

AVT Adaptor for MATLAB®



AVT Adaptor for MATLAB® Image Acquisition User Guide

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Vision Technologies

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Introduction

The AVT Adaptor for MATLAB Image Acquisition (referred to as **AVT Adaptor for MATLAB** in this user guide) can be used to access all features of AVT's high-performance FireWire and GigE Vision compliant digital cameras from within the MATLAB and Simulink environments.

Image Acquisition Toolbox provides a consistent interface to all supported devices and allows users to acquire data directly in MATLAB for analysis, visualization, and modeling.

The **AVT Adaptor for MATLAB** is based on AVT's interface-independent UniAPI provided with the AVT Universal Package and can easily be installed via an installer executable.

With **AVT Adaptor for MATLAB** you are able to access most camera features.

Advantages

- Supports AVT's FireWire and GigE cameras.
- Optimized control of the camera-integrated (all but interlaced cameras) image preprocessing features (AVT's smart features)

Requirements

- AVT Universal Package installed on your system
- MATLAB and Image Acquisition Toolbox installed on your system

www



For more information on MATLAB and the Image Acquisition Toolbox see:

<http://www.alliedvisiontec.com/emea/products/software/3rd-party-solutions/mathworks.html>

<http://www.mathworks.com/>

Document history

Version	Date	Remarks
V2.0.0	22.07.10	New Manual - RELEASE status
V3.0.0	03.05.11	<p>New file format:</p> <ul style="list-style-type: none"> • Changed file format from FM7 to FM9 <p>New 64-bit version:</p> <ul style="list-style-type: none"> • New driver related files in Chapter Package content on page 11 • Changed recommended AVT Universal Package Version to V2.0 in Chapter Hardware/operating system and software requirements on page 8 • Added 64-bit example in Chapter How to register AVT Adaptor for MATLAB via MATLAB command line or script on page 18 • Revised naming of *.dll and *.imdf in Table 3: AVT Adaptor for MATLAB components on page 11 and in Index on page 25 • Interlaced cameras are not supported: see Chapter Interlaced cameras on page 9 • New Chapter How to use the AVT Adaptor for MATLAB on page 19.

Table 1: Document history

Manual overview

The manual overview describes each chapter of this manual shortly.

- Chapter [System requirements](#) on page 8 lists conditions for hardware, operating systems and software. Read the special advice when working with Windows Vista / Windows 7 (**UAC = User Account Control**).
- Chapter [Components overview](#) on page 11 describes the **AVT Adaptor for MATLAB** in general and its components.
- Chapter [Installing the AVT Adaptor for MATLAB](#) on page 13 describes how to install the **AVT Adaptor for MATLAB**.
- Chapter [AVT Adaptor for MATLAB architecture](#) on page 22 gives you an overview of the **AVT Adaptor for MATLAB** architecture.

Conventions used in this manual

To give this manual an easily understood layout and to emphasize important information, the following typographical styles and symbols are used:

Styles

Style	Function	Example
Bold	Programs, inputs or highlighting important things	bold
Courier	Code listings etc.	Input
Upper case	Register	REGISTER
Italics	Modes, fields	<i>Mode</i>
Parentheses and/or blue	Links	(Link)

Table 2: Styles

Symbols

Note This symbol highlights important information.



Caution This symbol highlights important instructions. You have to follow these instructions to avoid malfunctions.



www This symbol highlights URLs for further information. The URL itself is shown in blue.



Example:

<http://www.alliedvisiontec.com>

Target group

You should have knowledge in MATLAB. Furthermore you should be acquainted with the Image Acquisition Toolbox. For more infos see the MATLAB documentation.

Before operation

We place the highest demands for quality on our software.

The **AVT Adaptor for MATLAB® Image Acquisition User Guide** describes the installation of the **AVT Adaptor for MATLAB**.

Note Please read through this manual carefully before installing AVT Adaptor for MATLAB.



