Car Detector + Car Plate Tracker
- Car Activity Detection Example Code
  - Entering
  - Occupying
  - Leaving



Video: https://www.youtube.com/watch?v=WwPVooIJRpI



Smart Parking: Imaged-Based AI Vehicle Occupancy Senor

Application and Use Case
WiseEye1

Automatic Meter Reading

Dial-Type

Wheel-Type

WiseEye AMR

Water Company

Video: https://www.youtube.com/watch?v=rrJa_Jee7po

Himax's AMR solution can automatically identify real-time data collected by WiseEye1; through API, readings can be confirmed in real time on the mobile phone or obtained on the cloud platform.

Capsule Endoscopy

12-Hour Battery Life for Image Capture and Transmission

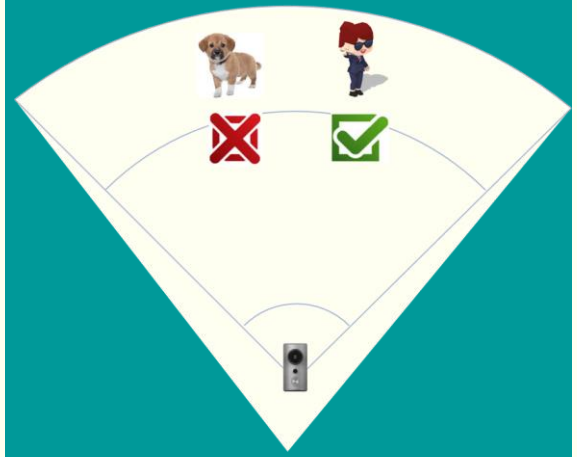
Smart Door Lock: Human-Aware AI Sensing

- Keep Monitoring Package by Motion Detection with ROI
- (DESMAN) 24Hours Monitoring by Periodic Image Captures and Upload to SDCARD/Cloud
- Alarm & Notification when package is moved or gone

DESMAN
德施曼 · 智能锁

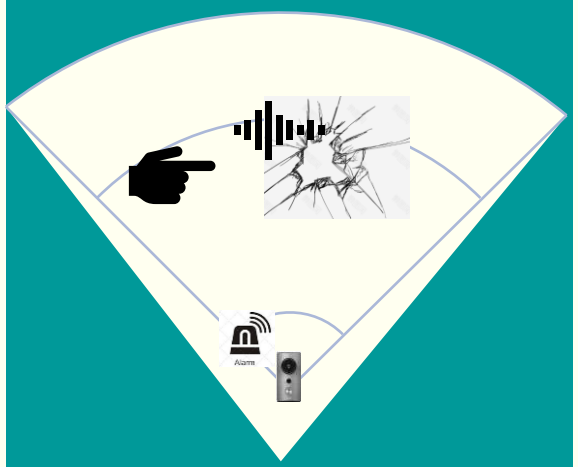
Use Case: Smart Door Lock / Doorbell

Human Presence Alert



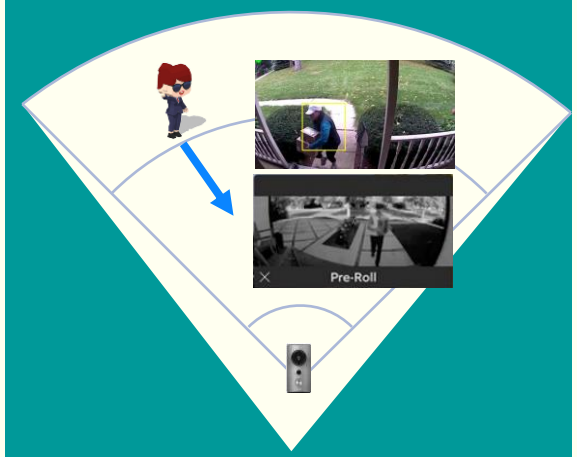
- Reduce false alarm
- Save battery power

Audio Detection Alert



- Sounds as auxiliary to improve security

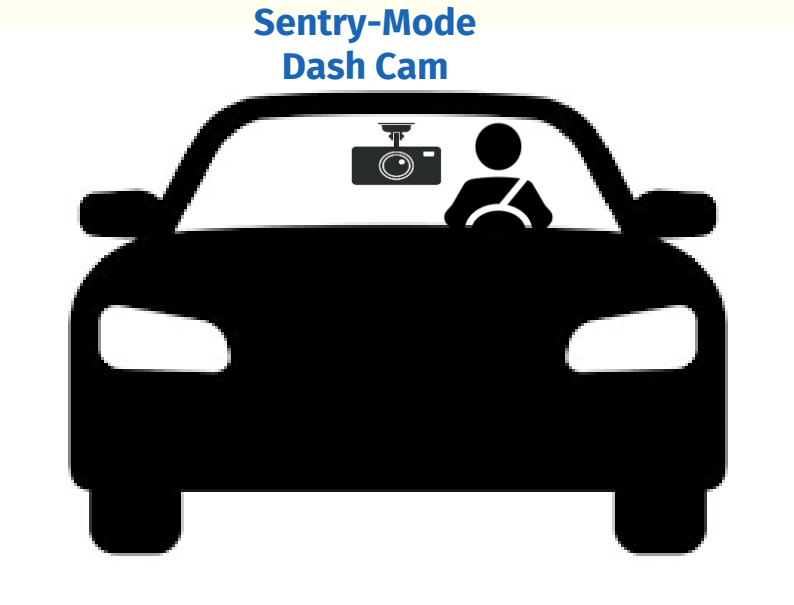
Always Watching



- Embedded motion detection
- Pre-rolling up to 4 secs

Source: DESMAN

WiseEye in the smart cockpit



Himax develops WiseEye™ to enable always on machine learning at the edge for a broad range of battery-powered applications. The main capability of WiseEye2 processor is to run complex deep neural network models traditionally requiring significant computing power. For instance, low-power palm vein authentication module will be soon introduced to the smart cockpit to perform contact-less ID recognition.
Automotive regulations will be discussed upon customers' requests.

Drive for better vision