CS101 – 튜플을 사용한 디지털 사진 변환 예제

Lecture 7

School of Computing
KAIST

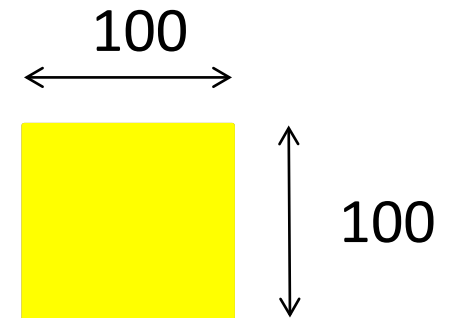학습 목표:

● 튜플을 활용하여 디지털 사진을 표현하는 방식을 이해할 수 있다.

● 디지털 사진을 색 반전이나 흑백 모드로 변환할 수 있다.

색

색은 3개의 값을 가진 튜플로 표현됩니다.
이 튜플이 가진 3개의 값들은 해당 색의 빨간색, 초록색, 파란색 세기/강도를 의미합니다.

```
red = (255, 0, 0)
blue = (0, 0, 255)
white = (255, 255, 255)
black = (0, 0, 0)
yellow = (255, 255, 0)
purple = (128, 0, 128)

from cs1media import *
img = create_picture(100, 100, purple)
img.show()
img.set_pixels(yellow)
img.show()
```

100

100

색

너비 w 픽셀, 높이 h 픽셀을 가진 디지털 이미지는
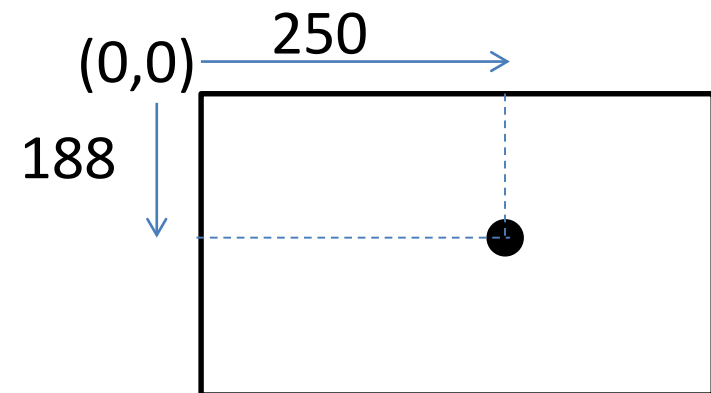h개의 행과 w개의 열을 가진 직사각형 행렬로 표현됩니다.

0,0	1,0	2,0	3,0	4,0
0,1	1,1	2,1	3,1	4,1
0,2	1,2	2,2	3,2	4,2

이미지의 각 픽셀은 행렬의 x와 y좌표를 이용해서 접근할 수 있습니다.
x좌표의 범위는 0부터 w-1까지, y좌표의 범위는 0부터 h-1까지 입니다.

```
>>> img.get(250, 188)
(101, 104, 51)
>>> img.set(250, 188, (255, 0, 0))
```

빨간색, 초록색, 파란색 값

for 반복문

for 반복문은 변수에 정수 값을 대입합니다.

```python
>>> for i in range(4):
...   print(i)
0
1
2
3

>>> for i in range(7):
...   print ("*" * i)


*
**
***
****
*****
******
```
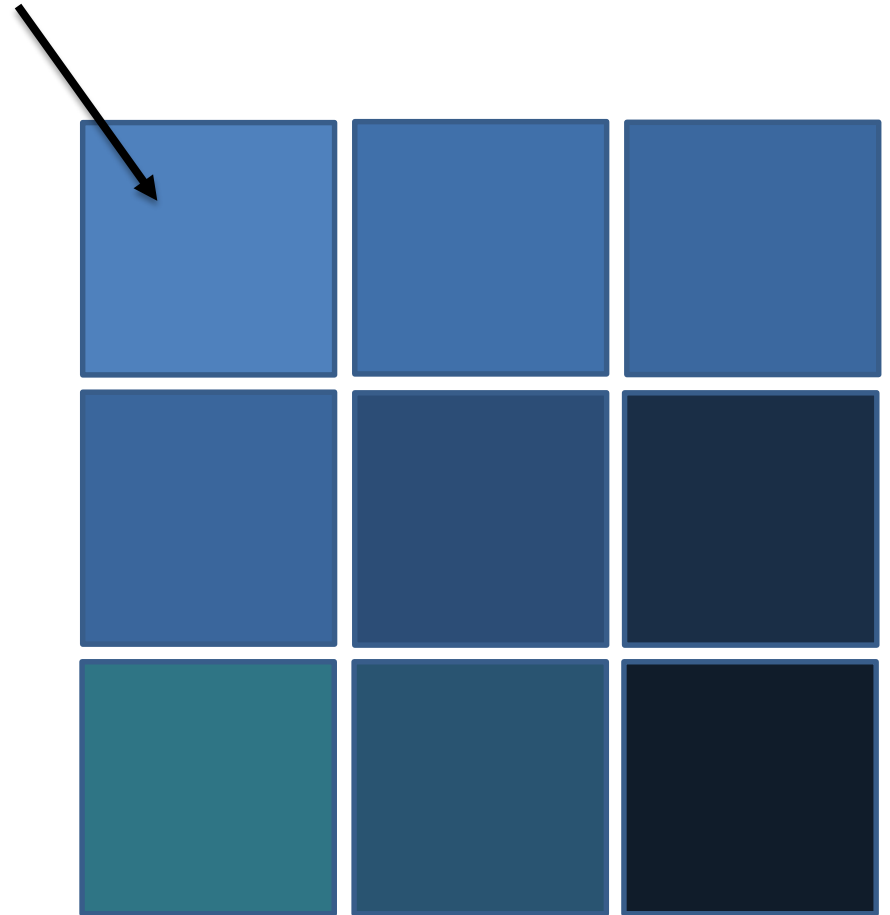
이미지 반전

```python
from cs1media import *

img = load_picture("../photos/geowi.jpg")
w, h = img.size()
for y in range(h):
    for x in range(w):
        r, g, b = img.get(x, y)
        r, g, b = 255 - r, 255 - g, 255 - b
        img.set(x, y, (r, g, b))
img.show()
```
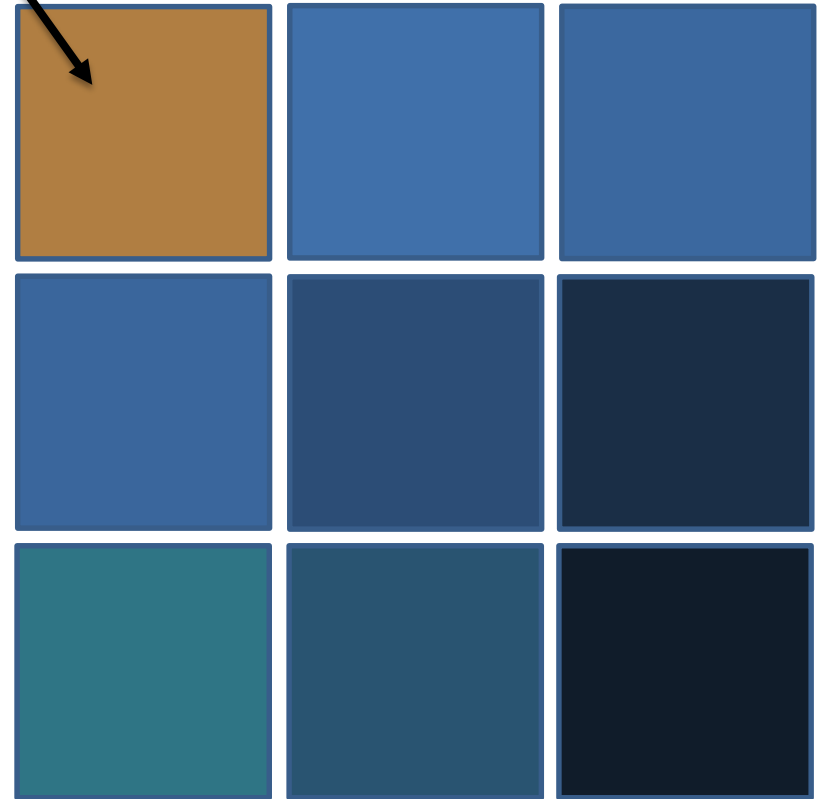
이미지 반전 예시