FireWire hot plug precautions

Note Although FireWire devices can be hot-plugged without powering down equipment, **we recommend turning the computer power off, before connecting a 1394 digital camera to the system via a FireWire cable.**



If you hot-plug a 1394 digital camera, it may be damaged.

System requirements

This chapter describes the requirements (or places where the actual requirements can be found) for installing **AVT Adaptor for MATLAB**:

- Hardware requirements
- Operating system requirements
- Software requirements

... and gives a special advice when working with Windows Vista or Windows 7.

Hardware/operating system and software requirements

Info



For hardware and operating system requirements see

- AVT Universal Package User Guide
<http://www.alliedvisiontec.com/emea/products/software/windows/avt-universal-package.html>
- Documentation of MATLAB
<http://www.mathworks.com>

Before installing **AVT Adaptor for MATLAB**, the following software has to be installed on your system:

- **32-bit Windows OS:**
32-bit version of MATLAB release 7.7 (R2008b) or greater
or
- **64-bit Windows OS:**
64-bit version of MATLAB release 7.9 (R2009b) or greater
- as well as the related Image Acquisition Toolbox
- AVT Universal Package V2.0 or greater

FireWire hot plug precautions

Note



Although FireWire devices can be hot-plugged without powering down equipment, **we recommend turning the computer power off, before connecting a 1394 digital camera to the system via a FireWire cable.**

If you hot-plug a 1394 digital camera, it may be damaged.

Interlaced cameras

Info

AVT cameras with **interlaced** sensors are **not supported** by the **AVT Adaptor for MATLAB Image Acquisition**.



Special advice when working with Windows Vista / Windows 7

This chapter gives you a short introduction to a new technology that Microsoft introduced with Vista operating systems and is also present when using Windows 7: the so-called **User Account Control**.

Basic information

User Account Control (UAC) is a technology and security infrastructure for Windows **Vista** and later operating systems. It aims at improving the security of Windows Vista by limiting application software to standard user privileges until an administrator authorizes an increase in privilege level. In this way, only applications that the user trusts receive higher privileges, and malware is kept from receiving the privileges necessary to compromise the operating system. So a user account may have administrator privileges assigned to it, but applications that the user runs do not have those privileges automatically unless the user explicitly authorizes them to have higher privileges.

UAC warning

An example of an **UAC warning** when a program (e.g. **AVT Adaptor for MATLAB** installation program) wants to write in a system folder is the following:

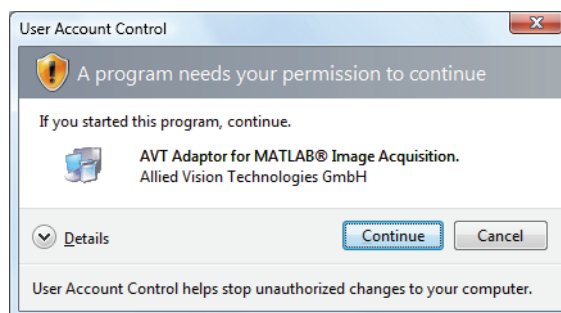


Figure 1: UAC warning: example

Perform the following steps:

1. In this case just click **Continue** because the shown program needs to write certain files to the system folder for general use.
2. Go on working.

Note



You may prevent this UAC warning by right-clicking the **AVT Adaptor for MATLAB EXE file** and select **Run as administrator** before you install the software.

Components overview

This chapter describes the following:

- What is the **AVT Adaptor for MATLAB**?
- What are the advantages of the **AVT Adaptor for MATLAB**?
- Description of package content of **AVT Adaptor for MATLAB**

What is the AVT Adaptor for MATLAB?

The **AVT Adaptor for MATLAB** is a dynamic link library (DLL) which implements the connection between the Image Acquisition Toolbox engine and a device driver utilizing elements of the AVT Universal Package.

What are the advantages of the AVT Adaptor for MATLAB?

