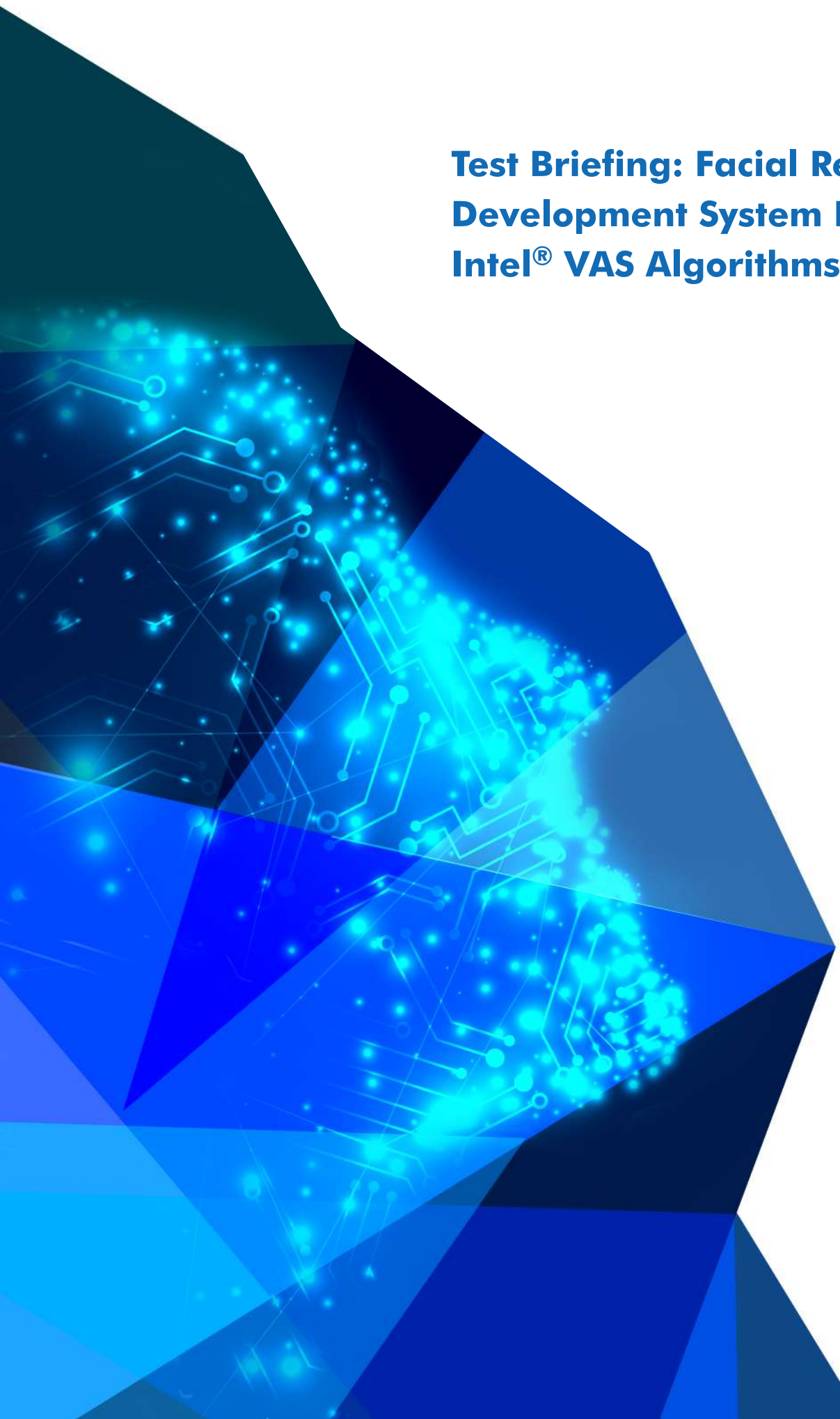
Test Briefing: Facial Recognition Development System Based on Intel® VAS Algorithms



Face identification is a form of biometric authentication that relies on detection of facial features to verify a person's identity. Technologies that involve automatic detection, tracking and identification of photographed images or video recordings containing people's faces captured on cameras or video recorders all fall under the category of face identification or face recognition. Such technologies are widely used in finance, law enforcement, military, public safety, border control, government, aerospace, electrical power system, factory management, education, healthcare and a slew of business applications. With face recognition technologies continuing to advance toward maturity while gaining social acceptance, their applications will keep expanding to the following areas, just to name a few.