(x = 0, y = 0): 79, 129, 189

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
    for x in range(w):
        r,g,b = img.get(x, y)
        r,g,b = 255-r,255-g,255-b
        img.set(x, y, (r, g, b))
img.show()
```

이미지 반전 예시

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```

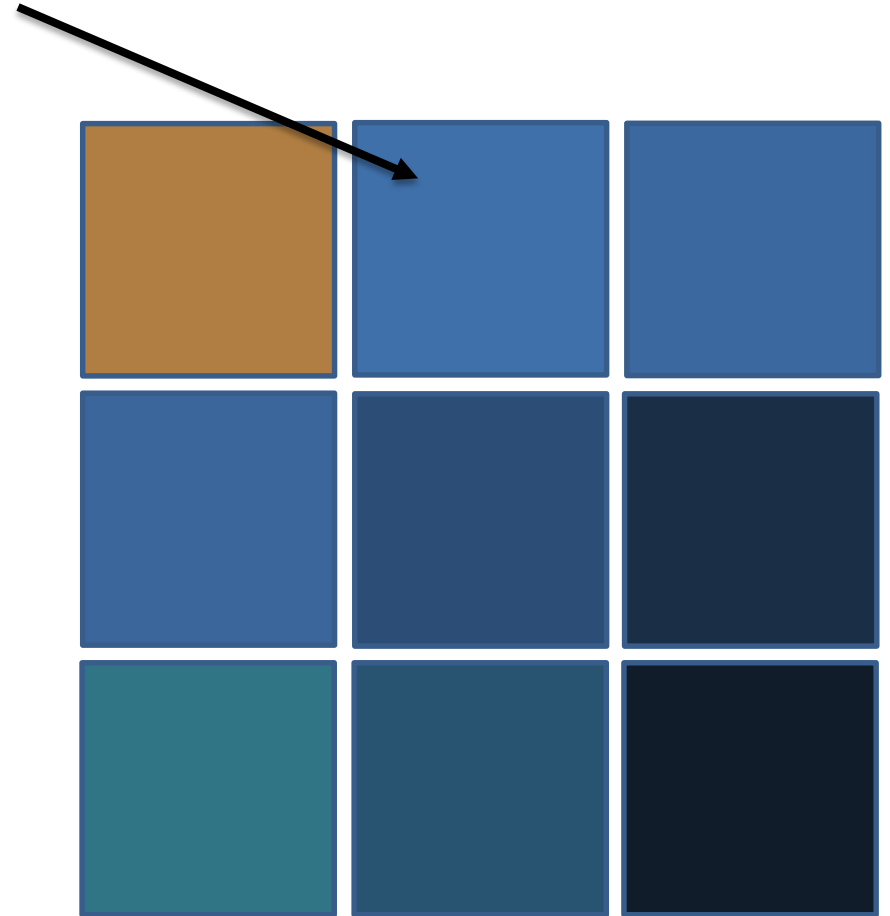**(x = 0, y = 0)**: **176**, **126**, **66**

이미지 반전 예시

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```
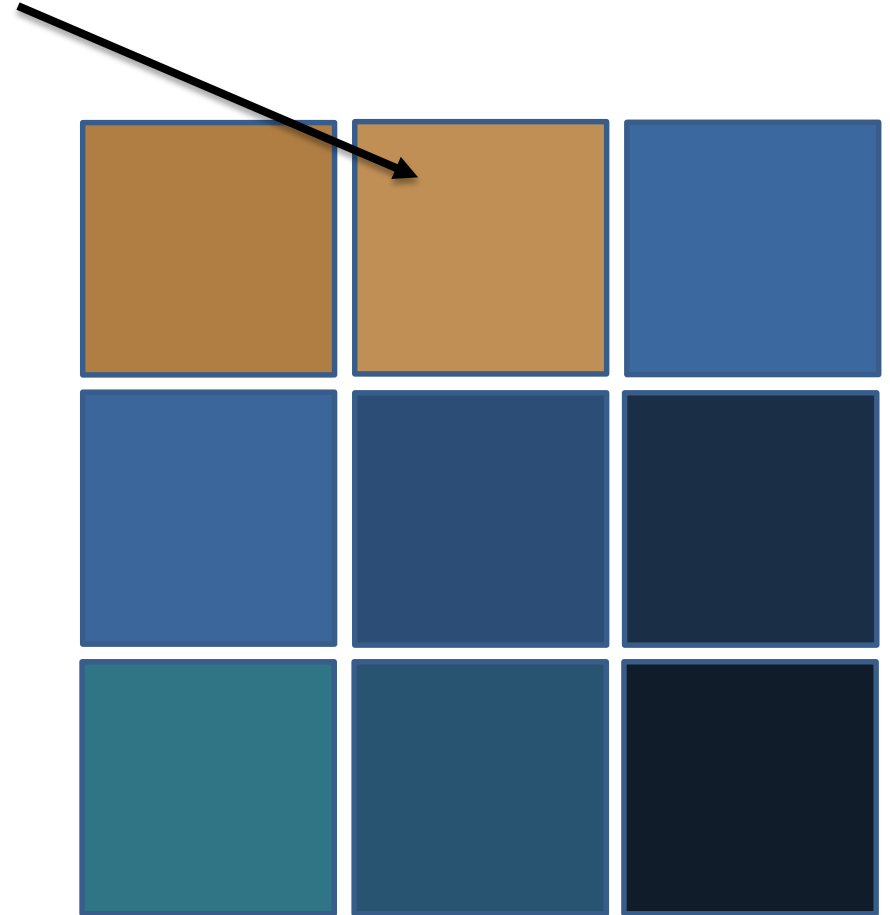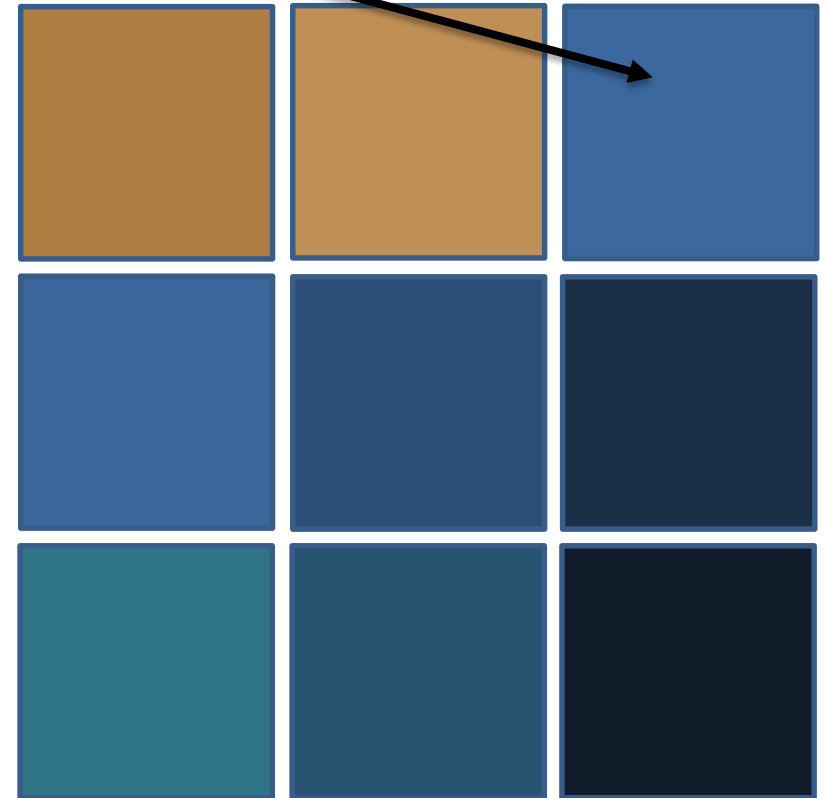
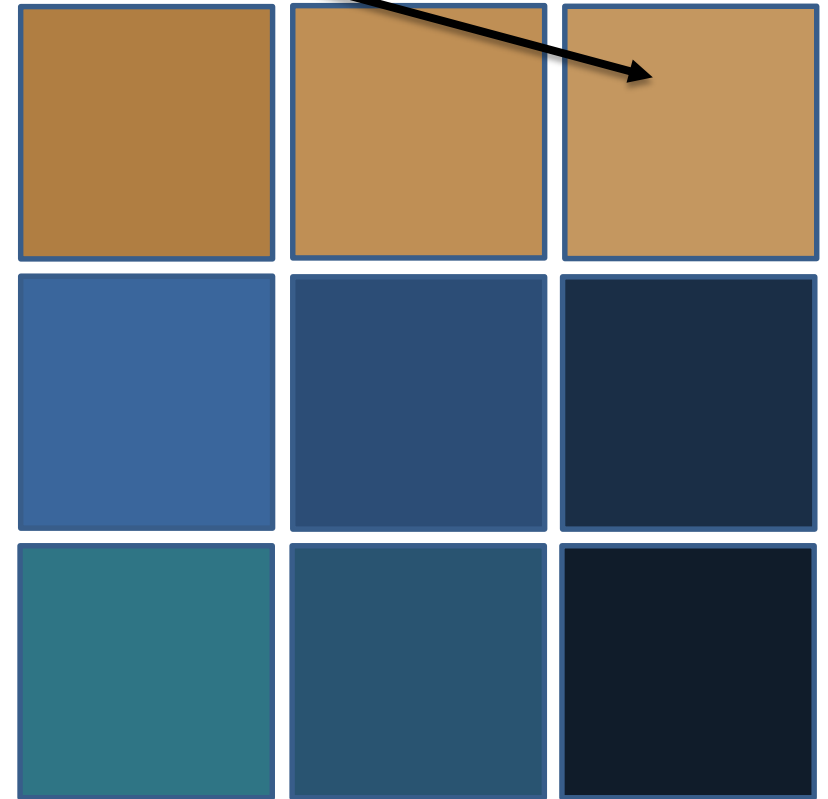**(x = 1, y = 0): 64, 112, 170**

이미지 반전 예시

(x = 1, y = 0): 191, 143, 85