- Supports AVT's FireWire and GigE cameras.
- Optimized control of camera features
- Access to camera-integrated image preprocessing features (AVT's smart features)
- AVT smart feature related online help (see description IMDF files below and remarks on online help)

Package content

The **AVT Adaptor for MATLAB** consists of the following files:

OS	Driver related file	Description
All versions	ReleaseNotes.txt	Release notes with up-to-date informations about this product.

Table 3: **AVT Adaptor for MATLAB** components

OS	Driver related file	Description
32-bit version	AVTMatlabAdaptor_R2008b.dll	Adaptor for MATLAB 2008b - 2009a
	AVTMatlabAdaptor_R2008b.imdf	IMDF (Image Device File) Related help text for adaptor properties
	AVTMatlabAdaptor_R2009b.dll	Adaptor for MATLAB 2009b and greater
	AVTMatlabAdaptor_R2009b.imdf	IMDF (Image Device File) Related help text for adaptor properties
64-bit version	AVTMatlabAdaptor64_R2009b.dll	Adaptor for MATLAB 2009b and greater
	AVTMatlabAdaptor64_R2009b.imdf	IMDF (Image Device File) Related help text for adaptor properties

Table 3: AVT Adaptor for MATLAB components

Note

For information about the **AVT Adaptor for MATLAB** architecture see Chapter [AVT Adaptor for MATLAB architecture](#) on page 22.



How to use online help

To activate the online help do the following:

- Imaqtool: On **Device Properties** tab right-click a feature. In the bubble box click **What's this?** The help is displayed.
- From MATLAB command line or script: Use the `imaqhelp` function to display help for one of the properties of the video source object.
 - The first line of the help lists the name of the property with its constraints, such as range and permission.
 - The text of the help appears exactly as it was entered in the IMDF file.

For more information on MATLAB and help files see the MATLAB documentation: <http://www.mathworks.com>

Installing the AVT Adaptor for MATLAB

Overview

We assume that you have already installed ...

- MATLAB
- Related Image Acquisition Toolbox
- AVT Universal Package

... on your system.

Info We assume that you can see your camera in the UniCam viewer.



Installing AVT Adaptor for MATLAB

To install **AVT Adaptor for MATLAB**, perform the following steps:

1. Save and exit out of all currently running applications.
 - **GigE camera:** If you want to install a GigE camera, connect it now (hot plug possible) and go on reading step 7 on page 13.
 - **1394 camera:** If you want to install a 1394 camera, read the caution and follow the instructions (hot plug may lead to a damaged camera).

Caution Although FireWire devices can be hot-plugged without powering down equipment, **we recommend turning the computer power off, before connecting a 1394 digital camera to the system via a FireWire cable.**



If you hot-plug a 1394 digital camera, it may be damaged.

2. **Shut down your system.**
3. **Turn computer power off.**
4. Connect your 1394 camera to the 1394 (FireWire) port.
5. Turn computer power on.
6. Restart your system.
7. Download the **AVT Adaptor for MATLAB** zip file (AVTMatlabAdaptor_XvY.zip) from the AVT web site: Unpack it and start the corresponding *.exe.

The **Windows Installer** box with a progress bar will appear while setup prepares to start the installation process.

Now you are ready to start installing **AVT Adaptor for MATLAB**.

The **Welcome** dialog box will appear:

