Introduction to Image Processing HW04 - Color Edge Detection - CSIE 4B 408410120 鍾博丞

Given three color images, perform edge detection on the three color images using Sobel operator.

Date Information

- Due: 2023.01.06
- Last Modified: 2022.12.31

Environment Requirement

- python 3.5 or newer - for f-strings `f"Something {variable}"` and type hinting.
- Another requirements are written in `requirements.txt`, just type `pip install -r requirements.txt` in the terminal.
  - matplotlib
  - numpy
  - opencv-python == 4.5.5.62 (for auto-complete working on pycharm)
    - https://stackoverflow.com/questions/73174194/opencv-autocomplete-not-working-on-pycharm
  - tqdm

Execution

The main python code is `main.py`, type the following command and then you can run the program.

```
python main.py
```

There are some parameters in `main.py`.

Note that the program will always save all images in `Img`.

Warning: The program will always ask user whether user want to delete the existing folder `Img` and recreate it or not. The default behavior is **No**. You can only press **Enter** into the console, which also means No.

- `is_show`: Tell the program if you want to show the result on the screen or not.
  - `True`: Show the result on the screen.
  - `False`: Don't show. Save it only.

All the methods are implemented in `spatial_image_enhancement.py` and import in main as `sie`.

Technical Description

Sobel Operator

There are 4 kinds of Sobel operator. We define their names as their degrees.

- sobel_0 = $\begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 0 \end{bmatrix}$
- sobel_45 = $\begin{bmatrix} -2 & -1 & 0 \\ -1 & 0 & 1 \\ 0 & 1 & 2 \end{bmatrix}$
- sobel_90 = $\begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$
- sobel_135 = $\begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & 1 \\ -2 & -1 & 0 \end{bmatrix}$

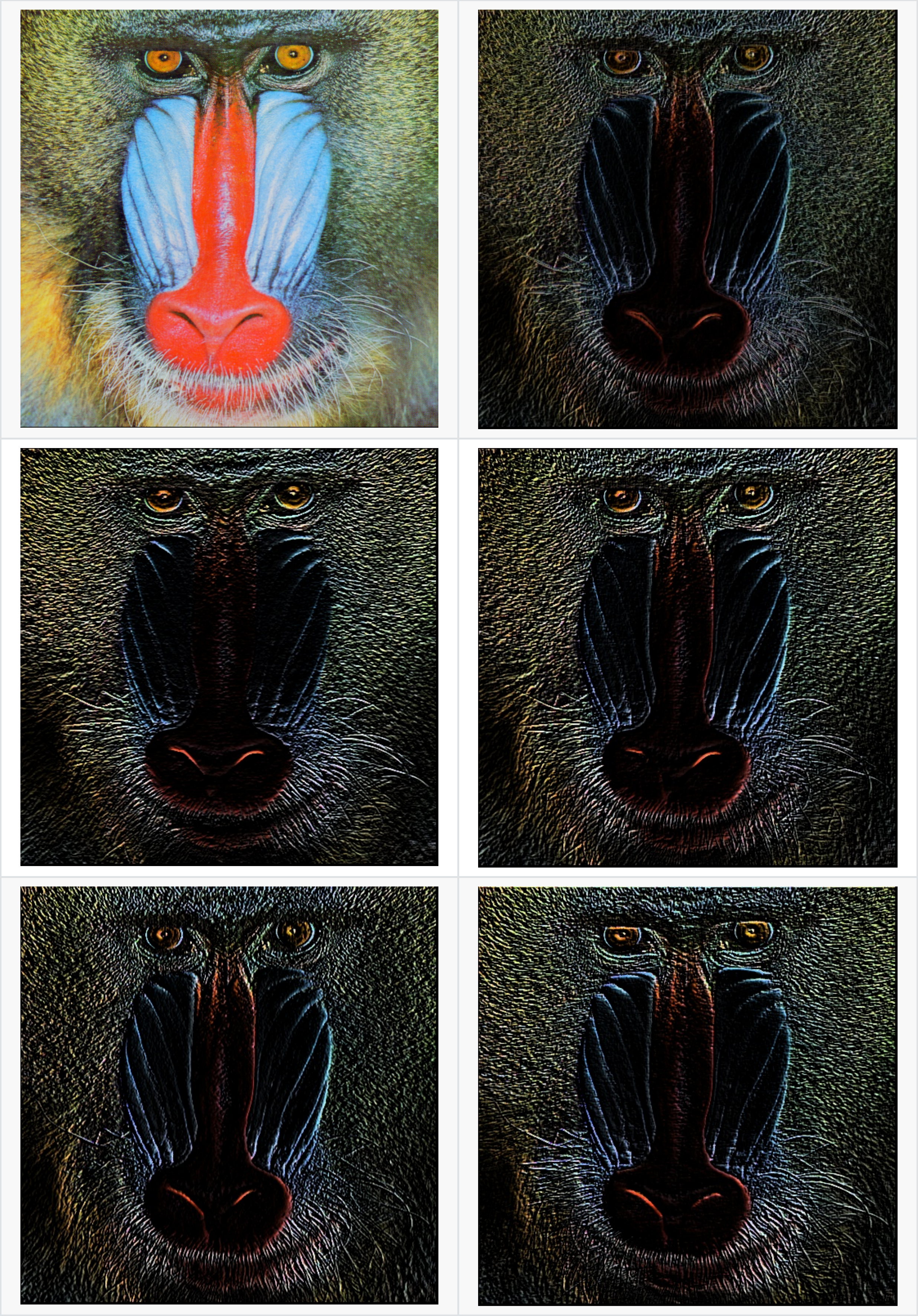
We have 4 results using the operators shown above and we create the final result by averaging the 4 results.