```
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```

이미지 반전 예시

(x = 2, y = 0): **59**, **104**, **159**

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```

이미지 반전 예시

(x = 2, y = 0): **196**, **151**, **96**

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```
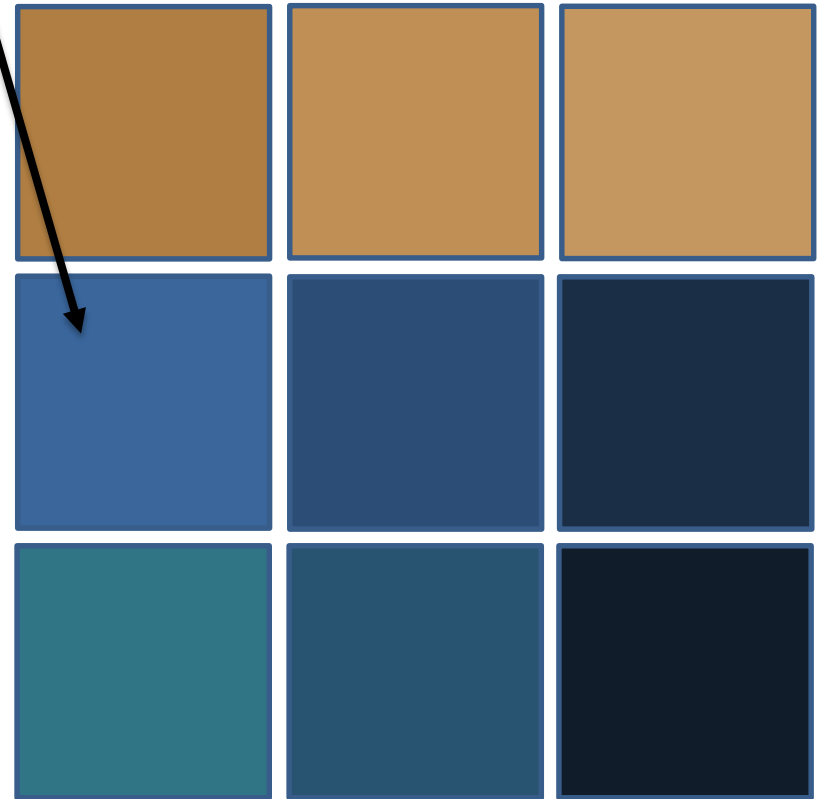
이미지 반전 예시