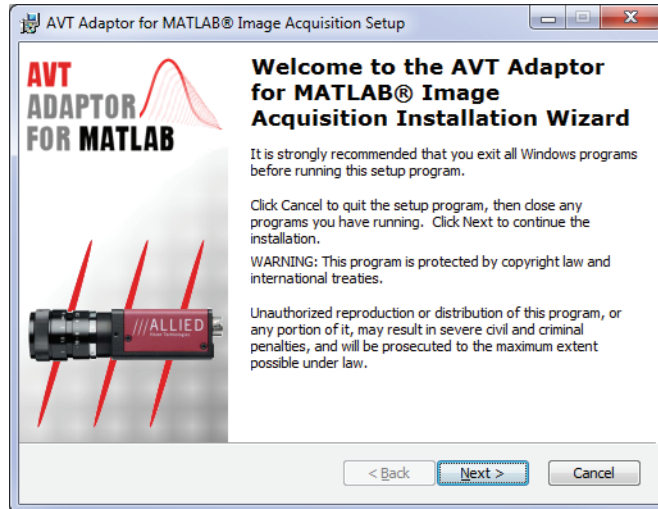


Figure 2: **AVT Adaptor for MATLAB** setup: Welcome

8. Read the information in the **Welcome** dialog box.
 - If any programs are running on your system, click **Cancel** to quit the setup program, then close any programs you have running.
 - If you already closed all your programs, click **Next** to continue the installation.

The **Readme Information** dialog box will appear:

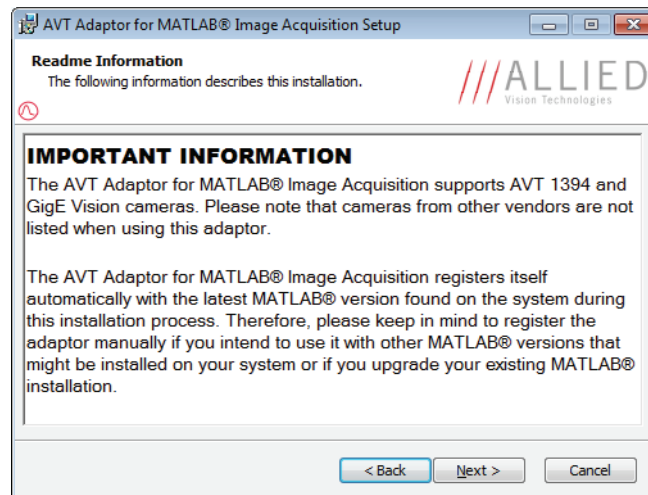


Figure 3: **AVT Adaptor for MATLAB** setup: Readme Information

9. Read the **IMPORTANT INFORMATION**.

10. Click **Next** to proceed.

The **Destination Folder** dialog box will appear:

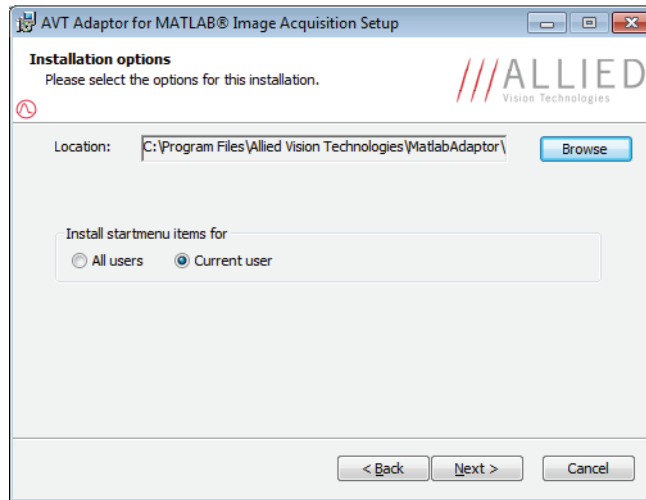


Figure 4: **AVT Adaptor for MATLAB** setup: Destination Folder/Installation options

The default location of **AVT Adaptor for MATLAB** files is

C:\Program Files\Allied Vision Technologies\MatlabAdaptor\

11. If you want to change the location, enter the path for the desired folder.
12. Furthermore you set a general installation option for the startup menu:

Check box / option	Description
Install startmenu items	Installs access to the release notes in the start menu. Choose an option to install the items for <ul style="list-style-type: none"> • All users • Current user (default)

Table 4: **AVT Adaptor for MATLAB** setup: Installation option

13. Click **Next**.

The following dialog will appear:

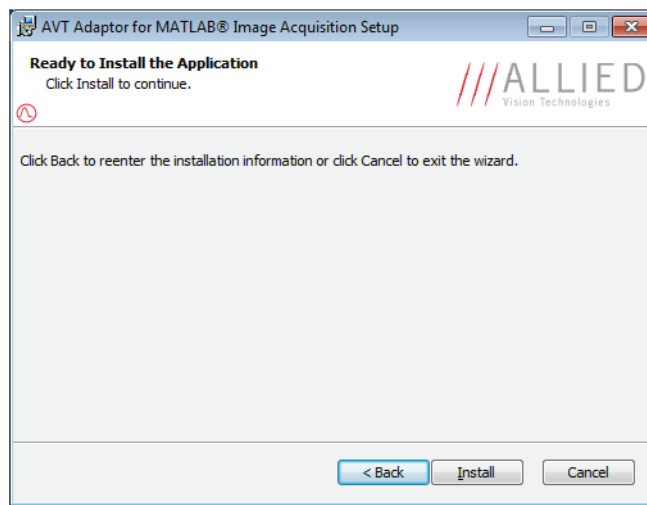


Figure 5: **AVT Adaptor for MATLAB** setup: Ready to Install the Application

14. Click **Install**.

AVT Adaptor for MATLAB will be installed. The following dialog will appear:

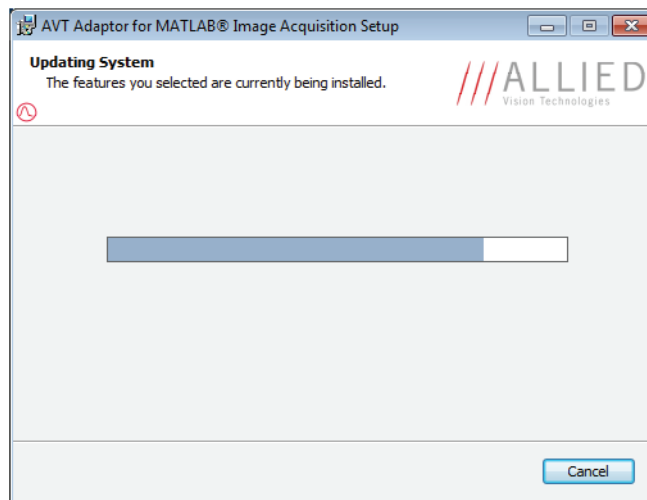


Figure 6: **AVT Adaptor for MATLAB** setup: Updating System

Once the installation is finished, the following dialog box will appear:

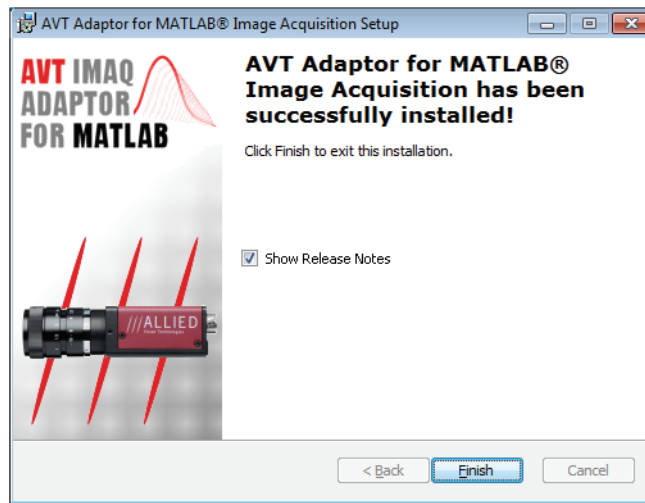


Figure 7: AVT Adaptor for MATLAB setup: Successfully installed

15. **Show Release Notes** check box is already activated, so that you can read the release notes with the latest information immediately after the installation is finished.
16. Click **Finish** to exit the installer.

Note



Depending on your operating system you might need to reboot your system at this point. You will be prompted if a reboot is required; if a message appears, follow the on-screen instructions.

How to register AVT Adaptor for MATLAB

During the installation the registration of the **AVT Adaptor for MATLAB** is only done for the *current user* and the latest installed MATLAB version.

