

## Creating Images in various Environments - Image Conversions

## Objectives:

- To introduce National Instrument's IMAQ Vision Builder.
- To explore basic image building and processing functions in MATLAB.
- To manipulate images as matrix arrays.
- To exchange image files between MATLAB and IMAQ Vision Builder.
- To explore simple imaging capabilities provided in Windows (Paint, Photo-Editor)

## Procedure 1:

- 1) Enter the following code at the MATLAB prompt:

```
A=ones(16,16);  
A=A*255;  
B=zeros(16,16);  
C=[A B;B A];  
colormap(gray);image(C)
```

**[comment]**

- 2) Using the *help* command of MATLAB if necessary, write comments next to this code, so as to explain in detail what it does. Also, if necessary, experiment a little, to understand the reasons for each line. For example, omit line 2 to see what happens. Then, to obtain the same results without line 2 you will need to use *imagesc(C)* instead of *image(C)*. **[explanation]**
- 3) Also try omitting the *colormap* function. **[observation]**
- 4) By the same process as in line 4 of the above code, use matrix C as a building block to build a matrix D of dimensions  $128 \times 128$ . Note that matrix D should still have a chessboard-like pattern. **[labeled printout]**
- 5) The function *image()* plots the matrix in the bracket as if it were an image. This is not a conversion that can be used outside of the MATLAB environment. To convert the matrix to one of the standard image file formats you must use the *imwrite* function as shown in *help imwrite* using a .tif extension<sup>1</sup>. The .tif file will be saved in c:\matlab\_sr13\work. Actually, this may turn out to not be enough, because MATLAB may not give the .tif file the proper header. To complete the task you need to use MS Photo Editor as follows:

Start → Programs → MS Office 2000 → MSOffice Tools → MS Photo Editor.

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<sup>1</sup> The second and third arguments of *imwrite* must be included in single quotes.

- 6) From within Photo Editor browse to MATLAB subdirectory \work and open the .tif file you created in MATLAB. Immediately save the file as .tif, overwriting the existing one.
- 7) Now go to IMAQ Vision Builder as follows: Start → Programs → National Instruments → IMAQ Vision Builder → IMAQ Vision Builder. Through the File menu, browse to the .tif file and open it. You have succeeded in bringing into IMAQ a file that you created in MATLAB. Go on exploring IMAQ as in pages 2-3 to 2-7 (attached).
- 8) Finally, create a file in IMAQ and read it into MATLAB as a matrix as follows: Open one of the example images of IMAQ, say Blister\Image00.tif. Go to the Binary menu and click on Threshold. Notice the new window that appears. It is called Threshold parameter window (see attached sheets, page 2-6). It contains three histograms. Move the blue threshold cursors to about 20 % of the range of the histograms and the red cursors to about 80 %. Click OK. The resulting binary image should be mostly white. Save this image into MATLAB's \work directory.
- 9) Return to MATLAB and use the *imread* function to read this image as a matrix. Record the exact MATLAB line you used:

\_\_\_\_\_ [MATLAB code]

### Exercise:

Working as above, create a  $512 \times 512$  matrix with the opposite chessboard pattern (white boxes become black and vice versa). Make a printout of this matrix. **[labeled printout]**

### Procedure 2: Create an image in MATLAB

Using the *ones* and *zeros* functions of MATLAB create an array that will produce the lizard binary image shown below. Plot this image and retain a soft copy in .tif form for future use.

**To properly manage printing, please do not send individual images to the printer. This wastes both paper and toner. Instead, open a file in MS Word and put your output images there. At the end of the lab session, you can send just that file to the printer. If you also copy and paste your programs to this file, you will be much better prepared to write a report. In any case, you will have something neat to put in your lab book. It is a good idea to get into this habit now and keep it up throughout the course.**

### Procedure 3: Create an image in MS PAINT

Obtain the lizard image from your instructor. ... under construction