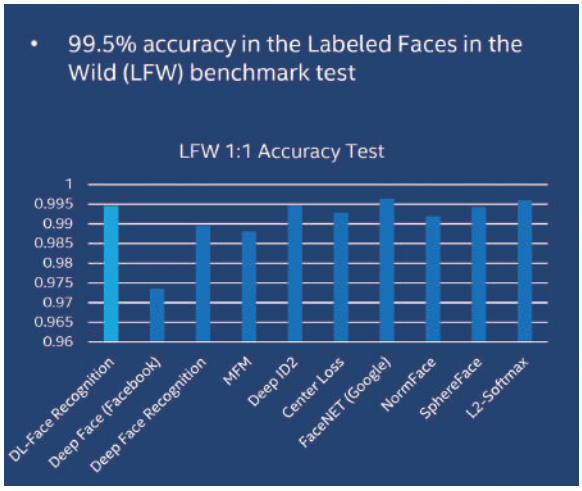
1. Security and management of commercial and residential premises, for instance, face recognition access control and time attendance systems or face recognition door locks.
2. E-passports and e-ID cards. First Research Institute of the Ministry of Public Security of PRC is expediting the planning and implementation of biometric passports.
3. Public safety, law enforcement and crime investigation, for example, searching for suspects using face recognition systems and nationwide networks
4. Self-service such as facial recognition payment systems

(Image 1: Wide-ranging application scenarios:)

Solution overview

1. Intel® VAS algorithms

Developed by Intel's algorithm department, the Intel® VAS (Video Analytics Suite) algorithm enables the development of high-precision and high-reliability face recognition, facial feature analysis, face comparison and detection and face tracking systems based on AI deep learning technologies in Windows 10 and Ubuntu 16.04 environments. Upon the signing of a non-disclosure agreement, customers can use the Intel® VAS algorithm at no cost to quickly develop their face recognition applications and products. If the products are based on Intel® CPU, customers can add smart features to their products to give them a competitive edge without increasing hardware costs.



(Image 2: VAS delivers 99.5% face detection accuracy)

2. JWIPC E7QL industrial computer

Featuring premium specs and long-term operational stability, JWIPC's E7 series is designed specifically for industrial application and is widely used to carry out many types of visual inspection work.

JWIPC E7QL:

(Image 4-1: Outlook of JWIPC E7QL)

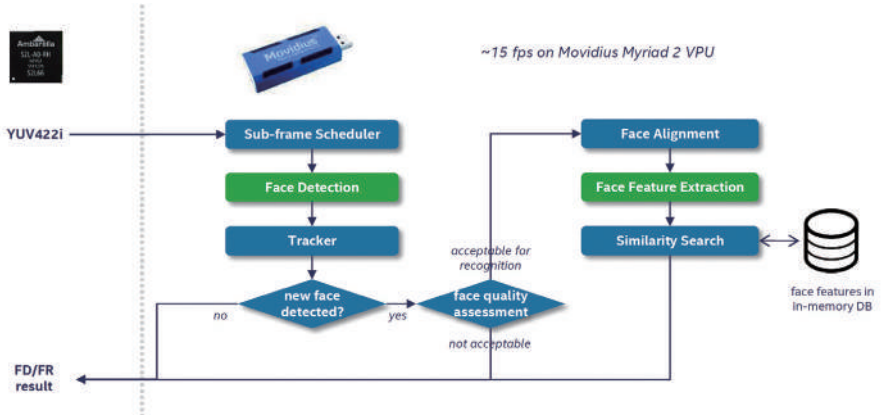
(Image 4-2: Inside of JWIPC E7QL)

