

EE435: Biometric Signal Processing
Using Video in a MATLAB GUI Tutorial

This exercise will introduce some of the basics of integrating live video into a MATLAB GUI. From the course website, download the .m and .fig files for three GUIs:

(1) *myCameraGUI_1.m myCameraGUI_1.fig*

This GUI ONLY imports the live video feed from the camera and displays it in a GUI window. There is one display axes. The video will display as soon as the GUI gets up and running.

(2) *myCameraGUI_2.m myCameraGUI_2.fig*

This GUI conducts sampling of the live video and displays successive image frames from the live video stream. There is one display axes. The video frames will start to display after a user pushes a “Start Capture” button. The user can also stop the display by pushing the “Stop Capture” button. The frame rate (sample rate) is included in the code at 20 frames/sec.

(3) *myCameraGUI_3.m myCameraGUI_3.fig*

This GUI has two display axes. The live video is displayed on the left as soon as the GUI starts up, and when the “Start Capture” is pushed, samples of the live video are taken (20 frames/sec), converted to grayscale and displayed in the right window. The “Stop Capture” button will stop the sampling process and display in the right window, but the live video display will continue.

Try this:

1. Download the six files listed above from the course website (under *In-Class Activities*). Be sure that the computer you are using has a USB Webcam attached and operational (be sure the drivers are installed on the computer). You’ll know when you connect it, if it is not already connected.
2. To view/edit the .fig files, at the command line, type `>> guide xxxx.fig`
This starts the MATLAB GUI Development Environment.
3. Run the *myCameraGUI_1* file. Satisfy to yourself that you are viewing live video (move around in the field of view of the camera). Open the *myCameraGUI_1.m* m-file. Besides the normal code that the GUI developer creates when I built this GUI, there are a few commands that connect the GUI to the video source. Read through the comments I’ve inserted to get a feel for what each line does. When you’re done, close the GUI.
4. Run the *myCameraGUI_2* file and push the “Start Capture” button. It will take a few seconds for the captured video to appear. Open the *myCameraGUI_2.m* m-file. There are a few commands that connect the GUI to the video source and conducts the sampling. Read through the comments I’ve inserted to get a feel for what each line does. Stop the camera, and then close the GUI. Change the frame rate from 20 frames/sec to 2 frames/sec as follows:
 - a. In the *myCameraGUI_2_OpeningFcn*, adjust the ‘TimerPeriod’ to 0.5. Timer period is used here to specify the sample period, thus the frame rate.
 - b. Rerun the GUI, and you should now see the result of a reduced frame rate. When you’re done, press the “Stop Capture” button and close the GUI.

4. Run the *myCameraGUI_3* GUI file. Open *myCameraGUI_3.m*. This m-file combines the commands that connect the GUI to the video source and conducts the sampling. Read through the comments I've inserted to get a feel for what each line does. When you're ready, press the "Start Capture" button and see how it operates. When you're done, stop the capture and close the GUI.
 - a. Find in the m-file where I've converted the color frames to grayscale. Change it so that it displays the photo-negative of the grayscale image. Run the GUI again and press the "Start Capture" button. When done, stop the camera and close the GUI.
 - b. Change the m-file again so you threshold the grayscale image at some value. Rerun the GUI and push "Start Capture" and you should see binary video.
 - c. Change the m-file to display only the red component in a color frame (green = blue = 0).
 - d. Note: Depending on how much you want to process each frame, the time to process may be too long compared to the sample rate. In this case, you may either want to reduce the sample rate (frame rate), or reduce the video resolution of the image.
5. If you happen to get errors regarding multiple sources trying to access the video, it is best to exit MATLAB and start over.