Defective Pixel List Management Tool

2017-Aug-04

Introduction

This document presents instructions on how to mask and manage defective pixels using the Allied Vision **Defective Pixel List Management Tool**. The **Defective Pixel List Management Tool** allows you to manage both camera (factory defined) and user defined defective pixel lists to match your application and optimize the life-cycle of the camera. You can also revert the camera to the factory defined defective pixel list.

This tool is for use with Microsoft Windows® only.

Prerequisites

The following items are required:

- Allied Vision GigE camera with `DefectMaskEnable` feature
  Supported models: Prosilica GT4090, GT4090NIR, GT4096, GT4096NIR, GT5120, GT5120NIR

  You can enable/disable defect masking in Vimba Viewer, under `Controls` > `DefectMaskEnable` = *True*/*False*. By default `DefectMaskEnable` is *True*.

  If your Allied Vision GigE camera has `DefectMask` > `DefectMaskColumnEnable` feature instead of `DefectMaskEnable`, refer to the *Column Defect Masking Application Note*.

  https://www.alliedvision.com/en/support/technical-papers-knowledge-base

  For all other Allied Vision GigE cameras with `DefectMask` > `DefectMaskEnable` feature, refer to the *Defect Masking Application Note*.

  https://www.alliedvision.com/en/support/technical-papers-knowledge-base

- Vimba Viewer installed on the host PC to adjust the camera settings and get an image.

  To download **Vimba Viewer**, go to:

  https://www.alliedvision.com/en/support/software-downloads

- Third-party tool such as **ImageJ** to inspect the image and identify defective pixels in an image.

  To download **ImageJ** go to:

  http://rsbweb.nih.gov/ij/download.html

- Defective Pixel List Management Tool to create and maintain defect pixel lists.

  To download the **Defective Pixel Lists Management Tool**, go to:

  https://www.alliedvision.com/en/support/software-downloads

Defining defects

Almost all image sensors have a certain proportion of pixels that are defective and are commonly referred to as "bad" pixels or defective pixels. These pixels manifest due to defects in design of the semiconductor chip or manufacturing errors. They can also develop during operation of the sensors, particularly when the operating conditions are harsh and the sensors are operated for long periods of time.

Pixel defects can usually be divided into three main groups: stuck high (hot), stuck low (dead or cold), or noisy.

- Stuck high pixels are those which produce output values much higher than expected from its surrounding neighbors, even until the point of saturation of the value.
- Stuck low pixels are pixels whose values are much lower than expected from neighboring pixels and the value may even be completely low.
- Noisy pixels are the pixels whose values are different by a certain degree than its surrounding neighborhood, usually by a small factor.

The dark current, that is a major contributor to defective pixels, is highly sensitive to temperature. Therefore, defects and associated detection threshold levels are usually defined for a specific operating temperature.

For more information, please refer to the sensor data sheet or contact sensor manufacturer.

Masking defects

1. Connect your Allied Vision GigE camera and start the **Vimba Viewer** application. Wait until the camera is listed in the **Detected Cameras** list. This may take a few seconds.
2. Click on the camera serial number and open the **All** tab in the **Features** window.
3. In `Controls > Exposure`, increase `ExposureTimeAbs` to a value suitable for your application or until defects are visible.

   Increasing exposure time will increase the number of hot pixels; however, these may not be considered as defective pixels by sensor manufacturer. Check the sensor data sheet to see if there is constraint on exposure value in defect pixel definition.

4. Click the **Freerun** button to initiate live camera view. Right-click on the image and uncheck **Color Interpolation** and save the image to disk as a TIFF file.

5. Open the saved TIFF file in **ImageJ** or a similar application. Locate the exact coordinates of pixel defects using the application tools.

> You can also select the defect pixels by using `Threshold` functionality in **Image/ Adjust** menu in **ImageJ**.

