

第三章

Getting started with Thresholding

1

Thresholding

影像處理

2

Global Local

處理類別

3

Thresholding

參數優化

同學，歡迎你參加本課程

- ☑ 請關閉你的FB、Line等溝通工具，以免影響你上課。
- ☑ 考量頻寬，請預設關閉麥克風、攝影機，若有需要再打開。
- ☑ 隨時準備好，老師會呼叫你的名字進行互動。
- ☑ 如果有緊急事情，你必需離開線上教室，請用聊天室私訊給老師，以免老師癡癡呼喚你的名字。
- ☑ 先倒好水、上個洗手間，準備上課囉^^

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程式語言 好難學?

那是因為
你還沒學過Python!

(線上老師 **LIVE** 直播教學 · 搶先看)

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常見問題

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ZOOM 學員操作說明

The screenshot shows the Zoom interface with several key areas highlighted for student use:

- Annotation Menu:** A dropdown menu is open, showing options like '原始大小' (Original Size), '請求遠端控制' (Request Remote Control), '共同註記' (Annotate), and '退出全螢幕' (Exit Full Screen). The '共同註記' (Annotate) option is highlighted with an orange box and labeled with a '5'.
- Toolbar:** The bottom toolbar contains icons for '游鼠' (Cursor), '文字' (Text), '筆' (Pen), '橡皮' (Eraser), '格式' (Format), '撤銷' (Undo), '重做' (Redo), and '清除' (Clear). The '筆' (Pen) icon is highlighted with an orange box and labeled with a '5'.
- Participants Window:** A window titled '與會者 (15)' (Participants (15)) is open, showing a list of participants. The '舉手' (Raise Hand) button is highlighted with an orange box and labeled with a '3'.
- Bottom Bar:** The bottom bar contains icons for '解除靜音' (Unmute), '啟動視訊' (Start Video), '邀請' (Invite), '與會者' (Participants), '共享螢幕' (Share Screen), '聊天' (Chat), and '錄影' (Record). The '解除靜音' (Unmute) icon is highlighted with an orange box and labeled with a '4'. The '與會者' (Participants) icon is highlighted with an orange box and labeled with a '3'.
- Chat Window:** A chat window is open, showing a list of messages. The '聊天' (Chat) icon in the bottom bar is highlighted with an orange box and labeled with a '1'.
- Share Screen Window:** A window titled '共享螢幕' (Share Screen) is open, showing a list of participants. The '共享螢幕' (Share Screen) icon in the bottom bar is highlighted with an orange box and labeled with a '2'.

5 查看選項/共同註記/筆 (連連看)

2 共享螢幕 (指導演練；點評作品)
老師須先停止共享螢幕
才能請學生共享螢幕

1 聊天

3 與會者/舉手

4 解除靜音

Thresholding

Partitioning an image into a foreground and background

By making it **black and white**

We do so by setting each pixel to:

- 255 (white) if pixel $>$ thresh value
- 0 (black) if pixel $<$ thresh value

Original



Thresholded



Thresholding

Simplest method of image segmentation

- Isolate objects
 - Object detection
 - Face detection
 - Etc.

Original image



Thresholded image



Thresholding

Only from grayscale images

Original image



Grayscale image



Thresholded image



Apply it

```
# Obtain the optimal threshold value
thresh = 127

# Apply thresholding to the image
binary = image > thresh

# Show the original and thresholded
show_image(image, 'Original')
show_image(binary, 'Thresholded')
```

Original



Thresholded



Inverted thresholding

```
# Obtain the optimal threshold value
thresh = 127

# Apply thresholding to the image
inverted_binary = image <= thresh

# Show the original and thresholded
show_image(image, 'Original')
show_image(inverted_binary,
            'Inverted thresholded')
```

Original Image



Inverted Thresholded



Categories

- Global or histogram based: good for uniform backgrounds
- Local or adaptive: for uneven background illumination

Original

Region-based segmentation

Let us first determine markers of the coins and the background. These markers are pixels that we can label unambiguously as either object or background. Here, the markers are found at the two extreme parts of the histogram of grey values:

```
img_background = np.where(img == 0)
```

Global thresholding

Region-based segmentation

determine markers of the coins and the background. These markers are pixels that we can label unambiguously as either object or background. Here, the markers are found at the two extreme parts of the histogram of grey values:

```
img_background = np.where(img == 0)
```

Local thresholding

Region-based segmentation

Let us first determine markers of the coins and the background. These markers are pixels that we can label unambiguously as either object or background. Here, the markers are found at the two extreme parts of the histogram of grey values:

```
img_background = np.where(img == 0)
```