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
    for x in range(w):
        r,g,b = img.get(x, y)
        r,g,b = 255-r,255-g,255-b
        img.set(x, y, (r, g, b))
img.show()
```
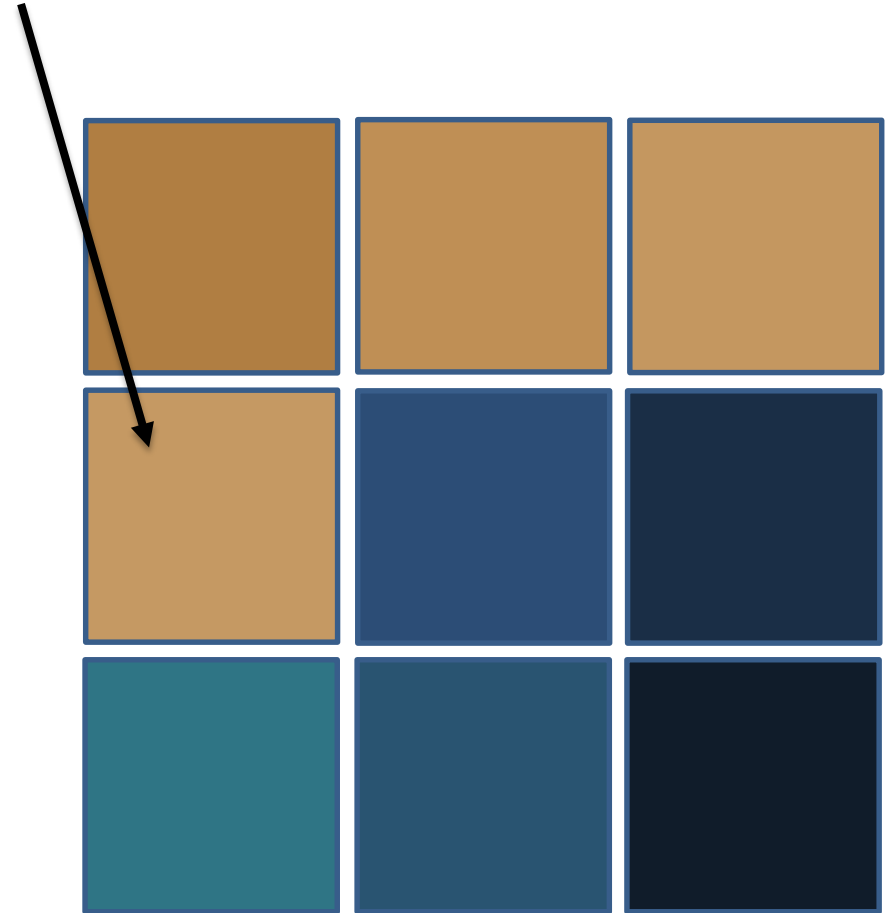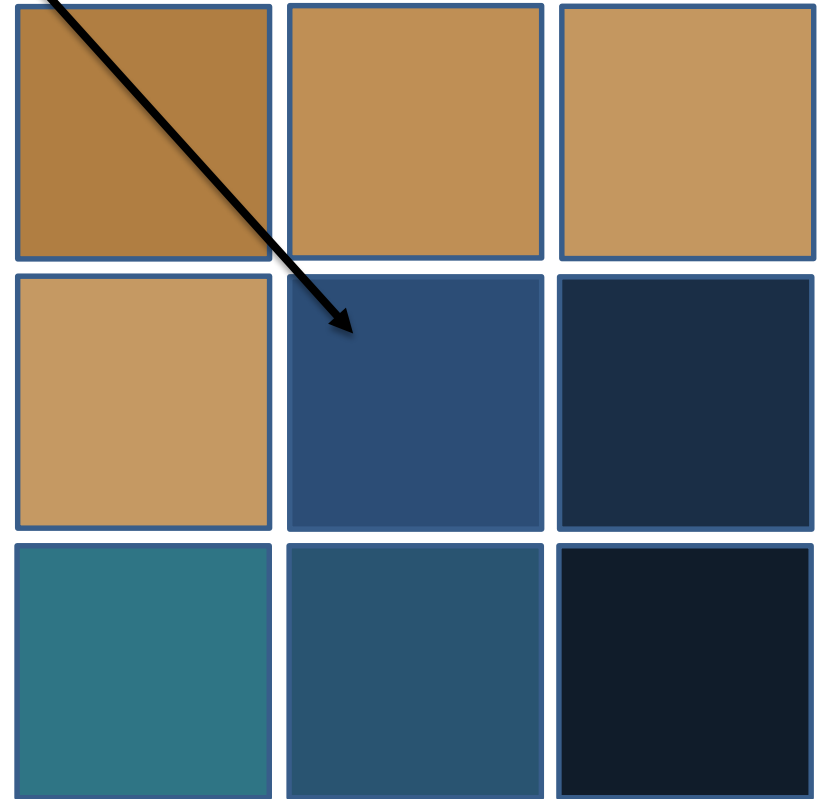
(x = 0, y = 1): 58, 102, 156

이미지 반전 예시

(x = 0, y = 1): 197, 153, 99

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```

이미지 반전 예시

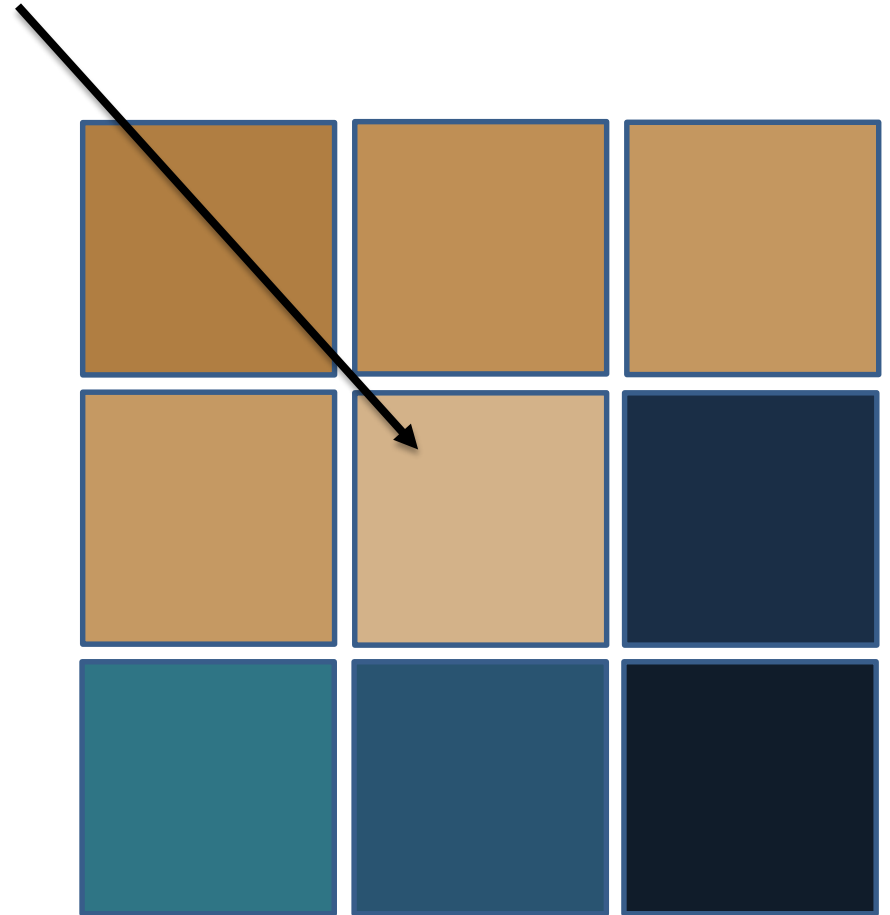**(x = 1, y = 1)**: **44**, **77**, **118**

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```
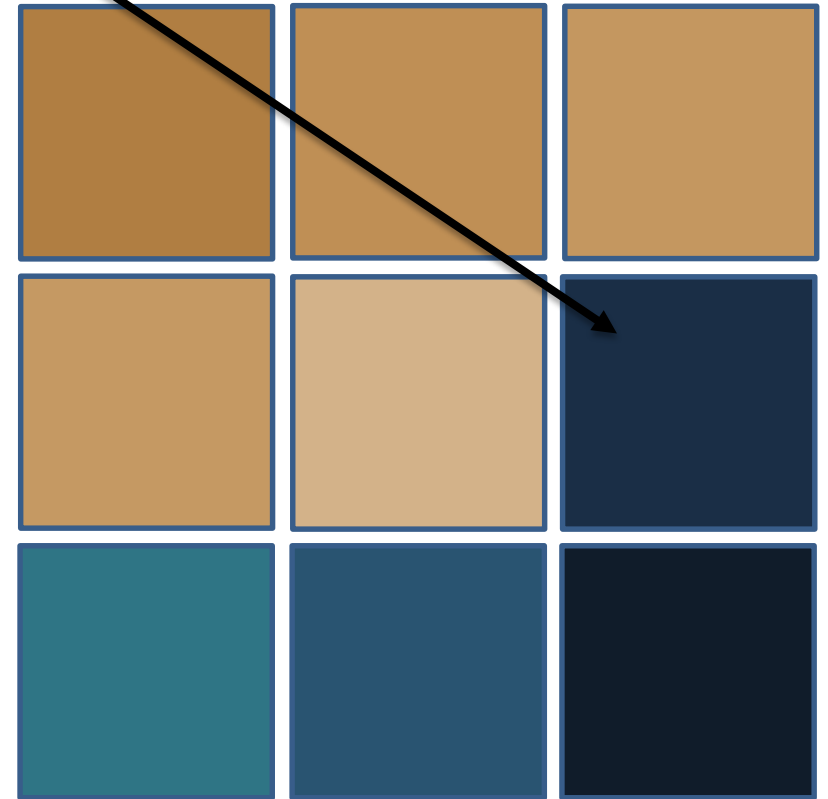
(x = 1, y = 1): 211, 178, 137