This means: If anyone else than the current user wants to use the **AVT Adaptor for MATLAB**, you have to register the **AVT Adaptor for MATLAB**.

You also have to register **AVT Adaptor for MATLAB**, if you have more than one MATLAB version on your system.

Therefore you have to register the adaptor that is related to the desired MATLAB version.

How to register AVT Adaptor for MATLAB via Image Acquisition Tool

For definitions of tools see Chapter [AVT Adaptor for MATLAB architecture](#) on page 22.

Using the *imaqregister* function, you can use the *Image Acquisition Tool* menu as an easier way to add the **AVT Adaptor for MATLAB**.

Note



This function is not documented in the *Image Acquisition Toolbox User's Guide*, but is documented in the *Image Acquisition Toolbox Adaptor Kit User's Guide*.

To register **AVT Adaptor for MATLAB** via **Image Acquisition Tool**, do the following:

1. In the **Image Acquisition Tool** menu: Click **Tools** → **Register a Third-Party Adaptor**.
2. In the **Register a 3rd Party Adaptor** dialog box, browse to the *.dll file that represents **AVT Adaptor for MATLAB**.
3. Select the file and click **OK** to register the **AVT Adaptor for MATLAB**.

How to register AVT Adaptor for MATLAB via MATLAB command line or script

32 bit To inform the *Image Acquisition Toolbox* software of its existence by registering it with the *imaqregister* function, do the following (this is an **32-bit example**):

```
imaqregister('C:\Program Files\Allied Vision  
Technologies\MatlabAdaptor\AVTMatlabAdaptor_R2009b.dll');
```

64 bit To inform the *Image Acquisition Toolbox* software of its existence by registering it with the *imaqregister* function, do the following (this is an **64-bit example**):

```
imaqregister('C:\Program Files\Allied Vision  
Technologies\MatlabAdaptor\AVTMatlabAdaptor64_R2009b.dll');
```

This code registers the **AVT Adaptor for MATLAB** with the toolbox using the *imaqregister* function.

This *imaqregister* function tells the toolbox where to find **AVT Adaptor for MATLAB**.

You only need to register your **AVT Adaptor for MATLAB** once. The toolbox stores adaptor location information in your MATLAB preferences.

Note



Because the toolbox caches adaptor information, you might need to reset the toolbox, using *imaqreset*, before a newly registered adaptor appears in the *imaqhwinfo* listing.

How to use the AVT Adaptor for MATLAB

Target group

For this chapter you should have knowledge in MATLAB.

Furthermore you should be acquainted with the

- Image Acquisition Toolbox (IMAQ Toolbox)
- MATLAB scripting

For more infos see the MATLAB documentation.

Overview

This chapter provides an easy start for using the AVT Adaptor for MATLAB.

In principal there are two methods to get an image from the camera:

- Via the IMAQ Toolbox from Mathworks
- By using Matlab scripts

Info

With both methods there is an IMDF file that describes the camera properties.



Using IMAQ Toolbox from Mathworks

To get an image from the camera perform the following steps:

1. Open IMAQ toolbox: Type `imaqtool` at the MATLAB command line.
The **Image Acquisition Tool** window opens.
2. Select camera and format.

