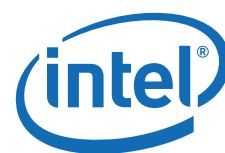


# **Test Briefing: Facial Recognition Development System Based on Intel® VAS Algorithms**



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

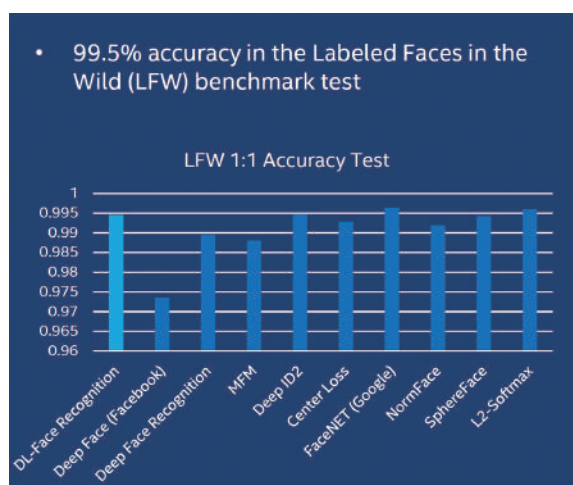


(Image 1: Wide-ranging application scenarios:)

## 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)



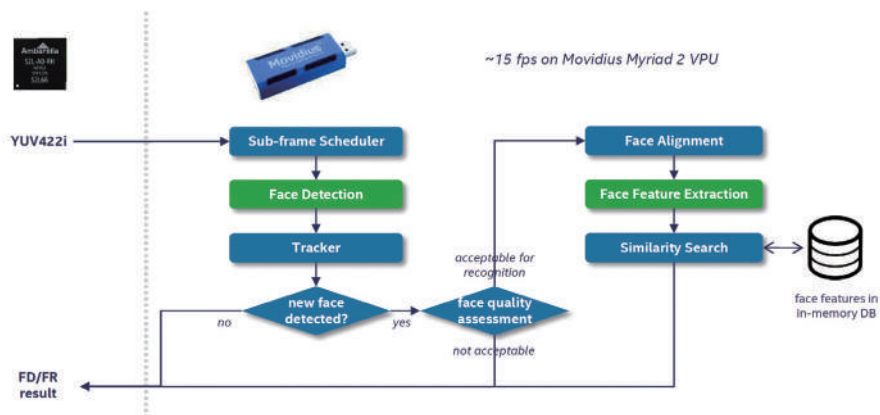
(Image 4-2: Rear of JWIPC E7QL)