```
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
    for x in range(w):
        r,g,b = img.get(x, y)
        r,g,b = 255-r,255-g,255-b
        img.set(x, y, (r, g, b))
img.show()
```
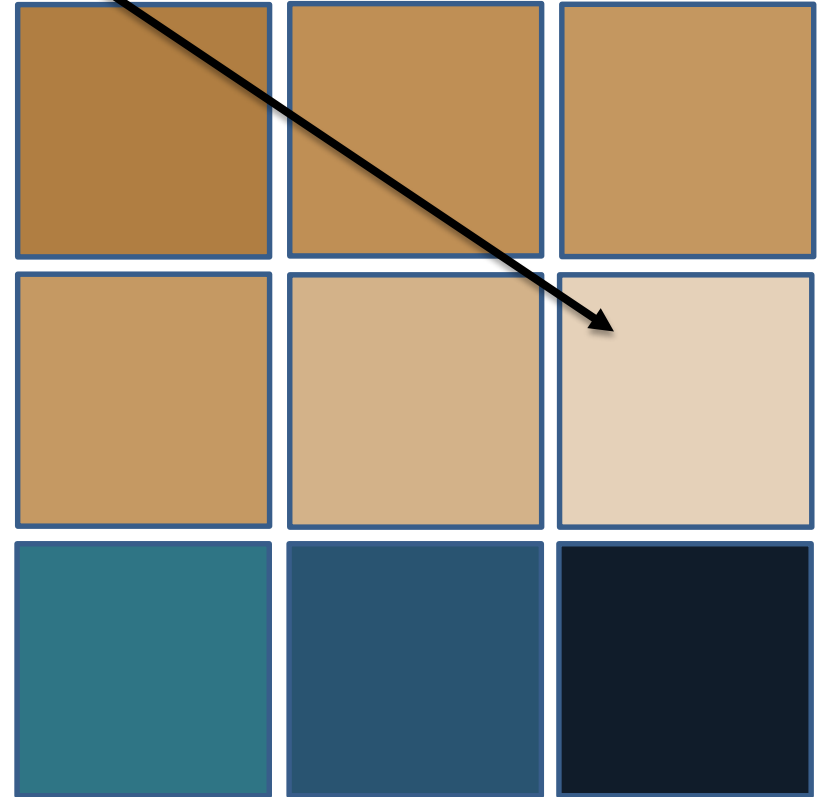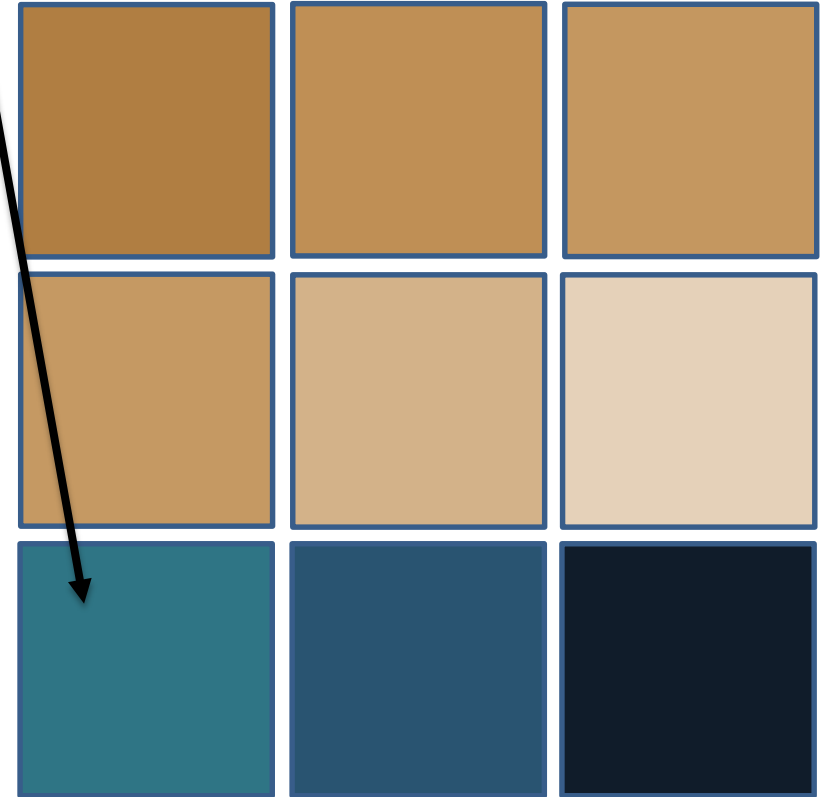
(x = 2, y = 1): 26, 46, 70