Experimental results

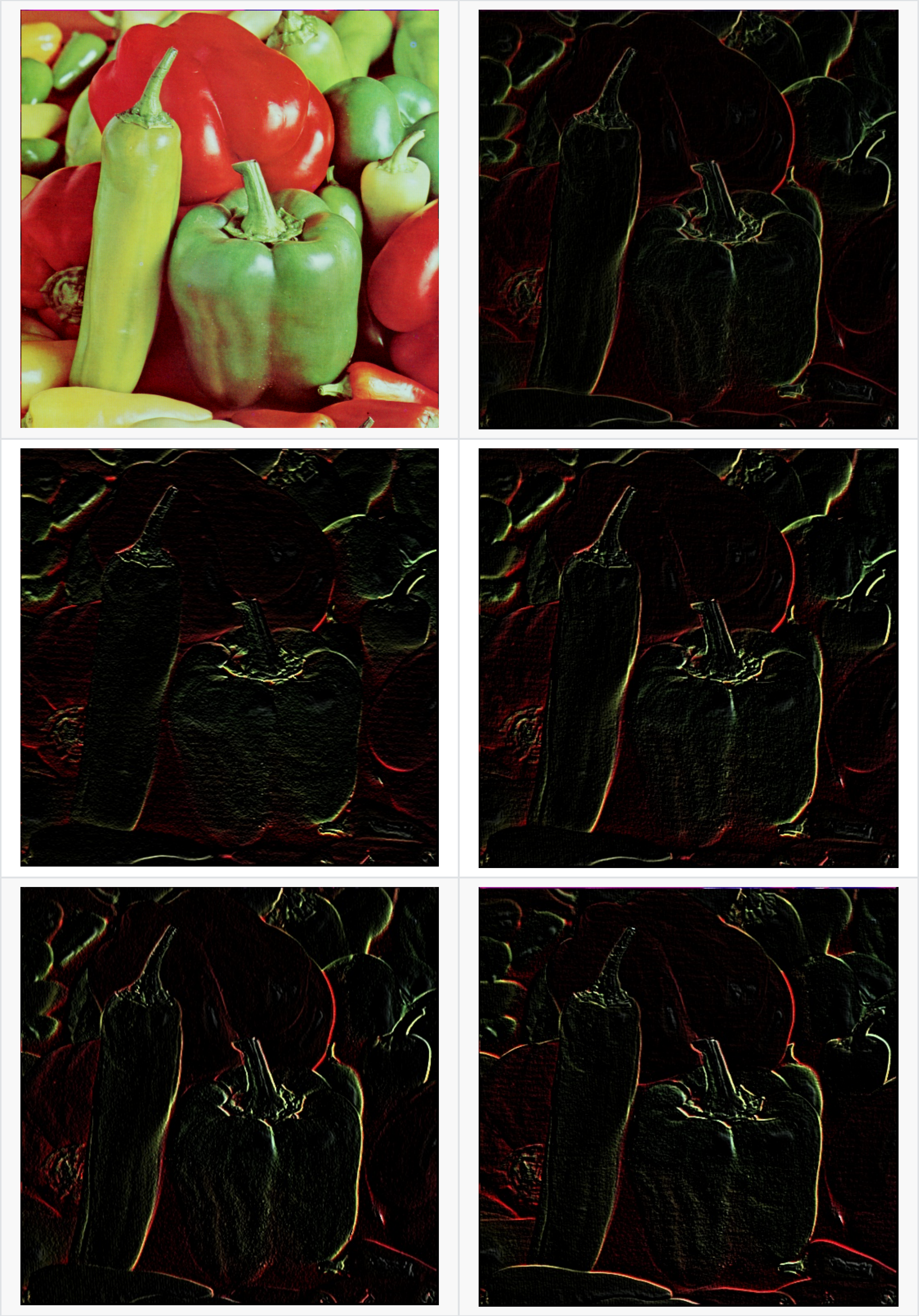
The order of the permutation is described below.