(Image 4-2: Rear of JWIPC E7QL)

JWIPC E7 Industrial Gateway Specifications	
Processor	
Processor family	Intel® Core i7
Codename	Sky Lake
Processor model	6700T
Processor frequency	2.8 GHz
Processor boost frequency	3.6 GHz
Processor cores	4
Memory	
Internal memory	16 GB + 256G SSD + 1T Hdisk
eMMC	Not included
Ports And Interfaces	
USB	6
RS232	6
HDMI	Yes
SATA	Yes
Mini PCIe*	YES
GPIO	8pins (4xDI,4xDO)
Graphics	
On-board graphics	Intel HD Graphics 505, 18EU

(Image 3: JWIPC E7QL specification)

Facial Video Analytics at the Edge



The integrated face recognition solution:

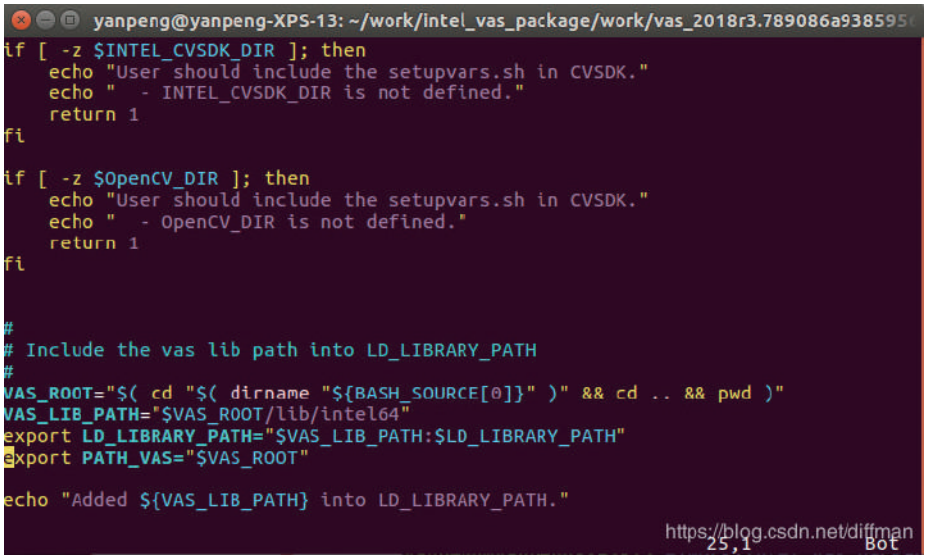
As an Intel® partner, JWIPC combines Intel's VAS algorithm with its JWIPC E7QL industrial PC hardware to form the integrated face recognition solution.

VAS installation guide

0. First, install Ubuntu 16.04 and Intel® OpenVINO and set OpenVINO environment variables.
1. Under Linux, install VAS using the file "vas_2018r3.789086a93859567_ubuntu_16.04.zip." Unzip the file to the development directory, for example, "~/work/Intel®_vas_package/work/" as illustrated below.