Defect Pixel List Management tool

Camera Connection tab

The **Camera Connection** tab allows you to manage the connections to the Allied Vision cameras. The detected cameras available to the system will be listed here. This list is automatically refreshed when new cameras are discovered, however, the **Refresh** button may be used to force a refresh.

To connect to a camera

1. With **Vimba Viewer** closed, run DefectivePixelListManager.exe.
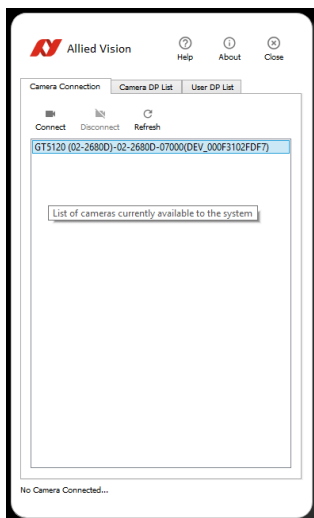2. Connect a supported camera(s) to the host PC.

Figure 1: Detected cameras

3. Select a camera from the list and click the **Connect** button to connect to the selected camera.

Disconnect

Click the **Disconnect** button to disconnect the currently connected camera.

Refresh

Click the **Refresh** button to force a refresh of detected cameras.

Camera DP List tab

In the **Camera DP List** tab you can download the list of defective pixels that are currently stored in the connected camera, restore a previously saved list of defective pixels to the connected camera, backup the current camera defective pixel list to a file, and revert back to the factory defective pixel list settings.

Download

Click the **Download** button to view the list of defective pixel coordinates from the connected camera. The row and column coordinates are displayed for each defective pixel.
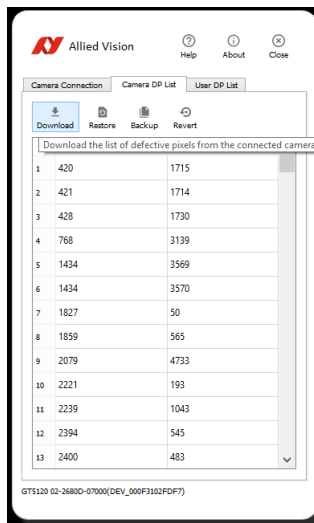
Figure 2: Download the defective pixel list

Restore

Click the **Restore** button to restore a previously saved backup defective pixel list from the host PC to the connected camera. The backup file is a *.bin binary file and is camera model specific. **Restore** allows you to switch between different defective pixel configurations for various lighting and operating conditions.

> The Defective Pixel List Management tool verifies the file format, corrupt file check, and that the sensor size matches the connected camera. The tool does not check the camera serial number or model number.

Backup

Click the **Backup** button to save the current defective pixel list to the host PC. The backup file is saved as a *.bin binary file and is camera model specific. The serial number is added to the backup file name when saved.

> The *.bin binary files cannot be manually altered on the host PC.

Revert

Click the **Revert** button to revert back to the original factory defective pixel list settings. All user defined defective pixels will be removed. A warning message will be displayed requesting confirmation to continue.
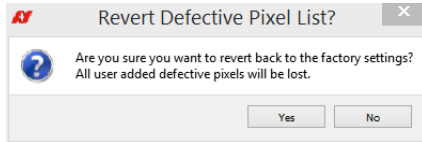

Figure 3: Revert defective pixel list confirmation message

User DP List tab

In the **User DP List** tab you can load a user defined defective pixel list, save the current defect pixel list, add a defective pixel, clear all defective pixels in the list, remove a defective pixel, and upload the user defective list to camera storage. The defective pixel correction algorithm is optimized to correct four or less consecutive pixels in a row. The maximum number of defective pixels that can be corrected is eight in a row. If more than the recommended four defective pixels are detected, they will be highlighted in yellow. Rows highlighted in red represent defective pixel coordinates that are outside of the correctable limits or sensor size.

