



# Advanced Diploma of Remote Engineering, Mechatronics & Robotics 52677WA (DMC)

MATLAB Computer Vision Toolbox

Instructions

Version 1.0

# MATLAB Computer Vision Toolbox

## Overview

These instructions will assist with performing MATLAB using computer vision toolbox.

**MATLAB with Computer Vision Toolbox is available on the EIT Remote Labs: 8, 9, and 13.**

## Before Starting

- Got to the link <https://in.mathworks.com/campaigns/products/trials.html?prodcode=vp>
- Download a 30-days trial version of the software. You need to provide your email address for downloading the trial version.
- Install the MATLAB software support package for computer vision toolbox on a windows based machine.

## Starting MATLAB on Windows Platforms

- To start MATLAB on a Microsoft Windows platform, double-click the MATLAB shortcut icon on your Windows desktop. The shortcut is automatically created by the installer in the installation directory.
- In the MATLAB desktop, click 'Add-Ons' and then 'Manage Add-Ons'. The list of Add-Ons will be displayed in a new 'Add-On Manager' window. Ensure that the Computer Vision Toolbox Add-On is installed.

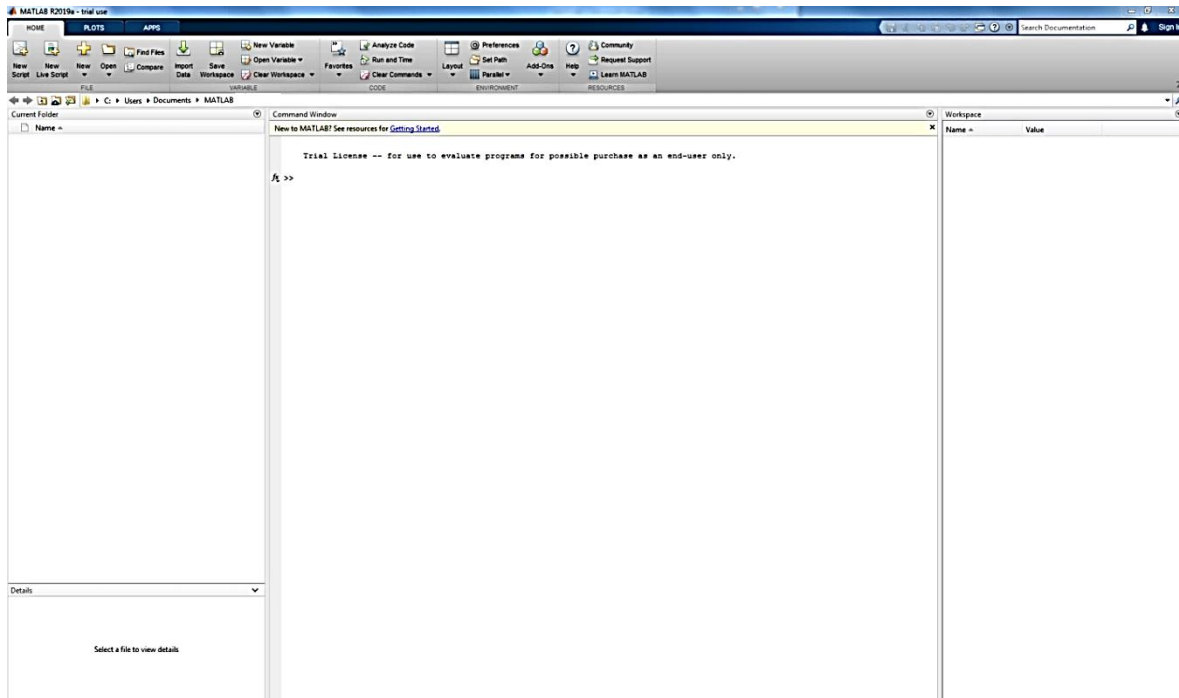
## Desktop Tools

- The following tools are managed by the MATLAB desktop, although not all of them appear by default when you first start.
- If you prefer a command line interface, you can use functions to perform most of the features found in the MATLAB desktop tools.

