

VeriLook 2.0 Algorithm Demo

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Table of Contents

| | |
|--|---|
| 1. Introduction | 1 |
| 2. Requirements | 2 |
| 3. Installation | 3 |
| 4. Image quality control | 4 |
| 4.1. Pose | 4 |
| 4.2. Expression | 4 |
| 4.2.1. Examples of Non-Recommended Expressions | 4 |
| 4.3. Face changes | 4 |
| 4.4. Lighting | 4 |
| 4.5. Eyeglasses | 4 |
| 4.6. Web cameras | 5 |
| 5. Application | 6 |
| 5.1. Main window | 6 |
| 5.2. Options dialog | 7 |
| 5.3. Menu commands | 8 |

List of Figures

| | |
|------------------------------------|---|
| 5.1. Main application window | 6 |
| 5.2. Options dialog | 7 |

Chapter 1. Introduction

VeriLook 2.0 Demo application is designed with aim to demonstrate the capabilities of VeriLook face recognition engine. The program is a Windows 98/ME/NT/2000/XP GUI application.

Evaluation software supports image acquisition from the external video source (such as Web cameras) via DirectX library. Also it can read face images from .bmp, .tif, .png, .jpg, .gif files.

The application has 3 operation modes:

1. Enrollment. Software processes the face image, extracts features and writes them to the database.
2. Face enrollment with features generalization. This mode generates the generalized face features collection from a number of the face templates of the same person. Each face image is processed and features are extracted. Then collections of features are analyzed and combined into one generalized features collection, which is written to the database. The face recognition quality increases if faces are enrolled using this mode.
3. Matching. This mode performs new face image matching against face templates stored in the database.

Chapter 2. Requirements

- 128 MB of RAM, 1Ghz CPU, 2MB HDD space for the installation package.
- Microsoft Windows 98/Me/NT/2000/XP.
- DirectX 8.1 or later. You can download DirectX upgrade from Microsoft web site
- Microsoft GDI+. This library is supplied with Windows XP and Windows .NET Server family. If you are using any other modern Windows platform (Windows 98/Me and Windows NT 4.0/2000) you should download and install it from Microsoft web site.
- The Microsoft® XML Parser (MSXML) 3.0 SP4 is required so if it is not already in the system you should download and install it from Microsoft web site.
- Optionally, video capture device (web camera).

Chapter 3. Installation

Before installing the demo program, check if your system complies with the system [requirements](#) for running VeriLook evaluation software.

The VeriLook evaluation program comes as zip file so you must unzip the files to the directory of your choice.

The distribution consists of 3 files:

- VLDemo.exe
- VeriLook 2.0 Demo.chm
- VeriLook 2.0 Demo.pdf

After the first use of the program, it will create database and configuration files in the installation directory

Chapter 4. Image quality control

Face recognition is very sensitive to image quality so maximum care should be attributed to image acquisition.

4.1. Pose

The frontal pose (full-face) must be used. Rotation of the head must be less than +/- 5 degrees from frontal in every direction – up/down, rotated left/right, and tilted left/right.

4.2. Expression

The expression should be neutral (non-smiling) with both eyes open, and mouth closed. Every effort should be made to have supplied images comply with this specification. A smile with closed jaw is allowed but not recommended.

4.2.1. Examples of Non-Recommended Expressions

1. A smile where the inside of the mouth is exposed (jaw open).
2. Raised eyebrows.
3. Closed eyes.
4. Eyes looking away from the camera.
5. Squinting.
6. Frowning.
7. Hair covering eyes.
8. Rim of glasses covering part of the eye.

4.3. Face changes

Beard, moustache and other changeable face features influence face recognition quality and if frequent face changes are typical for some individual, face database should contain e.g. face with beard and cleanly shaved face enrolled with identical ID.

4.4. Lighting

Lighting must be equally distributed on each side of the face and from top to bottom. There should be no significant direction of the light or visible shadows. Care must be taken to avoid "hot spots". These artifacts are typically caused when one, high intensity, focused light source is used for illumination.

4.5. Eyeglasses

There should be no lighting artifacts on eyeglasses. This can typically be achieved by increasing the angle between the lighting, subject and camera to 45 degrees or more. If lighting reflections cannot be removed, then the glasses themselves should be removed. (However this

is not recommended as face recognition typically works best when matching people with eyeglasses against themselves wearing the same eyeglasses).