Try more thresholding algorithms

```
from skimage.filters import try_all_threshold

# Obtain all the resulting images
fig, ax = try_all_threshold(image, verbose=False)

# Showing resulting plots
show_plot(fig, ax)
```

Optimal thresh value

Global

Uniform background

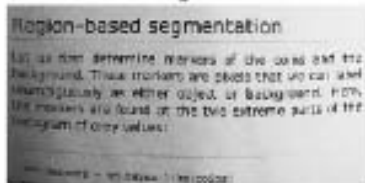
```
# Import the otsu threshold function
from skimage.filters import threshold_otsu

# Obtain the optimal threshold value
thresh = threshold_otsu(image)

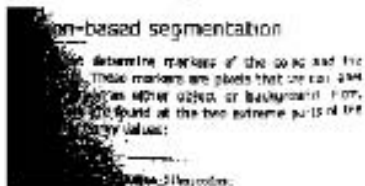
# Apply thresholding to the image
binary_global = image > thresh
```


Try more thresholding algorithms

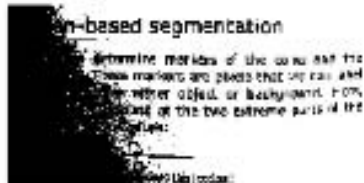
Original



Li



Isodata



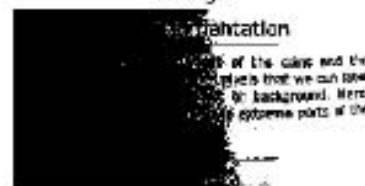
Mean



Minimum



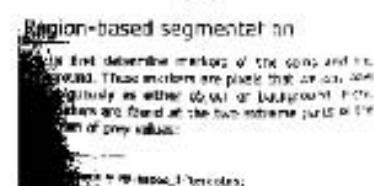
Triangle



Otsu



Yen



Optimal thresh value

Global

Uniform background

```
# Import the otsu threshold function
from skimage.filters import threshold_otsu

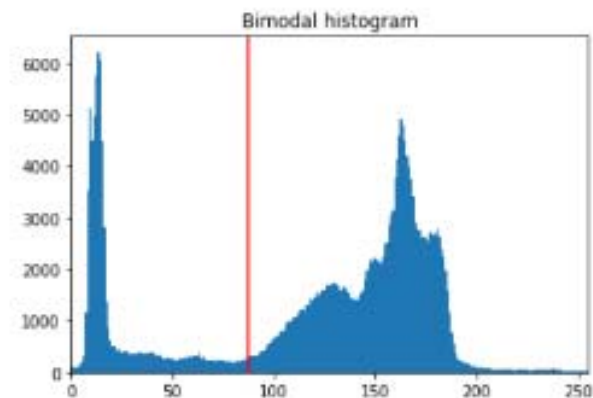
# Obtain the optimal threshold value
thresh = threshold_otsu(image)

# Apply thresholding to the image
binary_global = image > thresh
```

Optimal thresh value

Global

```
# Show the original and binarized image  
show_image(image, 'Original')  
show_image(binary_global, 'Global thresholding')
```



Optimal thresh value

Local

Uneven background

```
# Import the local threshold function
from skimage.filters import threshold_local

# Set the block size to 35
block_size = 35

# Obtain the optimal local thresholding
local_thresh = threshold_local(text_image, block_size, offset=10)

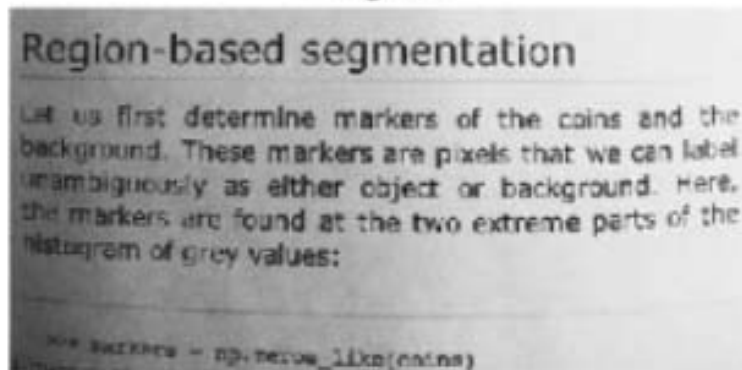
# Apply local thresholding and obtain the binary image
binary_local = text_image > local_thresh
```


