



StarFive
赛昉科技

Using VisionFive 2 to Detect and Decode QR Codes

Application Notes

Version: 1.0

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Legal Statements

Important legal notice before reading this documentation.

PROPRIETARY NOTICE

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Preface

About this guide and technical support information.

About this document

This application notes provide users with steps to use VisionFive 2 to detect and decode QR codes based on OpenCV. StarFive has made it compatible with VisionFive 2 and accelerated and improved GPU performance.






Version History

Table 0-1 Version History

| Version | Release Date | Revision |
|---------|--------------|-----------------------------|
| 1.0 | 2023/06/30 | The first official release. |

Notes and notices

The following notes and notices might appear in this guide:

-  **Tip:**
Suggests how to apply the information in a topic or step.
-  **Note:**
Explains a special case or expands on an important point.
-  **Important:**
Points out critical information concerning a topic or step.
-  **CAUTION:**
Indicates that an action or step can cause loss of data, security problems, or performance issues.
-  **Warning:**
Indicates that an action or step can result in physical harm or cause damage to hardware.

1. Introduction

This application notes provide users with steps to use VisionFive 2 to detect and decode QR codes based on OpenCV. StarFive has made it compatible with VisionFive 2 and accelerated and improved GPU performance.

This application is one of the object detection applications implemented by StarFive. For the other applications, see [Object Detection Applications \(on page 13\)](#).



2. Preparation

Before executing the demo program, make sure you prepare the following:

2.1. Environment Requirements

The environment requirements are as follows:

- Linux Kernel: Linux 5.15
- OS: Debian 12
- SBC: VisionFive 2
- SoC: JH7110

2.2. Preparing Hardware

Before executing the demo program, make sure you prepare the following:

Table 2-1 Hardware Preparation

| Type | M/O* | Item | Notes |
|-------------------------------|------|--|---|
| General | M | VisionFive 2 Board | - |
| General | M | <ul style="list-style-type: none">• 32 GB (or more) micro-SD card• Micro-SD card reader• Computer (Windows/Mac OS/Linux)• USB to serial converter (3.3 V I/O)• Ethernet cable• Power adapter (5 V / 3 A)• USB Type-C Cable | These items are used for flashing Debian OS into a Micro-SD card. |
| Object Detection Applications | M | Monitor and accessories: <ul style="list-style-type: none">• An HDMI monitor• An HDMI cable | - |
| | M | Camera and accessories: <ul style="list-style-type: none">• A USB camera• A IMX219 MIPI camera | For the compatible USB cameras, refer to JH7110 AVL . |
| | M | A USB keyboard | Used to operate on the Debian terminal. |
| | O | A USB mouse | Used to operate on the Debian terminal. |



Note:

*: M: Mandatory, O: Optional

2.2.1. Hardware Setup

Connect the external devices and accessories and power adapter to VisionFive 2 according to the following top-view diagram:

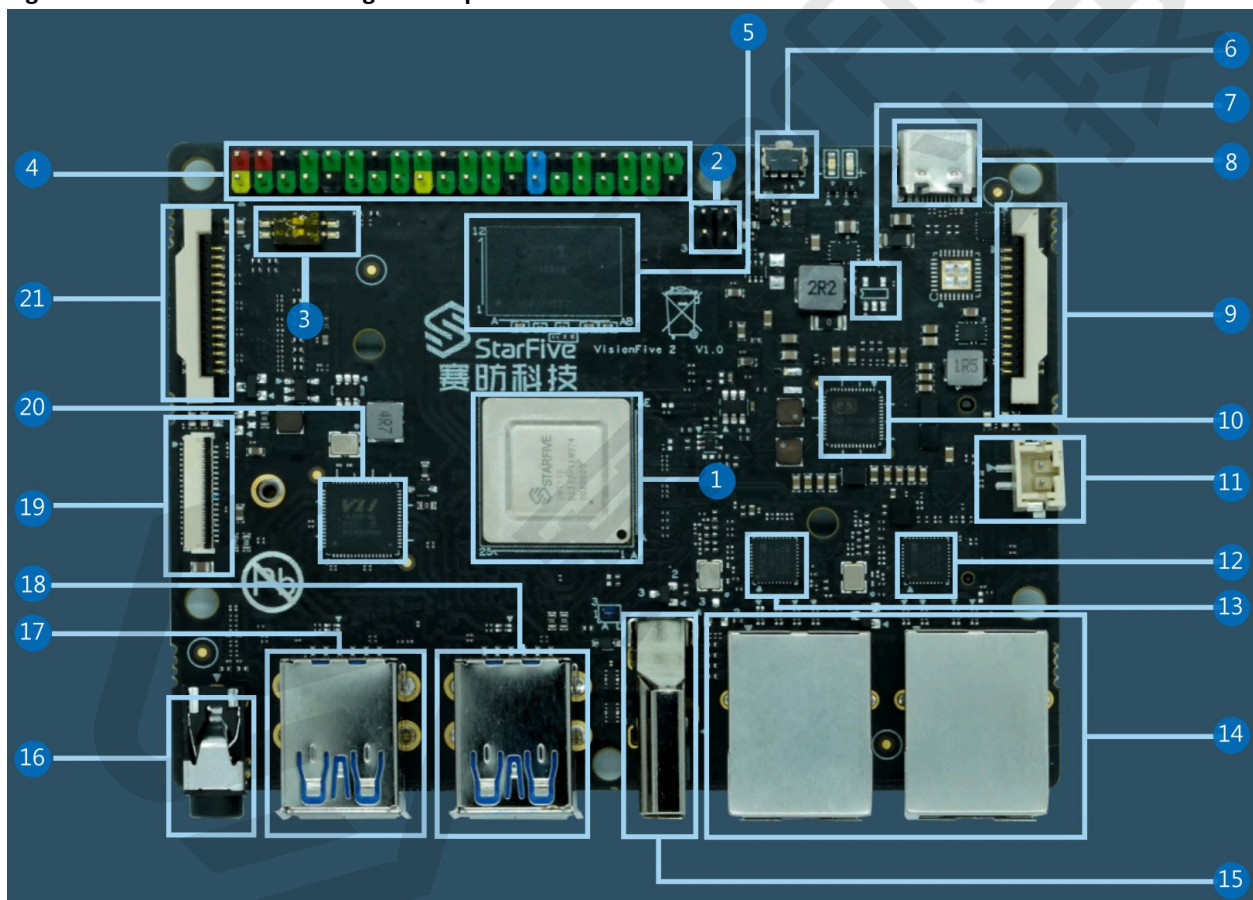
1. Plug the Micro-SD card with the latest Debian image into the card slot on the back of VisionFive 2.

