

FaceVACS-SDK is a development kit that provides the face recognition engine to system integrators, value added resellers and customers. The biometric functionality includes enrollment, verification, identification and face image quality assessment. Facial recognition works with 2D and 3D data. A set of tools and the documentation allow for efficient development; (re-)deployment requires a small set of binary libraries.

### FaceVACS® technology

#### Based on the latest and best FaceVACS® technology

- incorporates B6T8, A14T8 (2D) and B6L5T8 (2D/3D) engines
- incorporates face tracking
- incorporates portrait characteristics algorithms face image quality assessment and compliance to ICAO / ISO 19794-5

#### Engine is robust against

- typical gesture changes
- pose (+/- 15° deviation from frontal image)
- partial face occlusion

- beard and hairstyle changes
- glasses (except reflecting sunglasses)
- lighting changes that do not cause strong shadows

#### Minimal image requirements for facial recognition

- sharp image
- one face completely visible on the image
- inter-pupil spacing larger than 32 pixels
- at least 64 grayscales within the face area

### Option for using intensity and shape data

#### 3D capabilities

- requires intensity and shape data (FRGC-3D format, Cognitec proprietary binary format)
- fusion intensity and shape data scores
- spike and hole detection
- filtering
- smoothing
- facial shape alignment

### Portrait characteristics module

#### Portrait characteristics

- eye detection at predefined confidence levels
- sharpness estimation
- glasses detection
- tinted glasses detection
- exposure estimation
- closed eyes detection
- closed mouth detection
- head size and position detection
- rotation, cropping, downscaling to fit ISO 19794-5 Token Face and Full Frontal Image types
- unnatural skin tone detection
- red eye detection
- gender detection
- uniform background detection
- gaze away detection

- detection of reflections and hot spots on faces and glasses
- ethnicity detection
- age estimation
- format information extraction (e.g., color coding scheme)

#### Intensity image format support

grayscale and color image support

Reads formats:

- ISO 19794-5, JPG, JPG2000, PGM, PNG, BMP

Writes formats:

- JPG (configurable quality or predefined memory space)
- PGM, BMP
- ISO 19794-5 (configurable image type, image quality or predefined memory space)

### Encoding module

- generates Facial Identification Records (i.e. templates) of facial biometric traits
- uses multiple facial images of one person to generate a combined template

### Face tracker module

- allows tracking of faces using an input video stream
- determines face tracks based on temporal and spatial neighborhood
- generate unique tracking IDs and delivers subsequent face locations

#### Disclaimer

Face recognition technology, like any biometric application, cannot provide 100% recognition accuracy.

### Verification module

- 1:1 match of biometric trait evidence against one template created by the encoding module
- configurable score threshold
- threshold can be estimated based on targeted FAR/FRR rates and vice versa

### BioAPI 2.0 support

fully compliant BioAPI 2.0 (ISO 19784-1:2006) implementation of a **Verification Engine BSP**:

- functions: Load/ Unload, Attach/Detach, Query, Get/Free, BirHandle, Get Header, Create Template, Process, Verify Match
- BIR opaque data format is CBEFF compliant/ISO 19794-5 compliant

### API Bindings

- SDK functionality available through multiple programming languages and software development environments
- concepts and API's are, where possible, homogenous among the different programming languages, allows for easy switching to other environments

#### C++ API

- object oriented API using advanced software patterns and idioms
- example source code and compiled binaries

### Licensing

licenses can be granted for the following components, with any combination possible

#### Portrait characteristics module

determines photo-ID card relevant characteristics and performs tests following ISO 19794-5 requirements

#### Face and eye finding module

acquires faces on images and return the eye positions

#### Tracking module

tracks faces on video streams

### Documentation

- detailed manual including API reference and user guide
- API documentation is aligned to specifically supported programming languages, like java doc for java API
- fully documented examples illustrating the main use cases and providing hints on how to create customized implementations
- manual, guides and tutorials are provided in PDF and HTML formats

### Identification module

- 1:many match of biometric trait evidence against a set of templates created by the encoding module
- returns a list of references to the templates ordered by score
- size of the returned match list can be limited

### Biometric evaluation kit

- suite of tools to perform biometric evaluations on facial data residing in SQL databases (Windows only) or files (Windows and Linux)
- generation of identification match lists
- generation of similarity matrix data
- base for calculating CMC or ROC curves

#### .NET API

- accessible through Visual Basic, C# and Jscript programming languages on Windows platforms
- example source code in C# and compiled binaries

#### C API

- C language covered by BioAPI implementation
- verification engine BSP

#### Redistribution

component-based redistribution possible

#### Encoding module

- determines biometric sample quality to check suitability for comparison
- generates and stores biometric template from a given annotated image

#### Verification module

verifies an image and template

#### Identification module

- compares an image with set of templates
- additional parameter: size of reference template set

Platform	Windows I686	Linux I686	MacOSX Intel
<b>Development Host</b> Hardware Requirements	Proposed hardware: <ul style="list-style-type: none"> <li>Core 2 Duo CPU @ 2 GHz;</li> <li>4 GB RAM</li> <li>4 GB free disk space</li> </ul>		
<b>Development Host</b> Operating System	Windows XP Professional, Windows 2003 and 2008 Server, Windows Vista, Windows 7 on x86 32 bit and 64 bit architectures	Linux on x86 32bit and 64bit architectures	Mac OSX 10.5 and 10.6 on x86 32 and 64 bit architectures
<b>Development Host</b> Development Tools	Visual Studio 2005, 2008, 2010	Gcc 4.1/gcc 4.3 compiler	Gcc 4.0/gcc 4.2 (xcode 3.2)
<b>Programming APIs</b>	C++, .Net, BioAPI Verification Engine BSP (C -API)	C++, BioAPI Verification Engine BSP (C -API)	C++, BioAPI Verification Engine BSP (C -API)
<b>Target Host</b> Minimum Hardware Requirements	<ul style="list-style-type: none"> <li>P4 or similar @ 1.6GHz, 1GB RAM</li> <li>1 GB free disk space</li> </ul>		
<b>Target Host</b> Operating System	Same as development host		
<b>Available Functionality and Algorithm Versions</b>	<ul style="list-style-type: none"> <li>face finding: T8</li> <li>face tracking: R2</li> <li>portrait characteristics: P1</li> <li>enrollment, verification, identification: A14, B6, B6L5(3D)</li> </ul>		
<b>Target Host</b> Computing Performance	For Intel Core i7 CPU 920, 2,67 GHz, single threaded: <ul style="list-style-type: none"> <li>142.000 template comparisons per second (B6)</li> <li>generates 5 templates per second (B6T8)</li> </ul>		
<b>Contributions on Target Host</b>	Application for quality assessment and ISO test on multiple images  Video analytics application (age, glasses, gender, ethnicity of frontal faces in a live stream)		

### Biometric template

- single intensity image enrollment template size: 1424 Bytes (A14T8), 2833 Bytes (B6T8)
- shape and intensity single image enrollment template size: 9505 Bytes (B6L5T8)

### Remote Activation

- via SafeNet HASP HL dongles
- on Windows XP SP2, Windows 2003 Server SP2, Windows 2008 Server, Windows Vista SP1 (32/64 bit), Windows 7
- on SLES 10 SP1, RHEL 5 SP1, Ubuntu Desktop 8.04/ 8.10 (32/64 bit)