

OMRON's Face Sensing Technology: OKAO Vision

Visual information plays a significant role in face-to-face communication. Clearly, communication between people and machines would be more comfortable if a machine could understand people visually in much the same way as people do. 'OKAO Vision', which stands for face vision in Japanese, is the collection of OMRON's edge-cutting technologies in this area. By visually sensing and extracting useful information from face images, OMRON aims to provide various kinds of services optimized for each individual. These services will match their interfaces and contents to user's capabilities, preferences, condition, attributes, and applicability.

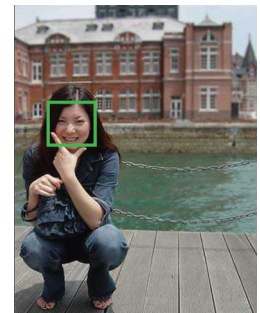
'OKAO Vision' is mainly composed by technologies as follows:

- **Face Detection**
Localizing multiple faces in target images quickly and accurately.
- **Facial Features Extraction**
Extracting feature position (e.g. eyebrow, eye, nose, mouth and face contour) in target face exactly.
- **Face Recognition**
Recognizing a person by comparing his/her face with faces registered in database.
- **Facial Attributes Estimation**
Estimating attributes of person such as gender, age and ethnicity with facial image.
- **Automatic Optimum Facial Picture Adjustment**
Adjusting the skin color of face images automatically to look more beautiful easily.

Face-priority Auto Focus



With the technology of the face detection function, the focus of the face is easily adjusted.



Auto adjustment for photo printing



With the technology of the face detection function, the brightness of the face is easily adjusted.



Proprietary Face Patch theory accurately detects multiple faces from a signal image at high speed in a variety of embedded devices.

High speed

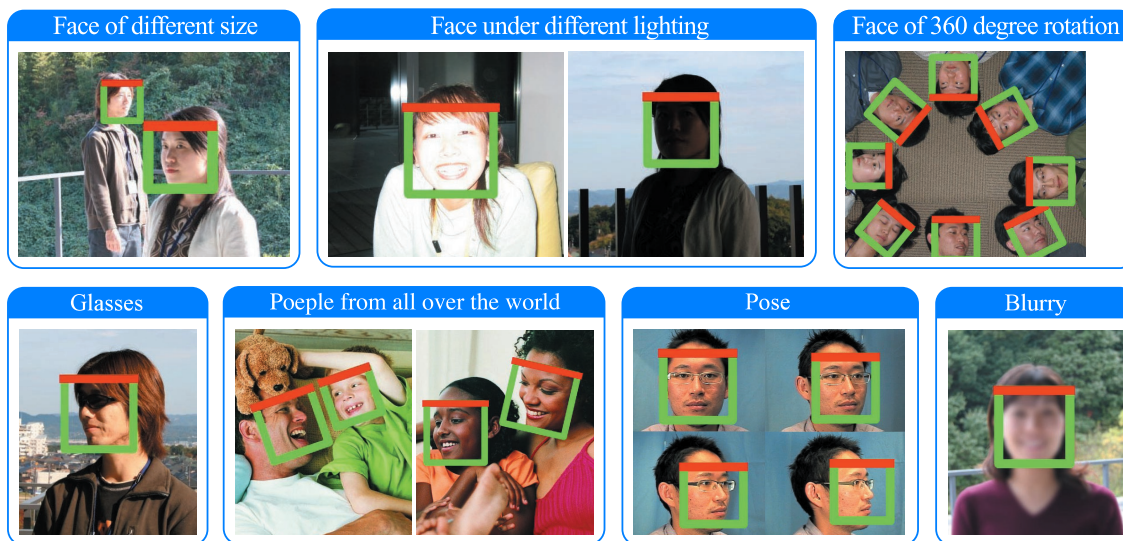
0.2 seconds per image.*1

High Accuracy and Versatility

Can detect even half profile faces (Rotation Out of Plane at $\pm 60^\circ$).

Compactness

Small run-time library can be transplanted to a cell phone with a camera easily.



◆ Specifications

Item	Specifications
Input image	VGA or smaller Grey Scale(8-bit)/Full Color(24-bit)
Range of Rotation Out of Plane (ROP)	$0 \sim \pm 30^\circ$ (left and right) · $0 \sim \pm 30^\circ$ (up and down) or $0 \sim \pm 60^\circ$ (left and right) · $0 \sim \pm 30^\circ$ (up and down)
Face orientation	Combination of UP, DOWN, LEFT, and RIGHT.
Range of Rotation in Plane(RIP)	$\pm 15^\circ, \pm 25^\circ, \pm 45^\circ$
Maximal face number	140
Minimum face size	20X20 Pixel
other	Optional module for reducing false detection further While the input is video, the processing speed might be further accelerated

NOTE:It can be sold as a PC software.

* 1 Operating Condition:RIP $\pm 15^\circ$, upright face, ROP $\pm 30^\circ$, a minimum face size 40 pixels and QVGA image size on ARM920T 200MHz.

* 2 The figure was based on 4,000 real-world Images, and does not guarantee the performance.

* 3 Operating Condition:RIP $\pm 15^\circ$, upright face, a minimum face size of 40 pixels and QVGA image size.
The processing time, ROM size and RAM size depend on the platform and the image.

◆ Performance

Item	Performance
Detection rate*2	92%
False detection rate*2	1 per 100 Images

	0~ $\pm 30^\circ$ (left and right)		0~ $\pm 60^\circ$ (left and right)	
	ARM 920T 200MHz	DM642 600MHz	ARM 920T 200MHz	DM642 600MHz
Processing Time*1	0.20s	0.03s	0.41s	0.06s
ROM*2	90KB	100KB	160KB	170KB
RAM*3	320KB	320KB	330KB	330KB

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