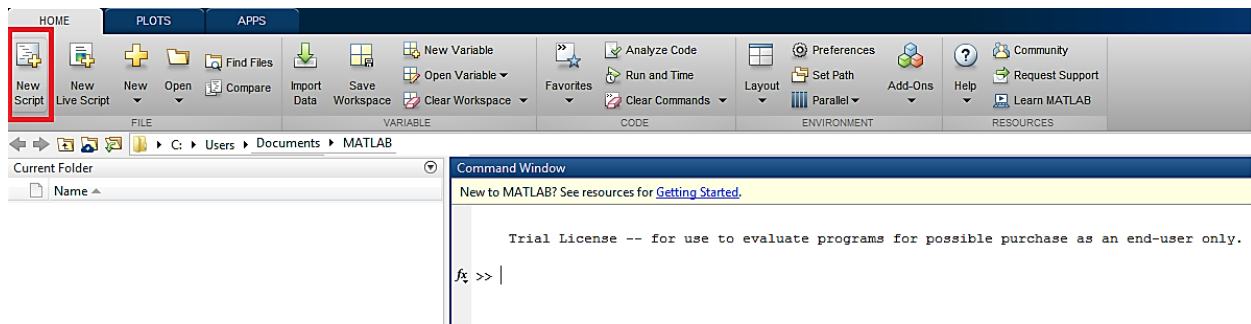
**Instructions for using these function equivalents are provided with the documentation for each tool:**

- Command Window – Run MATLAB functions.
- Command History – View a log of the functions you entered in the Command Window, copy them, and execute them.
- Launch Pad – Run tools and access documentation for all of your MathWorks products.
- Current Directory Browser – View MATLAB files and related files, and perform file operations such as open, and find content.
- Help Browser – View and search the documentation for the full family of MATLAB products.
- Workspace Browser – View and make changes to the contents of the workspace.
- Array Editor – View array contents in a table format and edit the values.
- Editor/Debugger – Create, edit, and debug M-files (files containing MATLAB functions).

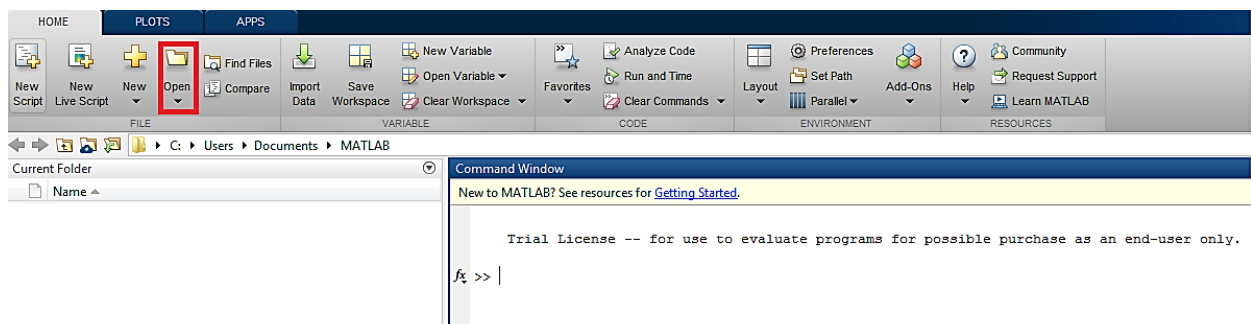
**Other MATLAB tools and windows, such as figure windows, are not managed by the desktop.**