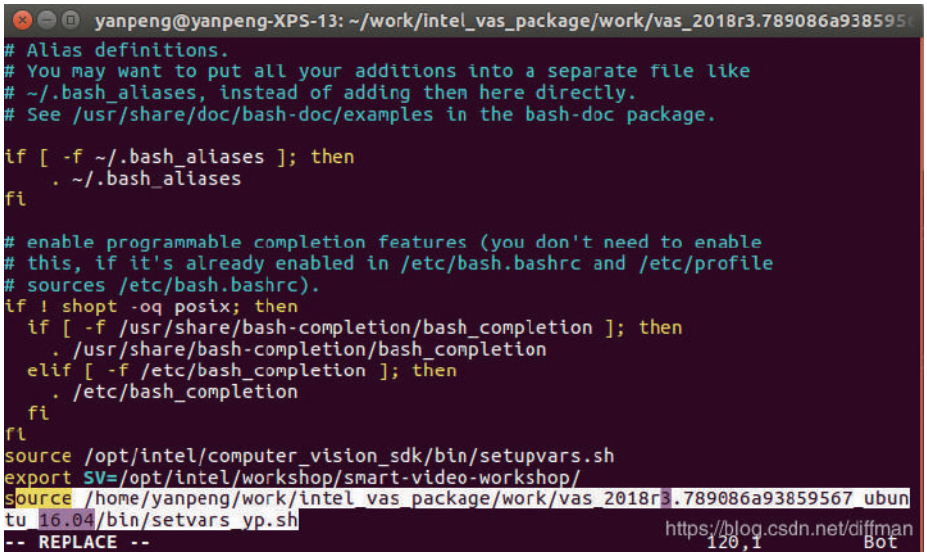
2. Use an editor of your choice to add a line (as shown below) to "bin/setvars.sh."

export PATH_VAS="$VAS_ROOT"



3. Add VAS environment variables into bashrc.

source /home/yanpeng/work/Intel®_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04/bin/setvars.sh

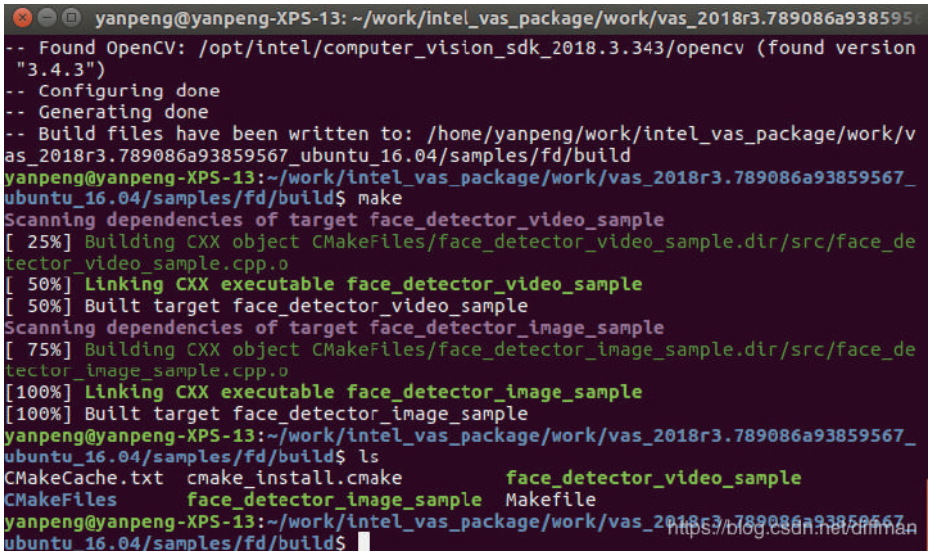


Then, restart the terminal to add the environment variables.

1. To compile, enter the “sample/fd” directory. Use “cmake” to compile with the following commands:

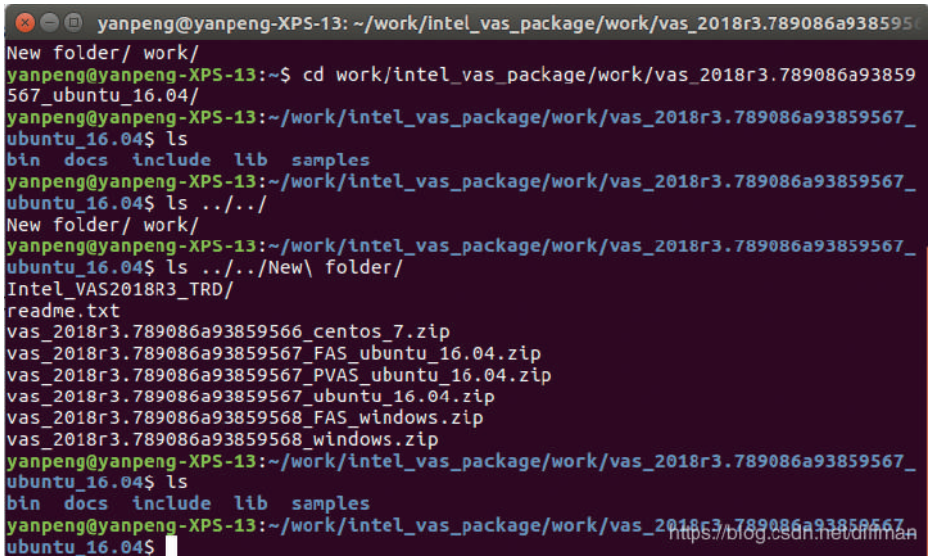
```
cd sample/fd

mkdir build && cd build

cmake ..

make
```

