PIXELS TO PICTURES

A PROGRAMMING COURSE ON IMAGES WITH MATLAB

Instructor Guide

Module 7: Applying Special Effects to Images

Prerequisite Domain Knowledge: Live Scripts, Basic MATLAB Syntax

Expected Completion Time: 30 minutes

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Applying Special Effects to Images

Expected Duration: 30 minutes

Learning Objectives

- Execute functions to apply transformations on images
- Partition MATLAB Live Scripts into Sections
- Use of comments in MATLAB

Materials

- MATLAB®
- Handout "MATLAB Functions"

Steps

Tell students that now that we are starting to get an understanding of what functions are and how they work, let's start using them to create some special effects on images by applying transformations on them.

Instruct students to type the following in the Command Window:

```
open 'SpecialEffectsBasic.mlx'
```

This will open up an already created MATLAB script called `SpecialEffectsBasic.mlx`.

In the third section, we introduce a new function `imeffects`, which takes in two inputs by default. Ask the students to turn their attention to the **Special Effects** section of the **MATLAB Functions** Handout.

```
web('worksheets_and_handouts/MATLABFunctions.pdf', '-browser');
```

Continue clicking on **Run and Advance** to progress through each special effects section and view the effect each function call has on the original image.

Once you have advanced through the whole script, ask :

- *What is the difference between the **Run** and **Run and Advance** buttons?*
- Students should notice that the **Run** button will execute the whole script at once and show all the images in quick succession.
- *What situations might you want to use the **Run** button instead of **Run and Advance**?*
- Students should notice that the **Run and Advance** button will execute a section and then advance to the next section.

The students can now run the script on other images of their choice. Ask the students if they would like to control the extent to which some of the effects are being applied to the images. Well, there is a way to do that!

Instruct students to type the following into the Command Window:

```
open 'SpecialEffectsAdvanced.mlx'
```

Observe this script has a subset of the special effects and the syntax for `imeffects` takes a third input. The third input is optional, which means, if we don't provide the third input, the function will use default settings but we can use the third input to have some control over the effects.

Click Run and Advance to run the first two sections (clean up and read in image).

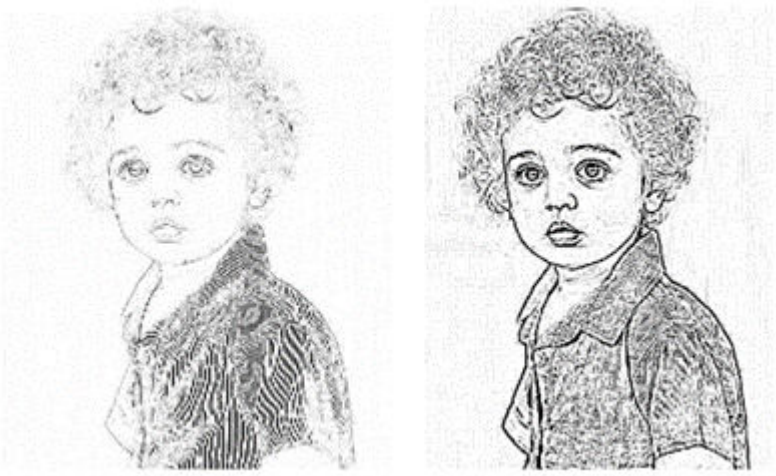
For the third section, which applies the neon effect to an image with an intensity of 1, Click on **Run Section**.

This will only run the current section but not advance to the next section. Ask:

- *What happens to the image if we change the third input to 3?*
- Students should notice that the intensity of the effect increases.
- *What happens if we continue to increase the value of the third input?*
- Students should notice that the intensity of the neon effect continues to gradually increase as the third input increases. Below are the results of changing the third input to 1, ,5, 9, 13 and 17.

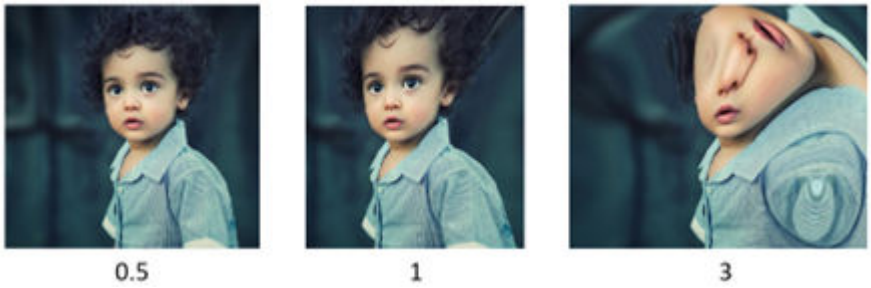
Continue through the different effects and demonstrate how to use the optional third inputs for each in a similar fashion. Guide the students through the next effect, **Pencil**, and then let them explore how the other effects impact the image. Give students about 5 minutes to experiment with the following effects.

- Effect Name – Pencil
- Optional Inputs – **`'light', 'dark'`**

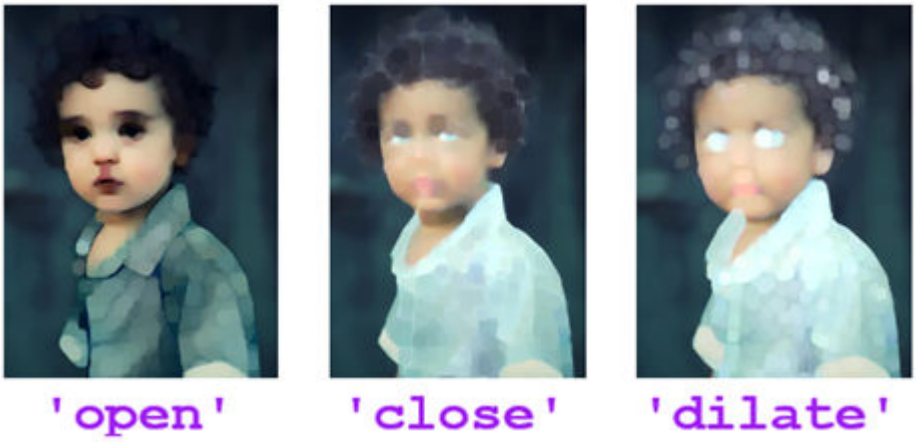


- Effect Name – Barrel
- Optional Inputs – 0 to 10

- Effect Name - Pincushion
- Optional Inputs – 0 to 10



- Effect Name – Blur
- Optional Inputs – **`'open', 'close', 'dilate'`** (These are different algorithms used by MATLAB to blur the images)



- Effect Name – Ripple
- Optional Inputs – 0 to 5

Tell the students that they can use more than one effect on an image to get a cascaded effect. Encourage them to use the output of a special effect function as an input to another special effect function.

```
open 'CustomEffects.mlx'
```

Give students 15 minutes to apply their favorite effects to an image by adding to the `CustomEffects.mlx` script.

They can cascade even more effects if they like. When this time has elapsed, gather the students.

Ask:

- *What effects did you use for your image? What changes did you make to the intensity of each effect?*
- Students should respond with the effects they used and how they manipulated the effects.
- *What were the results of the effects you used?*
- Students should share what their image looks like and how each effect impacted the final image.