**Note:**

Flash Debian OS into a Micro-SD card as described in the *Flashing Debian OS to a Micro-SD Card* section in the [VisionFive 2 Single Board Computer Quick Start Guide](#). Make sure that the Debian image you download is the latest version. creation time of the folder where the image is located. Select the image with the latest creation time in the folder.

2. Connect the Ethernet cable to one of the RJ45 Ethernet ports (No. 14).
3. Connect the HDMI monitor with the HDMI cable to the HDMI 2.0 port (No. 15).
4. Connect the IMX219 MIPI camera to HDMI 2.0 port (No. 9). If the camera has a pin header for fixing purposes (without connecting to any actual circuit), it can be connected to the available pins of the 40-pin GPIO header (No. 4). (Optional)
5. Connect the USB camera, keyboard, and mouse to the USB ports (No. 17 and 18).
6. Connect the power adapter with a USB cable to the USB-C port (No. 8). (This step must be performed after Steps 1 to 4).

Figure 2-1 VisionFive 2 Block Diagram - Top View



2.3. Preparing Software

Make sure the following procedures are performed:

**Note:**

Make sure that you use the latest Debian image.

| 2 - Preparation

1. Log into the Debian and make sure VisionFive 2 is connected to the Internet. For detailed instructions, refer to the *Using SSH over Ethernet* or *Using a USB to Serial Converter* section in the [VisionFive 2 Single Board Computer Quick Start Guide](#).
2. Log into the Debian and make sure VisionFive 2 is connected to the Internet. Log into Debian with keyboard, mouse and monitor connected. For detailed instructions, refer to *Using Desktop over HDMI* section in the [VisionFive 2 Single Board Computer Quick Start Guide](#).
3. Extend the partition on Debian as described in *Extend Partition* section in the [VisionFive 2 Single Board Computer Quick Start Guide](#).
4. Execute the following command on VisionFive 2 Debian to install StarFive Packages and its dependencies. The installation requires 1-3 hours.

```
https://  
github.com/starfive-tech/Debian/releases/download/v0.8.0-engineering-release-wayland/install_package_and_dependencies.sh  
chmod +x install_package_and_dependencies.sh  
sudo ./install_package_and_dependencies.sh
```

5. (Optional) If you need to use the IMX219 CSI camera, open a separate terminal window on VisionFive 2 Debian and build media pipeline and run the ISP control process:

```
export PATH=$PATH:/opt/  
/opt/media-ctl-pipeline.sh -d /dev/media0 -i csiphy0 -s ISP0 -a start  
/opt/ISP/stf_ism_ctrl -m imx219mipi -j 0 -a 1
```

3. Running Demo Codes

The application of QR code detection and decoding supports both Python and C++ versions. The detailed steps are as follows:

Step:

- To run Python application:

Enter the Python application directory, and run the demo code on VisionFive 2 Debian:

```
cd /usr/share/doc/opencv-doc/examples/python/  
python3 qrcode.py --device=4
```

- To run C++ application:

Perform the following step under the user directory on VisionFive 2 Debian to run the C++ demo:

```
example_cpp_qrcode --device=1
```