Glasses must be clear glass and transparent so the eyes and irises are clearly visible. Heavily tinted glasses are not acceptable.

4.6. Web cameras

As web cameras are becoming one of the most common personal video capturing devices, we have conducted small video image quality check. Most of cheap devices tend to provide 320x240 images of low quality, insufficient for biometrical use, however few of higher quality devices deserve a mention: Logitech Quick Cam Pro 4000, Logitech Quick Cam Zoom, and Creative Pro Ex. As a general rule, true 640x480 resolution (without interpolation) and a known brand name are recommended.

Images should be enrolled and matched using the same camera, as devices have different optical distortions that can influence face recognition performance.

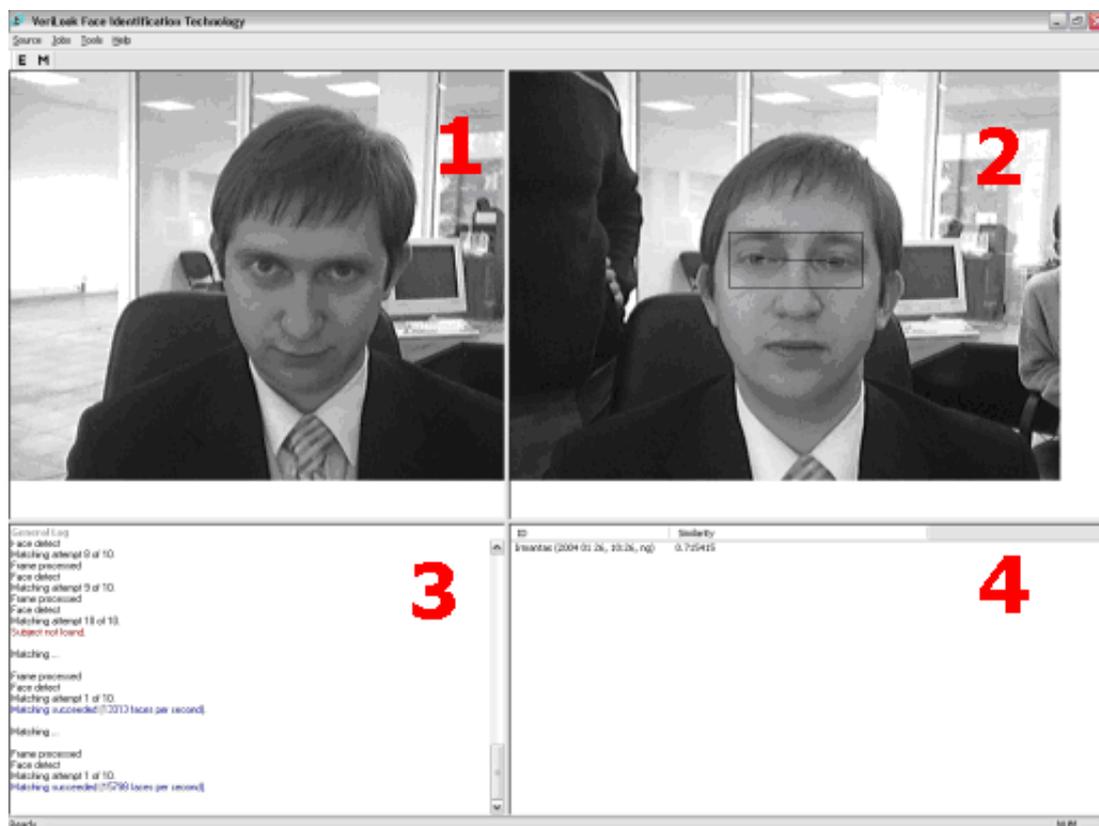
Chapter 5. Application

VeriLook demo application demonstrates VeriLook face recognition algorithm using video and still images.

5.1. Main window

Main application window has four-pane layout, where two top panes are used for image display and two bottom panes are used for message logging. Menu commands and two toolbar buttons, used as shortcuts for most accessed commands, control application.