After compilation, there will be an executable file “face_detector_video_sample.”



2. Make sure your PC has a functional camera (Use the command “ls /dev” to check. If there are video0 or video1 files, this means the camera is working.) Then, execute the sample file:

```
./face_detector_video_sample -model=$PATH_VAS/lib/Intel®64 -v:0
```

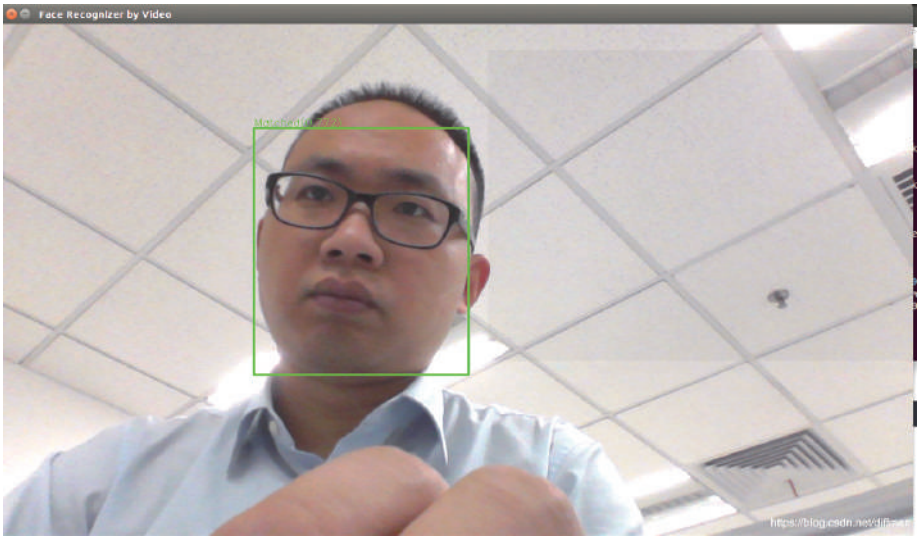


You will see result like this:

Follow the same procedures to compile FR. The commands are as follows. There is a pre-stored image file“yanpeng.jpg,” in the current directory, which can be used for comparison/detection.

```
./face_recognizer_video_sample -fd_model=$PATH_VAS/lib/Intel®64 -fr_model=$PATH_VAS/lib/Intel®64 -recognition_video=0 -register_image=./yanpeng.jpg
```

You will see result like this:



The above are all the installation steps. If you have any questions on installation Intel VAS, welcome to contact us.

Core technological advantages

1. Compelling 99.5%+ accuracy
2. Free availability to customers upon approval (NDA required)
3. Outstanding performance on Intel® platforms
4. Face recognition across age progression of more than 10 years

Solution spec:

1. Process model: normal tracking (partial detection)
2. Minimum face area: 24x24 (smallest spec)
3. Maximum detection distance: 15m (1080P, 60FOV)
4. Maximum face quantity detectable: no limit
5. Minimum illuminance: 10 lux
6. Model size: 580KB(INT8)
7. Input format: BGR/RGBA32/YUV(NV12,NV21, YV12, YUY2)
8. Output: a bounding box with five sets of coordinates
9. OS supported: Ubuntu 16.04 and Windows 10

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