FaceVACS® - SDK Version 8.3

Technical Specification

FaceVACS-SDK is a development tool that provides the native face recognition engine to System Integrators, Value Added Resellers and Customers. The basic biometric functionality of enrollment, verification and identification works on either image data or on intensity and shape image data. Additional functionality like portrait characteristics and face tracking complete the tool. The interfaces are available in a variety of programming languages and on the most common operating systems without any trailers like required databases, application frameworks, etc. A set of tools and the documentation allow for an efficient development whereby the (re-) deployment requires only a small set of binary libraries.

FaceVACS® TECHNOLOGY

Face Recognition engine is robust against

- Pose (+/- 15° yaw/ pitch +/- 20° roll deviation from frontal image)
- Minor partial face occlusion
- Beard and hairstyle changes
- Wearing glasses (except dark sunglasses)
- Moderate lighting changes

Based on the latest and best FaceVACS® technology

- Incorporates face and eye location algorithms (T series),
- Incorporates various 2D and 3D algorithms (A series ,B series and L series),
- Incorporates face tracker (R series)
- Incorporates portrait characteristics algorithms to determine face properties (P series)

Minimal intensity image requirements for facial recognition

- Sharp image
- One face is completely visible in the image
- Inter-pupil spacing larger than 32 pixels (60 pixel recommended)
- At least 64 grayscales within the face region are required for adequate contrast

OPTION FOR USING INTENSITY AND SHAPE DATA INFORMATION

(3D capabilities)

Operational modes

- Only Intensity image (as is); any shape information is ignored
- Intensity and shape data; requires always both, intensity and shape data

Biometric fusion

- Intelligent score fusion, in case intensity and shape data are used

Processing of raw shape data

- Spike and hole detection
- Filtering
- Smoothing
- Facial shape alignment

Intensity and shape data format support

- FRGC-3D format
- Cognitec proprietary binary

ACQUISITION / PORTRAIT CHARACTERISTICS MODULE

Intensity image capture sources

Captures images from
- File
- DirectShow (Windows only)

Portrait characteristics

- Eye detection at predefined confidence levels
- Sharpness estimation
- Glasses detection
- Tinted glasses detection
- Exposure determination
- Closed eyes determination
- Closed mouth determination
- Head size and position determination
- Rotation, cropping, downscaling to fit Token Frontal/Full Frontal Image Type and resolution
- Unnatural skin tone determination
- Red eye determination
- Gender determination
- Uniform background determination
- Gaze away detection
- Reflection on face / glasses detection
- Ethnicity determination
- Age group determination
- Format Information extraction (like color coding scheme)

Intensity image format 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)
- Grayscale and color image support

ENCODING MODULE

Generates biometric encoding (i.e. template) of facial biometric traits as obtained through the Acquisition Module.
- Uses multiple unique 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 special neighborhood.
- generate unique tracking Id's and delivers subsequent face locations (by eye positions frame by frame)

VERIFICATION MODULE

1:1 match of biometric trait evidence captured by the Acquisition Module against the template created by the Encoding Module.
- The calculated score in relation to a predefined threshold is used to make a yes/no verification decision
- Threshold can be estimated based on targeted FAR/FRR rates and vice versa

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IDENTIFICATION MODULE

1:many match of biometric trait evidence captured by the Acquisition Module 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
- As an extension, the Acquisition Module can be configured to detect all visible faces within an image

BIO API 2.0 SUPPORT

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

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

ENGINEERING ENVIRONMENT

SDK functionality is available through multiple programming languages and software development environments.
- Customer has the flexibility to select their preferred environment
- The 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

.NET API

- Accessible through Visual Basic, C# and Jscript programming languages
- Windows Only Support
- Example source code in C# and compiled binaries

C API

- The C Language is covered by the BioAPI implementation
- Verification Engine BSP

Redistribution

- Component based redistribution

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
- Documentation is in English

LICENSING

Licenses are granted for the following components, whereby any combination is 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

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

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

Disclaimer

Like any biometrics, face recognition intrinsically cannot provide 100% recognition accuracy. The remaining uncertainty has to be considered by the customer and can be operationally covered to a certain degree.

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Platform	Windows/I686	Linux/I686	Mac OSX/Intel
Development Host Hardware Requirements	**Proposed hardware** - Core 2 Duo CPU @ 2 GHz; - 1 GBytes RAM - 1.5 GBytes free disk space **Minimum hardware** - P4 @ 1.6 GHz, - 512 MBytes RAM - 1 GByte free disk space		
Development Host Operating System	Windows XP Professional, Windows 2003 Server, Windows Vista, Windows 7 on i686 32 bit and 64 bit architecture	Linux on i686 32bit and 64bit architecture	Mac OSX 10.5 Mac OSX 10.6
Development Host Development tools	- Visual Studio .NET edition compiler2005/ 2008	- gcc 4.1 / gcc 4.3 compiler	- gcc 4.2 (XCode 3.2)
Programming API's	C++, .Net, BioAPI Verification Engine BSP (C -API)	C++, BioAPI Verification Engine BSP (C -API)	C++, BioAPI Verification Engine BSP (C -API)
Target Host Minimum Hardware Requirements	- P4 or similar @ 1.6GHz, 512 MBytes RAM - 512 MBytes free disk space		
Target Host Operating System	Same as development host		
Available Functionality and Algorithm versions	Face finding: T8 Face tracking: R2 Portrait characteristics: P1 Enrollment, Verification, Identification: A14, B4, L5B4(3D)		
Target Host Computing Performance	- 200.000 template comparisons per second (B4) - generates up to 10 template per second depending on image size, eye distance range, algorithm version (B4T8) (Measured on: 1 core of Core 2 Quad CPU @ 2.66 GHz)		
Contributions on Target Host	Assessment application showing image quality assessment and ISO test functionality		

Biometric template

- Single intensity image enrollment template size: 1424 Bytes (A14T8), 2044 Byte (B4T8)
- Shape and intensity single image enrollment template size: 6400 Byte (B4L5T8)

Remote Activation

- via HaspID
- on Windows 2000 SP4, Windows XP SP2, Windows 2003 Server SP2, Windows 2008 Server, Windows Vista SP1 (32/64 bit)
- on SLES 10 SP1, RHEL 5 SP1, Ubuntu Desktop 8.04/ 8.10 (32/64 bit)

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Platform	Windows Mobile/XScale
Development Host Hardware Requirements	**Proposed hardware** - Core 2 Duo CPU @ 2 GHz; - 1 GBytes RAM - 1.5 GBytes free disk space **Minimum hardware** - P4 or similar @ 1.600 MHz, - 512 MBytes RAM - 1 GByte free disk space
Development Host Operating System	Windows XP Professional, Windows 2003 Server, Windows Vista
Development Host Development tools	- Visual Studio .NET embedded edition 2005
Programming API's	C++
Target Host Minimum Hardware Requirements	XScale CPU @ 500 MHz or higher; 128 MByte RAM; build in camera
Target Host Operating System	Windows Mobile 6.0
Available Functionality and Algorithm versions	Face finding: T8 Enrollment, Verification, Identification: A14
Target Host Computing Performance	
Contributions on Target Host	On Motorola MC75/ Windows Mobile 6.0: Offline capturing, Enrollment and Identification