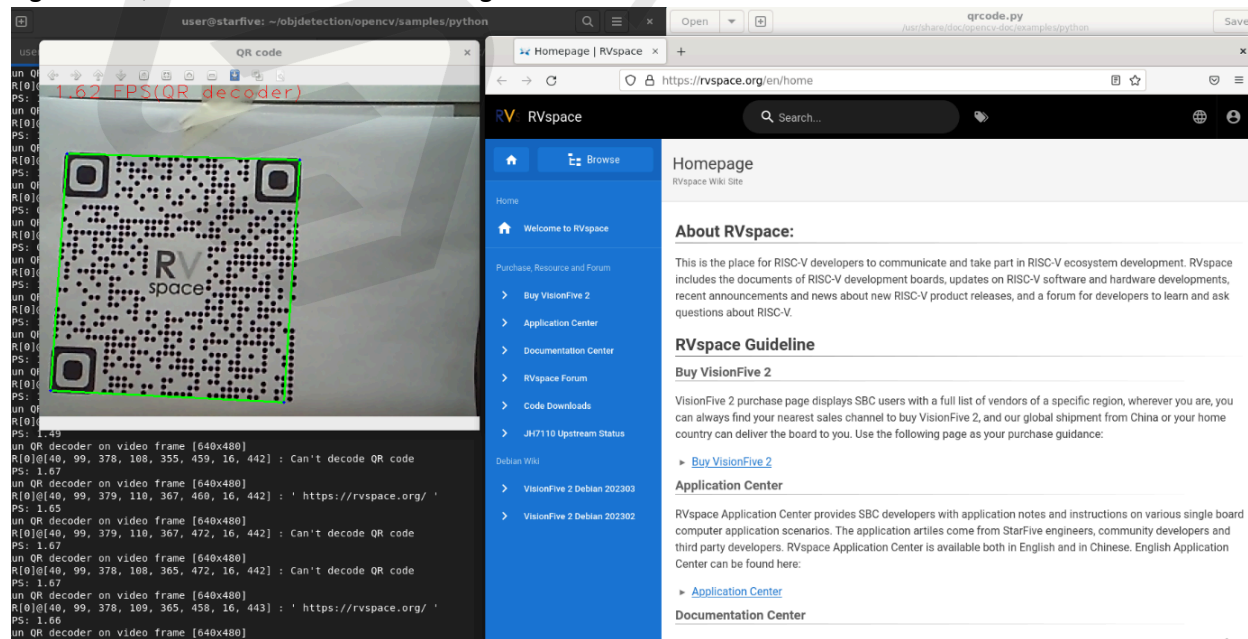
Tip:

VisionFive 2 parameter **device** is added to the OpenCV QR code detection application to set the video device number for capturing a video stream. Normally, `/dev/video1` represents the camera connected to MIPI CSI, and `/dev/video4` represents the USB camera.

Result:

- HDMI monitor displays the real-time video stream from a webcam;
- A real-time bounding box marks the position of the QR code, and QR code decoding is initiated.
- The decoding result like URL will be printed on the terminal where the demo code is run;
- The real-time frame rate is displayed in the top left corner. The frame rate is approximately 5.5 fps when performing standalone recognition, and approximately 1.8 fps for recognition and decoding combined.
- Python sample can utilize Firefox to open the website that is successfully decoded.
- The detection speed is 4-6 fps (for locating), and the decoding speed is approximately 1.5 fps (for extracting the content of the QR code).

Figure 3-1 QR Code Detection and Decoding



4. Demo Source Code

The Python source code of this demo is provided for reference purposes only.

After installing VisionFive 2 Debian object detection package, the dynamic library, header files, and application source code are also installed in the VisionFive 2 Debian. Developers can engage in secondary development as needed to unlock more possibilities.

- OpenCV dynamic library path:

```
/usr/lib/riscv64-linux-gnu/
```

- OpenCV head file path:

```
/usr/include/opencv4/
```

- The third party application sources:

```
/usr/share/doc/opencv-doc/examples/cpp/qrcode.cpp  
/usr/share/doc/opencv-doc/examples/python/qrcode.py
```



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5. Object Detection Applications

These applications use a vision framework based on OpenCV. StarFive has made it compatible with VisionFive 2 and accelerated and improved GPU performance.

These applications include:

- [Using VisionFive 2 to Recognize General Objects](#)
- [Using VisionFive 2 to Detect and Decode QR Codes](#)
- [Using VisionFive 2 to Detect Image Edge](#)
- [Using VisionFive 2 to Detect Image Defects](#)



6. Code Download

Click on this tab to find all code download resources.

The following link contains all the code download resources from StarFive.

- [StarFive Official GitHub Page](#)



7. Buy Now

Click on this tab to find all the online shops and compatible accessories.

Buy SBC

Use the following page to find your nearest sales channel or the global channels for purchasing a VisionFive 2 Single Board Computer (SBC).

- [Buy VisionFive 2](#)

Buy Parts

Use the following page to find the parts that are tested as compatible with VisionFive 2.

- [Buy Accessory](#)