Load

Click the **Load** button to load a user defective pixel list from a file on the host PC. The file must be a *.csv comma-separated values file with the header "*Row, Column*". Coordinate values must be unsigned integer values in the range of [0,65535]. Any value outside this range or any other character/symbol will be coerced to zero. This file is not camera or model specific.

 You can load a user defective pixel list with multiple defective pixel coordinates. For best results limit the number of consecutive defective pixels to four or less.

Save

Click the **Save** button to save the current user defective pixel list to a file on the host PC. The list is saved in a *.csv comma-separated values file. This file is not camera or model specific.

Add

Click the **Add** button to add a defective pixel coordinate to the user defective pixel list.
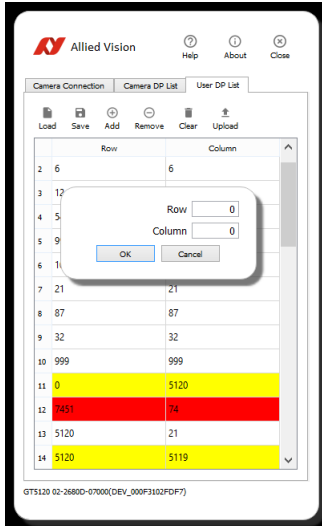

Figure 4: Add a single defective pixel

Enter the row and column coordinates of the defective pixel and click **OK** to add the defective pixel to the list. Click **Upload** to complete the action by uploading the modified defective pixel list to the connected camera.

Remove

Select a defect pixel in the list and click the **Remove** button to remove that defective pixel from the user defective pixel list. Click **Upload** to complete the action by uploading the modified defective pixel list to the connected camera.

Clear

Click **Clear** to clear the current user defective pixel list.

Upload

Click the **Upload** button to upload the user defective pixel list to camera storage. The user defective pixel is combined with the camera defective pixel list. An error message is displayed if an uncorrectable or unrecommended defective pixels have been entered and highlight the rows that do not meet the criteria. Select the highlighted row and click the **Remove** button to remove the entry before proceeding with an upload.

Duplicate defect pixels will be ignored. Only one instance of the defect pixel will be uploaded to the camera.

Allied Vision

Once you upload user defined defective pixel coordinates to the camera you cannot remove any defective pixels. You would need to revert the camera to camera back to the original factory configuration or load a previous camera defective pixel list backup.

Error messages and conditions
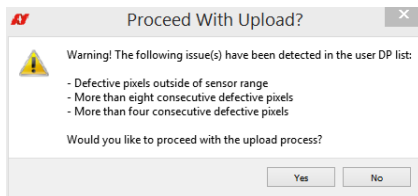
Defective pixel coordinates are highlighted in yellow

When five to eight consecutive defective pixel coordinates are added they are highlighted in yellow to indicate that this is not recommended. After selecting the **Upload** button, you will be prompted with a confirmation windows before these coordinates are uploaded to the camera.

Defective pixel coordinates are highlighted in red

Defective pixel coordinates that are highlighted in red cannot be corrected. After selecting the **Upload** button, these coordinates will be ignored and will not be uploaded to the connected camera. When entering more than four defective pixel coordinates the pixel to the left will be omitted.

The algorithm used to correct the defective pixel always uses the value to the left of the defective pixel. If there is no active pixel to the left of the defective pixel then the defective pixel cannot be masked.

Additional References

Technical manuals and GigE feature reference
https://www.alliedvision.com/en/support/technical-documentation

For technical support, please contact support@alliedvision.com.

For comments or suggestions regarding this document, please contact info@alliedvision.com.

Disclaimer

Due to continual product development, technical specifications may be subject to change without notice. All trademarks are acknowledged as property of their respective owners. We are convinced that this information is correct. We acknowledge that it may not be comprehensive. Nevertheless, Allied Vision cannot be held responsible for any damage in equipment or subsequent loss of data or whatsoever in consequence of this document.

For the latest version of this document, please visit the Allied Vision documentation website.