Figure 5.1. Main application window



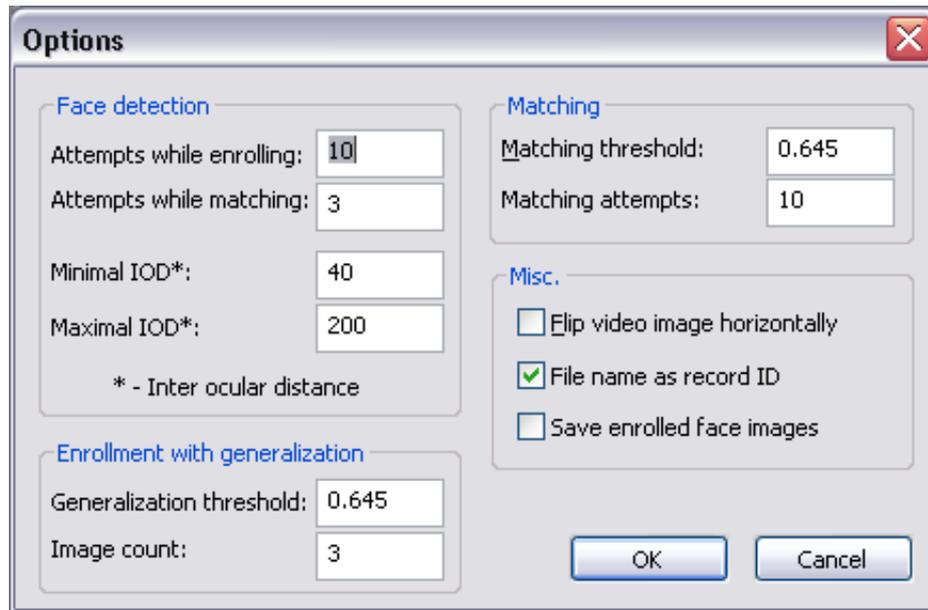
Main window panes:

1. Face detection pane, used to display video or still images and result of face detection algorithm overlaid on image.
2. Matching/enrollment pane, used to display images enrolled to face database or used for matching.
3. Application log, used for system information and application progress messages.
4. Match results pane for listing id of the subject in the database, most similar to matched

image. Subjects are considered “similar” if their similarity value exceeds matching threshold set via Options dialog. This value is displayed in the second list view column.

5.2. Options dialog

Figure 5.2. Options dialog



- Attempts while enrolling – maximum number of frames to process with face detection algorithm while enrolling subject using video camera.
- Attempts while matching – maximum number of frames to process with face detection algorithm while matching subject using video camera.
- Minimum IOD – minimum distance between eyes.
- Maximum IOD – maximum distance between eyes.
- Generalization threshold – similarity value that has to be mutually exceeded by each feature template used for generalization.
- Image count – number of images to use for enrollment with generalization.
- Matching threshold – threshold that separates identical and different subjects. Matching threshold is linked to false acceptance rate (FAR, different subjects erroneously accepted as of the same) of matching algorithm. The higher is threshold, the lower is FAR and higher FRR (false rejection rate, same subjects erroneously accepted as different) and vice a versa.

| FAR | Threshold |
|------|-----------|
| 1% | 0.520 |
| 0.1% | 0.585 |

| | |
|---------|-------|
| 0.01% | 0.642 |
| 0.001% | 0.695 |
| 0.0001% | 0.760 |

- Matching attempts – specifies how many times face database will be searched for a match for each newly detected face. Matching will be terminated after finding first subject with similarity value greater than matching threshold.
- Flip video image horizontally – mirror horizontally image received from video camera.
- File name as record ID – when enrolling still image files, use file name without extension as face database record identifiers.
- Save enrolled images* – write to disk images of subjects enrolled to face database.

Important

* It is recommended to save all enrolled images to allow re-enrolling in case of changes in internal feature template extraction algorithm in upcoming versions of VeriLook SDK.

5.3. Menu commands

| Menu command | Description |
|-----------------------------------|--|
| Source » "Camera name" | Choose selected camera as video source. |
| Source » File | Select an image file as a source. |
| Jobs » Enroll | Enroll image to face database. |
| Jobs » Enroll with generalization | Enroll several generalized images to face database. |
| Jobs » Match | Search for matching image in face database. |
| Tools » Face detection preview | View face detection result overlaid on images. |
| Tools » Save image | Save image to disk. |
| Tools » Clear logs | Clear application log windows. |
| Tools » Empty database | Empty face database. |
| Tools » Options... | Display options dialog. |
| Help » About VeriLook... | Display information about VeriLook demo application. |