**Create a new script** - To create script, click on 'New Script' button on MATLAB desktop.

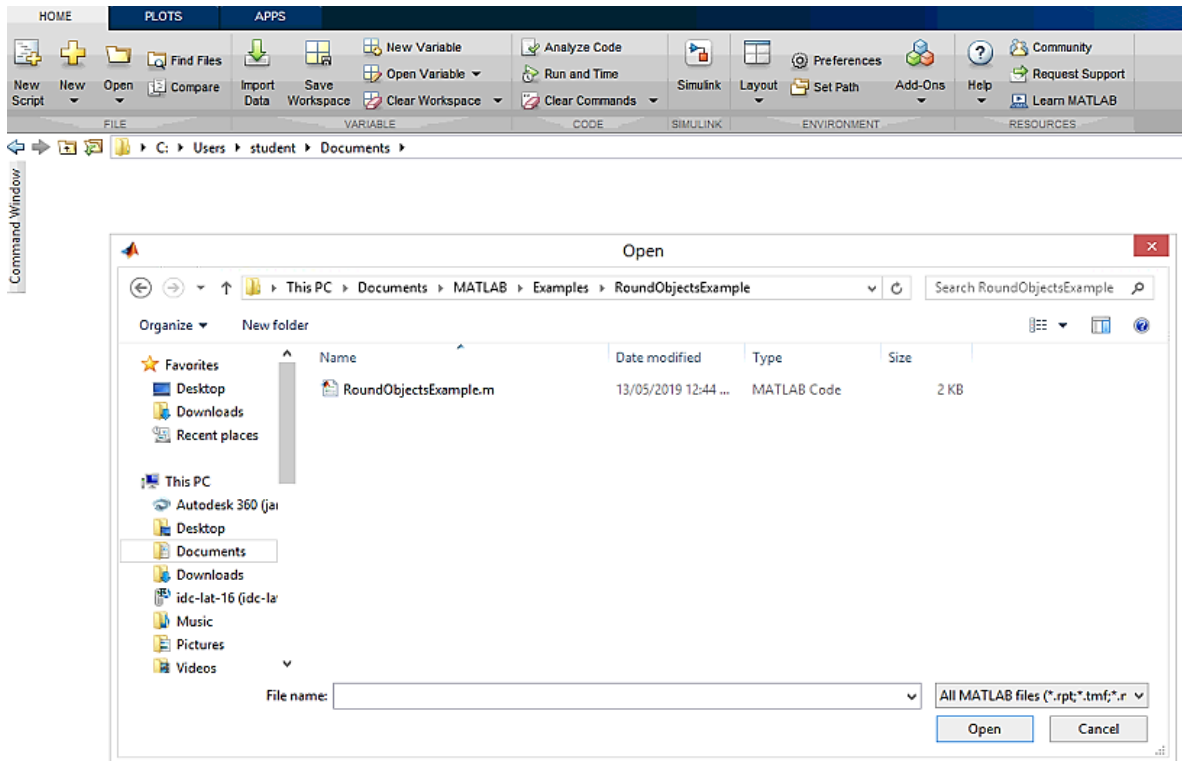


**Open a script** - To open a script, click on 'Open folder' and select the folder path of the script .m file.

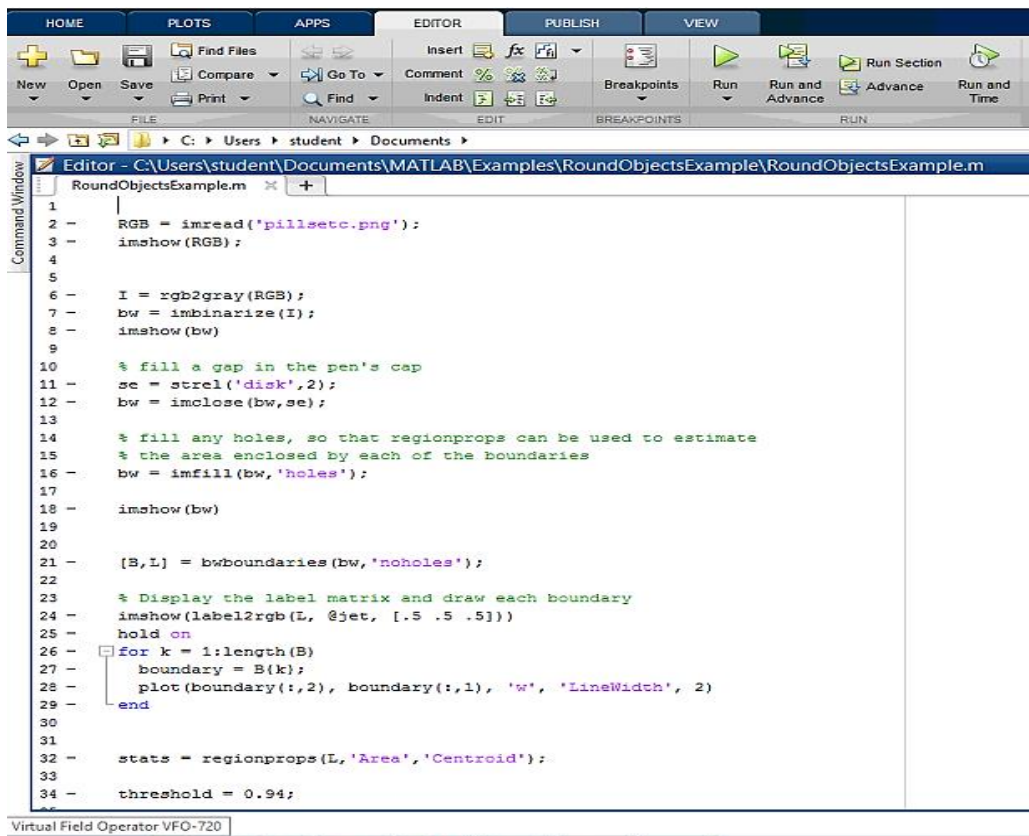


For instance, to open a prewritten example code file from the default MATLAB path.