Optimal thresh value

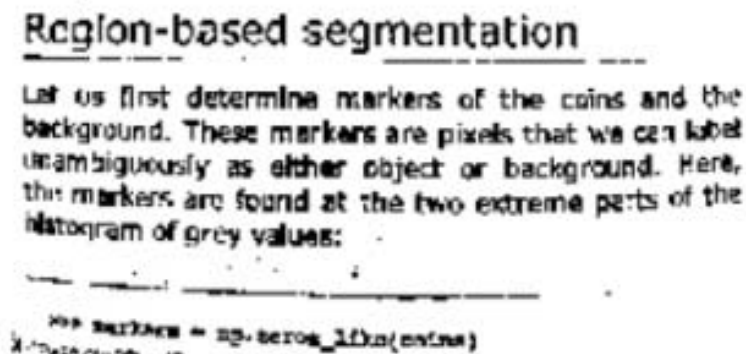
Local

```
# Show the original and binarized image
show_image(image, 'Original')
show_image(binary_local, 'Local thresholding')
```

Original




Local thresholding




練習時間

Getting started with thresholding.ipynb














 jupyter

Getting started with thresholding (autosaved)

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File Edit View Insert Cell Kernel Widgets Help

Trusted Python 3


       Run    Markdown 

Apply global thresholding In this exercise, you'll transform a photograph to binary so you can separate the foreground from the background.

To do so, you need to import the required modules, load the image, obtain the optimal thresh value using `threshold_otsu()` and apply it to the image.

You'll see the resulting binarized image when using the `show_image()` function, previously explained.

Chess pieces Image loaded as `chess_pieces_image`. Remember we have to turn colored images to grayscale. For that we will use the `rgb2gray()` function learned in previous video. Which has already been imported for you.



練習時間

Getting started with thresholding.ipynb



jupyter Getting started with thresholding (unsaved changes) Logout

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練習

When the background isn't that obvious Sometimes, it isn't that obvious to identify the background. If the image background is relatively uniform, then you can use a global threshold value as we practiced before, using `threshold_otsu()`. However, if there's uneven background illumination, adaptive thresholding `threshold_local()` (a.k.a. local thresholding) may produce better results.

In this exercise, you will compare both types of thresholding methods (global and local), to find the optimal way to obtain the binary image we need.



Page with text Image loaded as `page_image`.

Original












練習時間

Getting started with thresholding.ipynb



 jupyter Getting started with thresholding (unsaved changes)  Logout


File Edit View Insert Cell Kernel Widgets Help Trusted Python 3

       Run    Code 

練習

Trying other methods As we saw in the video, not being sure about what thresholding method to use isn't a problem. In fact, scikit-image provides us with a function to check multiple methods and see for ourselves what the best option is. It returns a figure comparing the outputs of different global thresholding methods.


Forest fruits Image loaded as `fruits_image`. You will apply this function to this image, `matplotlib.pyplot` has been loaded as `plt`. Remember that you can use `try_all_threshold()` to try multiple global algorithms.




練習時間

Getting started with thresholding.ipynb














 jupyter

Getting started with thresholding (unsaved changes)

 Logout


File Edit View Insert Cell Kernel Widgets Help Trusted Python 3

          Code 

練習

Apply thresholding In this exercise, you will decide what type of thresholding is best used to binarize an image of knitting and craft tools. In doing so, you will be able to see the shapes of the objects, from paper hearts to scissors more clearly.

Several tools for handcraft art Image loaded as tools_image. What type of thresholding would you use judging by the characteristics of the image? Is the background illumination and intensity even or uneven?



問卷

<http://www.pcschoolonline.com.tw>

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專業師

1

學員專區

講師專區



> 課程檔案下載：

學員的「上課教材」，下載檔案為壓縮檔 ([解壓縮操作步驟](#))。
如無法觀看上課教材，請安裝 [PDF閱讀軟體](#)。

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課程檔案下載

自107年1月1日起，課程錄影檔由180天改為365天(含)內無限次觀看 (上課隔日18:00起)。

問卷

上課日期	課程名稱	課程節次	教材下載		
2017/12/27 2000 ~ 2200	線上真人-ZBrush 3D動畫造型設計	18	上課教材	錄影 3	課堂問卷
2017/12/20 2000 ~ 2200	線上真人-ZBrush 3D動畫造型設計	17	上課教材	錄影檔	
2017/12/18 2000 ~ 2200	線上真人-ZBrush 3D動畫造型設計	16	上課教材	錄影檔	



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