```
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```

이미지 반전 예시

(x = 2, y = 1): **229**, **209**, **185**

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
    for x in range(w):
        r,g,b = img.get(x, y)
        r,g,b = 255-r,255-g,255-b
        img.set(x, y, (r, g, b))
img.show()
```

이미지 반전 예시

(x = 0, y = 2): 47, 117, 133

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```
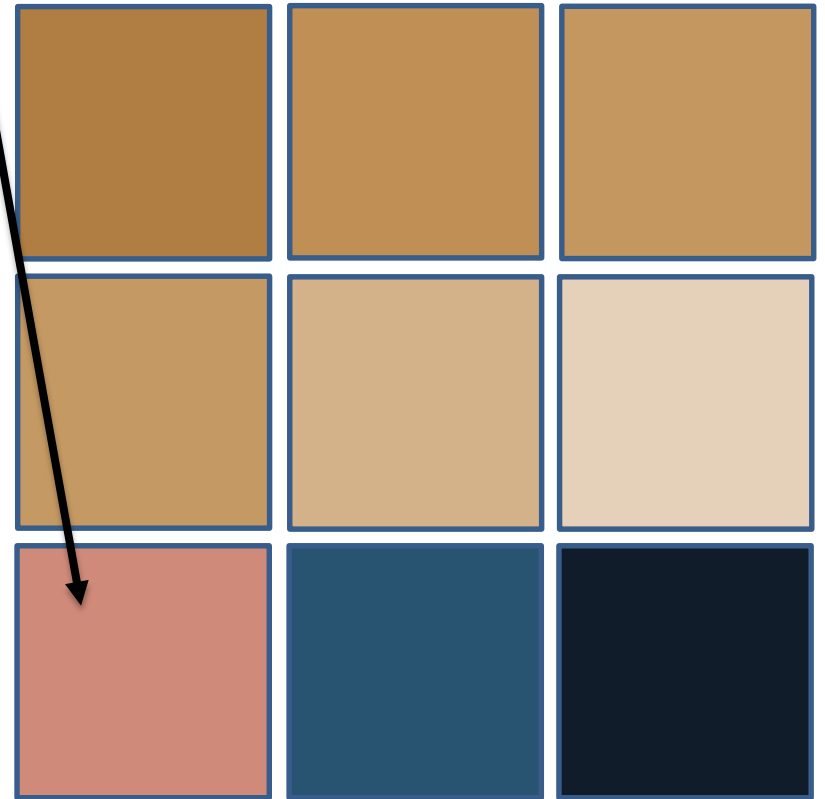
이미지 반전 예시

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```

(x = 0, y = 2): 208, 138, 122

이미지 반전 예시
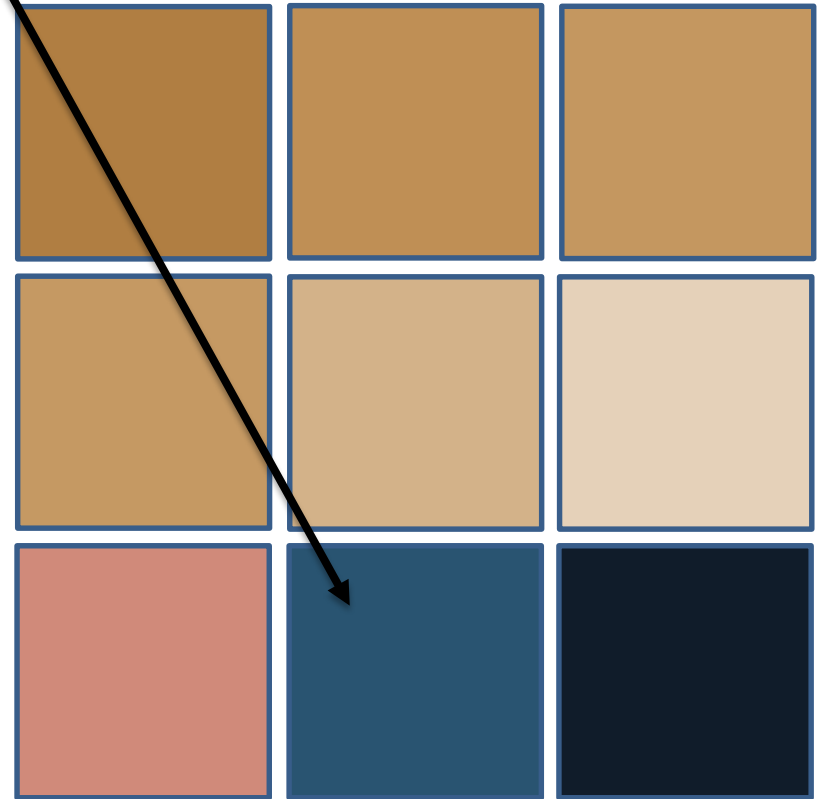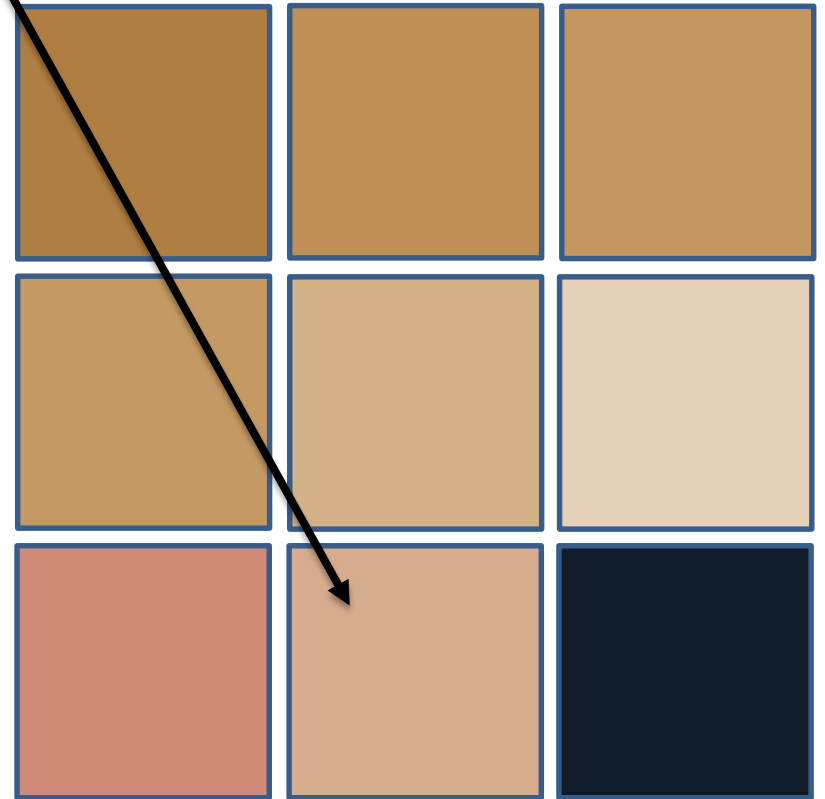
(x = 1, y = 2): **41**, **84**, **113**