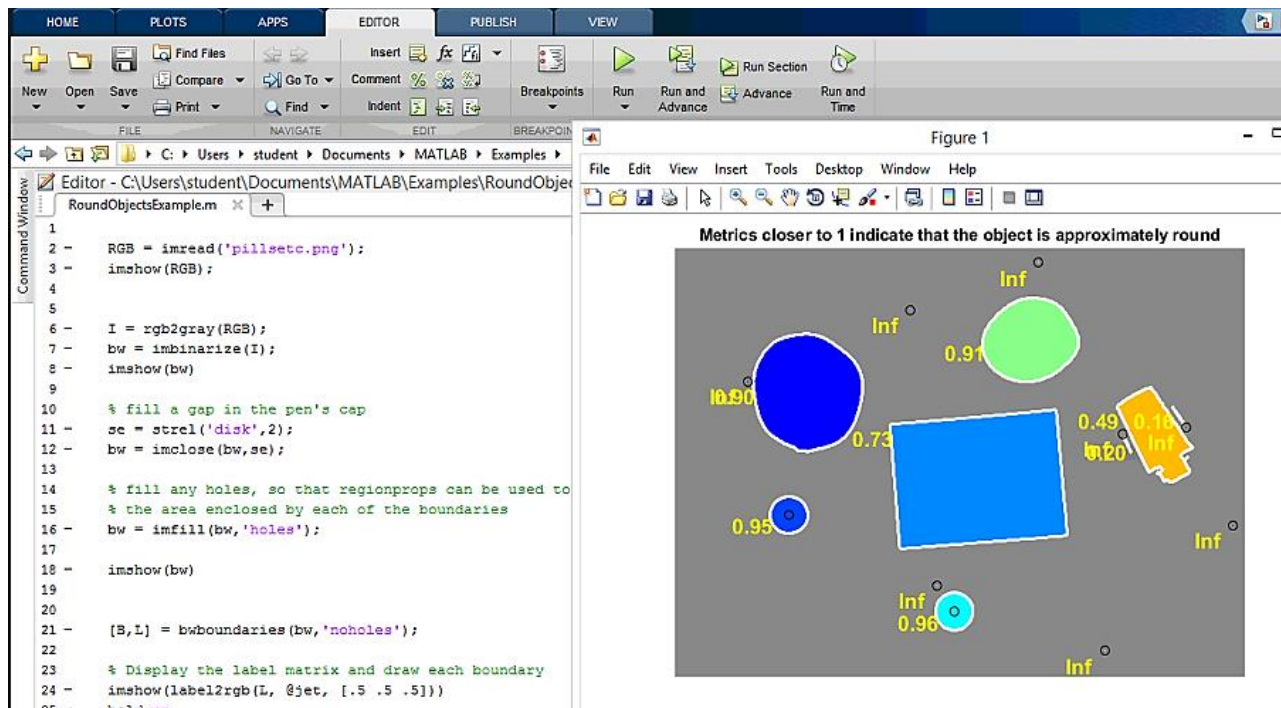
## Open → Select folder path



## Open the MATLAB Code file.



Run the script - Output screen will be displayed.



## Accessing Web Camera

For accessing web camera, you need to install MATLAB USB webcams support package that you

can find in the Add-On explorer. You can also refer to the following link for detailed guidance.

[https://www.uow.edu.au/~phung/resources/image/vision\\_ug.pdf](https://www.uow.edu.au/~phung/resources/image/vision_ug.pdf)

## Camera Setup

To properly calibrate your camera, follow these rules:

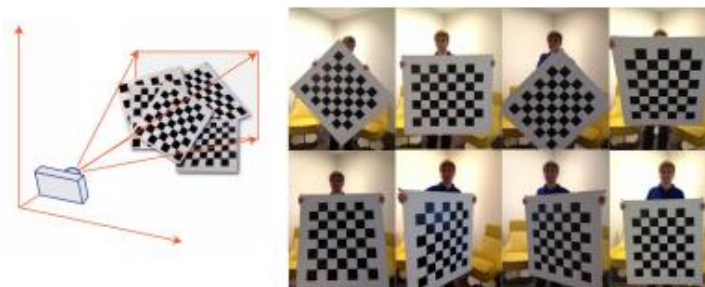
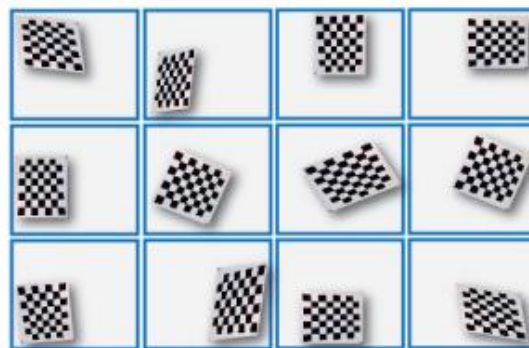
- Keep the pattern in focus, but do not use autofocus.
- Do not change zoom settings between images. If you change zoom settings, the focal length changes.