Original Image	**Final_Sobel_Result**
Sobel_0	Sobel_45
Sobel_90	Sobel_135

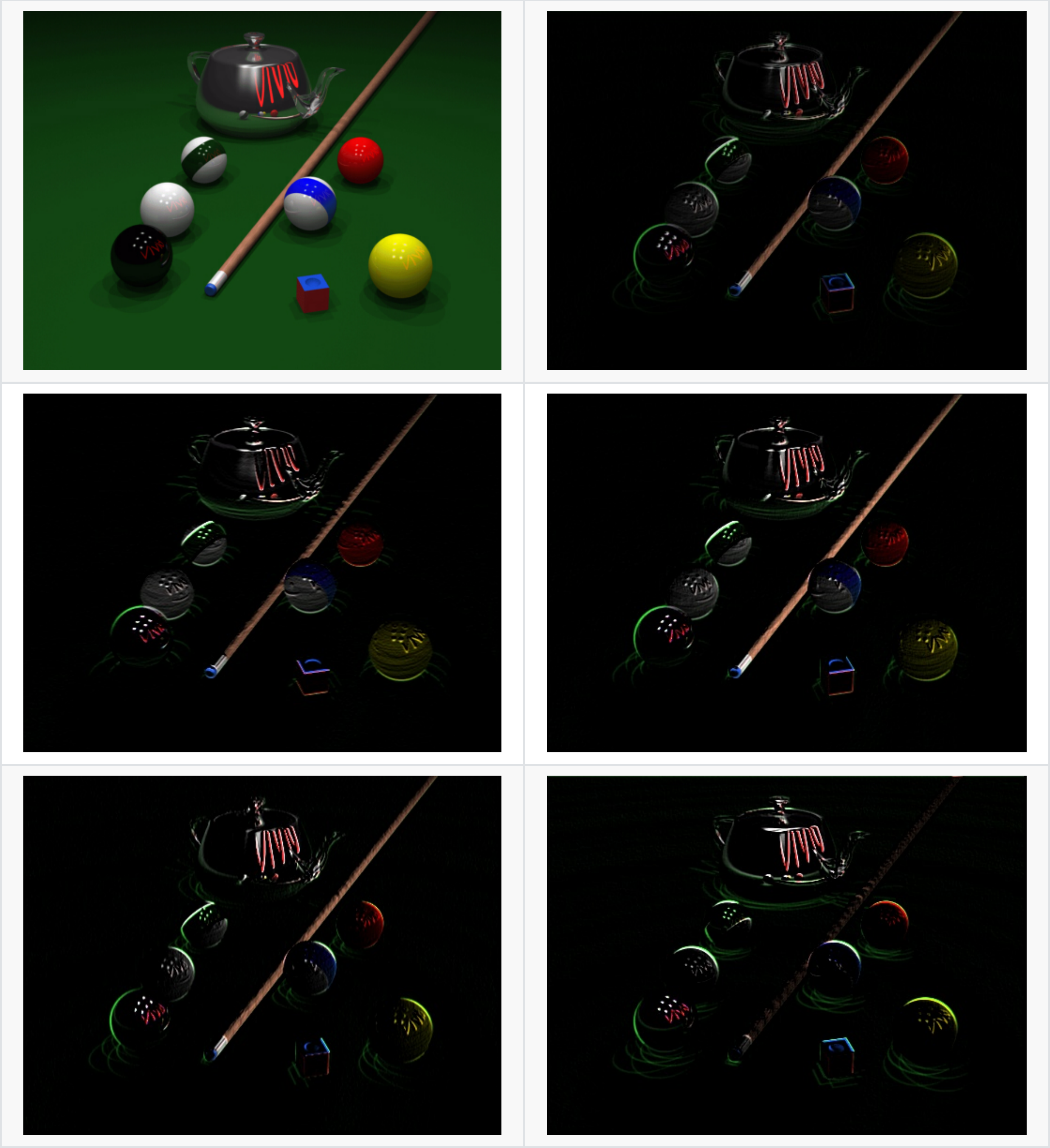
baboon



pepper



pool



Discussions

- The result is pretty great.

Reference

- Digital Image Processing, 4e (Rafael C. Gonzalez): Figure 10.14