```
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```

이미지 반전 예시

(x = 1, y = 2): 214, 171, 142

```
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```

(x = 2, y = 2): 16, 28, 42
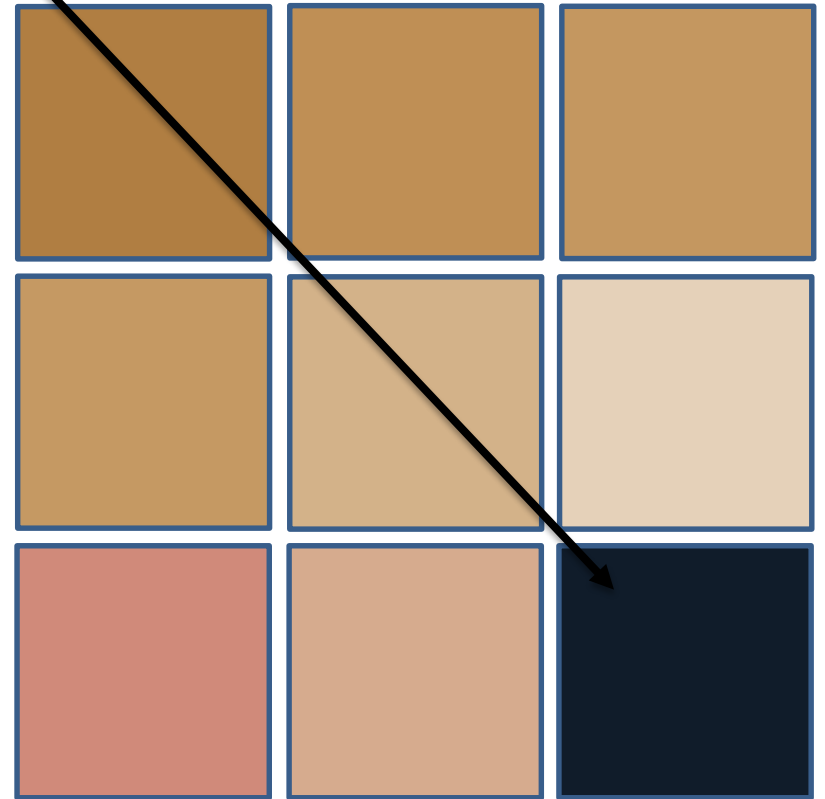
```
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```

(x = 2, y = 2): **239**, **227**, **213**

```python
from cs1media import *

img = load_picture(…)
w, h = img.size()
for y in range(h):
  for x in range(w):
    r,g,b = img.get(x, y)
    r,g,b = 255-r,255-g,255-b
    img.set(x, y, (r, g, b))
img.show()
```
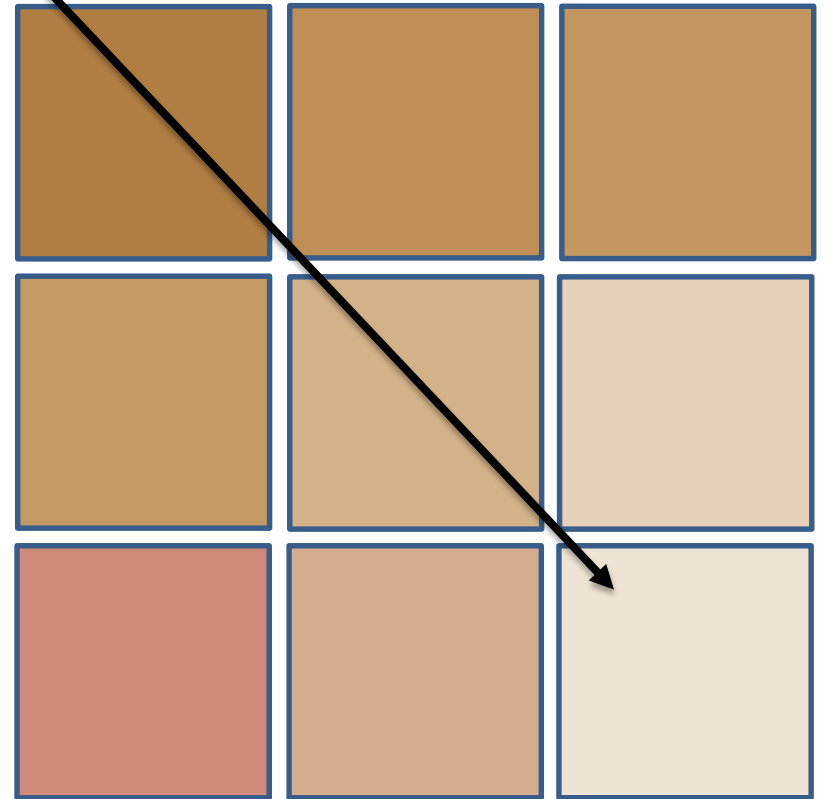
```python
from cs1media import *

threshold = 100
white = (255, 255, 255)
black = (0, 0, 0)

img = load_picture("../photos/yuna1.jpg")
w, h = img.size()
for y in range(h):
    for x in range(w):
        r, g, b = img.get(x, y)
        v = (r + g + b) // 3      # average of r,g,b
        if v > threshold:
            img.set(x, y, white)
        else:
            img.set(x, y, black)
img.show()
```

정리 및 예습

본 강의 학습 목표:

- 튜플을 활용하여 디지털 사진을 표현하는 방식을 이해할 수 있다.

- 디지털 사진을 색 반전이나 흑백 모드로 변환할 수 있다.

다음 강의 학습 목표:

- 매개 변수와 반환값을 가진 함수를 이해하고 사용할 수 있다.