## 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



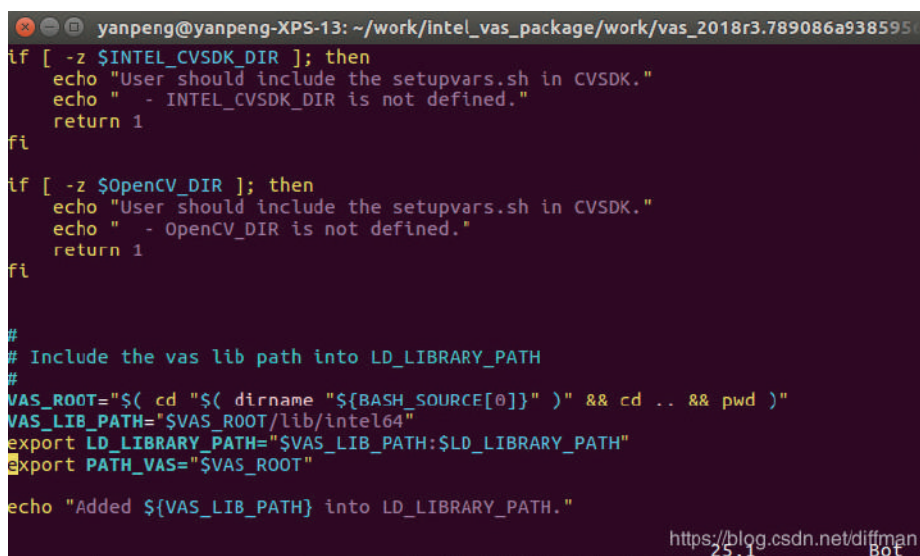


## The integrated face recognition solution:

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"**



```
yanpeng@yanpeng-XPS-13: ~/work/intel_vas_package/work/vas_2018r3.789086a93859567
if [ -z $INTEL_CVSDK_DIR ]; then
    echo "User should include the setupvars.sh in CVSDK."
    echo " - INTEL_CVSDK_DIR is not defined."
    return 1
fi

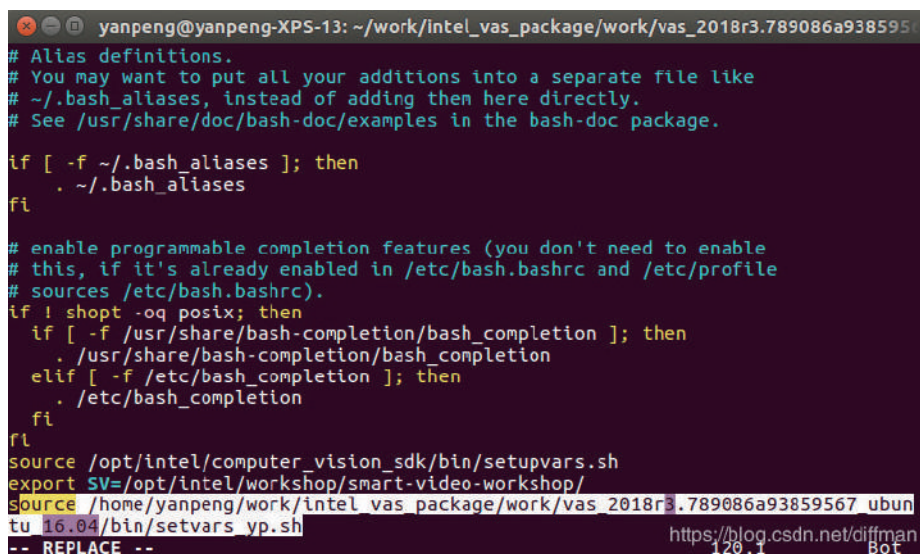
if [ -z $OpenCV_DIR ]; then
    echo "User should include the setupvars.sh in CVSDK."
    echo " - OpenCV_DIR is not defined."
    return 1
fi

#
# Include the vas lib path into LD_LIBRARY_PATH
#
VAS_ROOT="$( cd "$( dirname "${BASH_SOURCE[0]}" )" && cd .. && pwd )"
VAS_LIB_PATH="$VAS_ROOT/lib/intel64"
export LD_LIBRARY_PATH="$VAS_LIB_PATH:$LD_LIBRARY_PATH"
export PATH_VAS="$VAS_ROOT"

echo "Added ${VAS_LIB_PATH} into LD_LIBRARY_PATH."
```

3. Add VAS environment variables into bashrc.

**source /home/yanpeng/work/Intel®\_vas\_package/work/vas\_2018r3.789086a93859567\_ubuntu\_16.04/bin/setvars.sh**



```
yanpeng@yanpeng-XPS-13: ~/work/intel_vas_package/work/vas_2018r3.789086a93859567
# Alias definitions.
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.

if [ -f ~/.bash_aliases ]; then
    . ~/.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if ! shopt -oq posix; then
    if [ -f /usr/share/bash-completion/bash_completion ]; then
        . /usr/share/bash-completion/bash_completion
    elif [ -f /etc/bash_completion ]; then
        . /etc/bash_completion
    fi
fi

source /opt/intel/computer_vision_sdk/bin/setupvars.sh
export SV=/opt/intel/workshop/smart-video-workshop/
source /home/yanpeng/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04/bin/setvars.sh
-- REPLACE --
```

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."

```
yanpeng@yanpeng-XPS-13: ~/work/Intel_vas_package/work/vas_2018r3.789086a93859567
-- Found OpenCV: /opt/intel/computer_vision_sdk_2018.3.343/opencv (found version "3.4.3")
-- Configuring done
-- Generating done
-- Build files have been written to: /home/yanpeng/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04/samples/fd/build
yanpeng@yanpeng-XPS-13:~/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04/samples/fd/build$ make
Scanning dependencies of target face_detector_video_sample
[ 25%] Building CXX object CMakeFiles/face_detector_video_sample.dir/src/face_detector_video_sample.cpp.o
[ 50%] Linking CXX executable face_detector_video_sample
[ 50%] Built target face_detector_video_sample
Scanning dependencies of target face_detector_image_sample
[ 75%] Building CXX object CMakeFiles/face_detector_image_sample.dir/src/face_detector_image_sample.cpp.o
[100%] Linking CXX executable face_detector_image_sample
[100%] Built target face_detector_image_sample
yanpeng@yanpeng-XPS-13:~/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04/samples/fd/build$ ls
CMakeCache.txt  cmake_install.cmake  face_detector_video_sample
CMakeFiles      face_detector_image_sample  Makefile
yanpeng@yanpeng-XPS-13:~/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04/samples/fd/build$
```