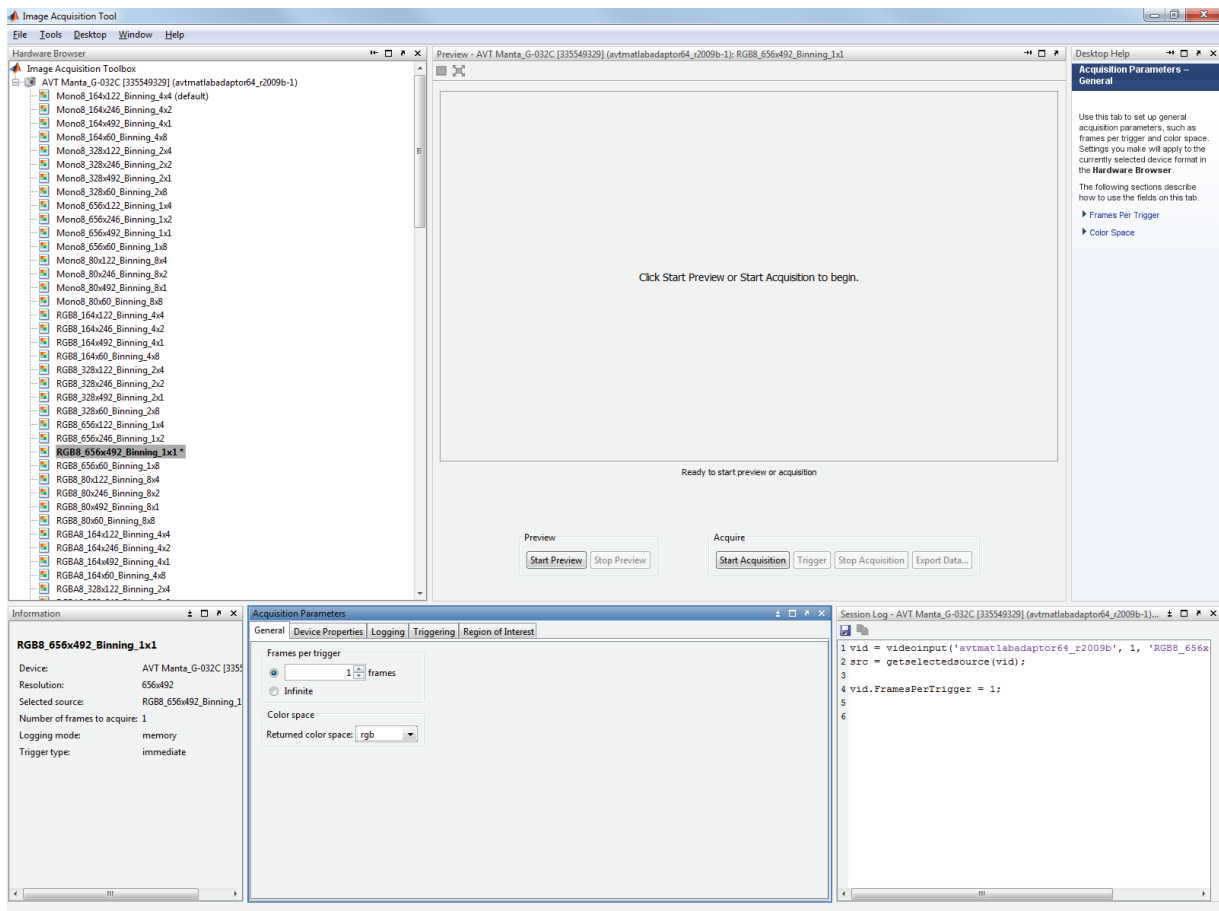


Figure 8: IMAQ Toolbox with selected camera and format

Info

For camera properties go to **Acquisition Parameters** section and click **Device Properties** tab.



3. Click **Start Preview** or **Start Acquisition** to begin.

The differences between these two are:

Start Preview: an image is displayed as livestream in IMAQ Toolbox.

Start Acquisition: a single shot image (default) is acquired in IMAQToolbox.

Using MATLAB scripts

The steps to perform are the same as with the IMAQ Toolbox but it's done with MATLAB scripts.