## Capture Images

For best results, use at least 10–20 images of the calibration pattern. The calibrator requires at least three images. Use uncompressed images or images in lossless compression formats such as PNG.

### The following instructions should be done for greater calibration accuracy:

- Capture the images of the pattern at a distance roughly equal to the distance from your camera to the objects of interest. For example, if you plan to measure objects from 2 meters, keep your pattern approximately 2 meters from the camera.
- Place the checkerboard at an angle less than 45 degrees relative to the camera plane.
- Do not modify the images. For example, do not crop them.
- Do not use autofocus or change the zoom between images.
- Capture the images of a checkerboard pattern at different orientations relative to the camera.
- Capture enough different images of the pattern so that you have covered as much of the image frame as possible. Lens distortion increases radially from the centre of the image and sometimes it is not uniform across the image frame. To capture this lens distortion, the pattern must appear close to the edges.



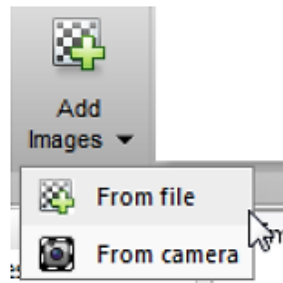
The Calibrator works with a range of checkerboard square sizes. As a general rule, your checkerboard should fill at least 20% of the captured image. For example, the preceding images were taken with a checkerboard square size of 108 mm.

### Add Images

To begin calibration, you must add images. You can add saved images from a folder or add images directly from a camera. The calibrator analyses the images to ensure they meet the calibrator requirements and then detects the points.

### Add Images from File

Click the Add images button, and select from file. You can add images from multiple folders by clicking Add images for each folder.



### Acquire Live Images

To begin calibration, you must add images. You can acquire images live from a Webcam using the MATLAB Webcam support. You must have the MATLAB Support Package for USB Webcams installed to use this feature. See 'Install the MATLAB Support Package for USB Webcams' (Image Acquisition Toolbox) for information on installing the support package.

To add live images, click the **Add Images** arrow and select **From camera**.

- The **Camera** tab opens (formerly called **Image Capture** tab, as shown in the graphics). If you have only one Webcam connected to your system, it is selected by default and a live preview window opens. If you have multiple cameras connected and want to use a different one, select the camera in the **Camera** list.
- You can set properties for the camera to control the image. Click the **Camera Properties** field to open a list of your camera's properties. This list varies, depending on your device.
- Use the sliders or drop-downs to change any available property settings. The **Preview** window updates dynamically when you change a setting. When you are done setting properties, click outside of the box to dismiss the properties list.

Enter a location for the acquired image files in the **Save Location** field by typing the path to the folder or using the **Browse** button. You must have permission to write to the folder you select.

**Set your capture parameters.**

- In the **Capture Interval** field, use the text box or slider to set the number of seconds between image captures. The default is 5 seconds, the minimum is 1 second, and the maximum is 60 seconds.
- In the **Number of images to capture** field, use the text box or slider to set the number of image captures. The default is 20 images, the minimum is 2 images, and the maximum is 100 images.
- In the default configuration, a total of 20 images are captured, one every 5 seconds.

It is helpful to dock the **Preview** window in the centre of the tool. Move it from the right panel into the middle panel by dragging the banner. It then docks in the middle.

The **Preview** window shows the live images streamed as RGB data. After you adjust any device properties and capture settings, use the **Preview** window as a guide to line up the camera to acquire the checkerboard pattern image you wish to capture.

Click the **Capture** button. The number of images you set are captured and the thumbnails of the snapshots appear in the **Data Browser** panel. They are automatically named incrementally and are captured as .png files.

You can optionally stop the image capture before the designated number of images are captured by clicking **Stop Capture**.