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`

```
yanpeng@yanpeng-XPS-13: ~/work/Intel_vas_package/work/vas_2018r3.789086a93859567
New folder/ work/
yanpeng@yanpeng-XPS-13:~$ cd work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04/
yanpeng@yanpeng-XPS-13:~/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04$ ls
bin docs include lib samples
yanpeng@yanpeng-XPS-13:~/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04$ ls ../
New folder/ work/
yanpeng@yanpeng-XPS-13:~/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04$ ls ../New\ folder/
Intel_VAS2018R3_TRD/
readme.txt
vas_2018r3.789086a93859566_centos_7.zip
vas_2018r3.789086a93859567_FAS_ubuntu_16.04.zip
vas_2018r3.789086a93859567_PVAS_ubuntu_16.04.zip
vas_2018r3.789086a93859567_ubuntu_16.04.zip
vas_2018r3.789086a93859568_FAS_windows.zip
vas_2018r3.789086a93859568_windows.zip
yanpeng@yanpeng-XPS-13:~/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04$ ls
bin docs include lib samples
yanpeng@yanpeng-XPS-13:~/work/intel_vas_package/work/vas_2018r3.789086a93859567_ubuntu_16.04$
```

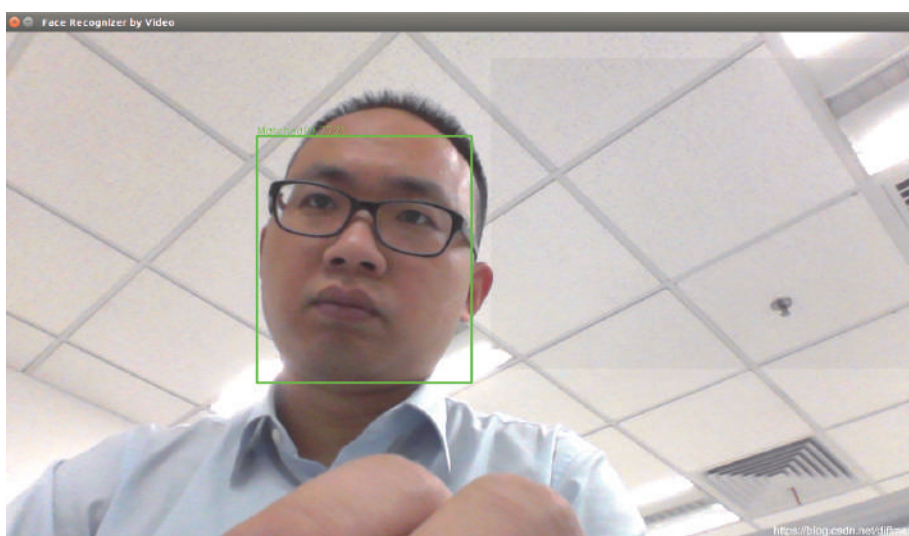
You will see result like this:



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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## About WPIG Intel® IoT Solution Aggregator

WPIG, as an Intel® IoT Solution Aggregator, is the best channel to offer the most diversified Intel® IoT solutions to address your business needs across multiple domains and applications. To play the role of IoT Solution Aggregator, WPI Group is capable to serve IT Systems Integrators and OT System Integrators in Asia and Greater China regions, bridge the overall end-to-end (Edge to Cloud) applications. To integrate IoT solutions and put Industrial ODM/OEM/ISV solutions on the shelf, more effectively support System Integrators to select suitable solutions and manage inventories. Moreover, assist in the establishment and cultivation of industry knowledge and use cases, promote various IoT applications and support to scale business through ecosystem partners' enablement.



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