Here you can see an example script:

```
vid = videoinput('avtmatlabadaptor64_r2009b', 1,  
'RGB8_656x492_Binning_1x1');  
src = getselectedsource(vid);
```

```
vid.FramesPerTrigger = 1;
```

```
preview(vid);
```

```
stoppreview(vid);
```

```
start(vid);
```

www



More scripts you can find at AVT Website:

<http://www.alliedvisiontec.com/emea/products/software/3rd-party-solutions/mathworks.html>

AVT Adaptor for MATLAB architecture

The following diagram describes the architecture of the **AVT Adaptor for MATLAB**:

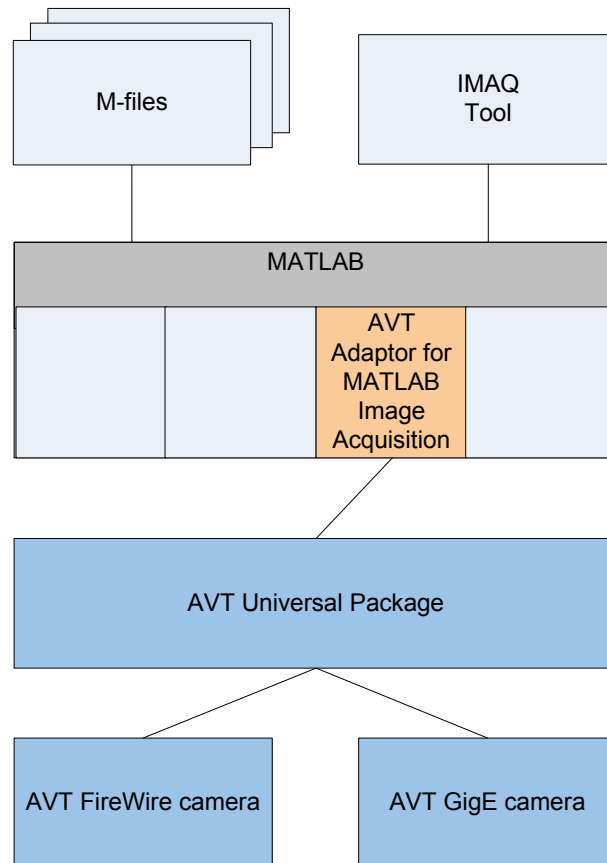


Figure 9: Architecture of **AVT Adaptor for MATLAB**

Element	Description
M-files	An M-file is an external file that contains a sequence of MATLAB statements. By typing the filename, subsequent MATLAB input is obtained from the file. Script files have the following filename extension: *.m
IMAQ tool	<p>IMAQ tool = Image Acquisition Tool:</p> <p>The Image Acquisition Tool is an interactive GUI that allows you to explore, configure, and acquire data from your installed and supported image acquisition devices.</p> <p>The functionality of the <i>Image Acquisition Toolbox</i> software (see below) is available in this desktop application. You connect directly to your hardware in the tool and can preview and acquire image data. You can log the data to MATLAB in several formats, and also generate an AVI file, right from the tool.</p> <p>The Image Acquisition Tool provides a desktop environment that integrates a preview/acquisition area with Acquisition Parameters so that you can change settings and see the changes dynamically applied to your image data.</p> <p>Image Acquisition Toolbox:</p> <p>The Image Acquisition Toolbox software is a collection of functions that extend the capability of the MATLAB numeric computing environment. The toolbox supports a wide range of image acquisition operations.</p>
MATLAB	MATLAB is a high-level language and interactive environment that enables you to perform computationally intensive tasks faster than with traditional programming languages such as C, C++, and Fortran.
AVT Adaptor for MATLAB	The AVT Adaptor for MATLAB (short form: AVT Adaptor for MATLAB) is a dynamic link library (DLL) that implements the connection between the Image Acquisition Toolbox engine and the device driver of the AVT Universal Package based on the UniAPI.

Table 5: Description of **AVT Adaptor for MATLAB** architecture

Element	Description
AVT Universal Package	The AVT Universal Package is an SDK for FireWire and GigE Vision compliant cameras from AVT. The underlying Universal API (UniAPI) enables camera interface independent camera control and simplified camera smart features access.
AVT FireWire camera	AVT's digital cameras with IEEE 1394 interface (IIDC compliant)
AVT GigE camera	AVT's digital cameras with Gigabit Ethernet interface (GigE Vision compliant)

Table 5: Description of **AVT Adaptor for MATLAB** architecture

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