

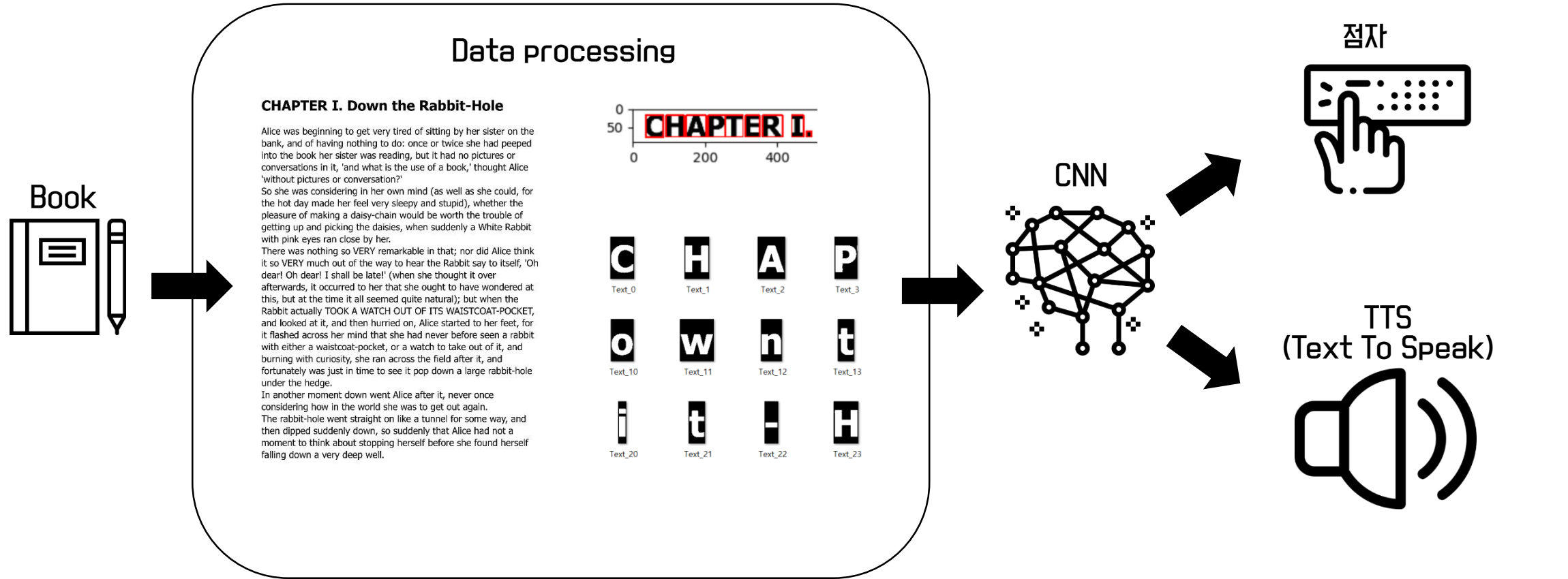
Seminar

점자 영상 출력 장치

2019.04.11

송재열

# Project 전체 개요



# Data Processing

## CHAPTER I. Down the Rabbit-Hole

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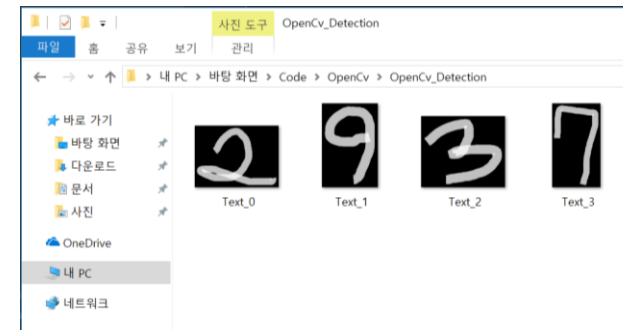
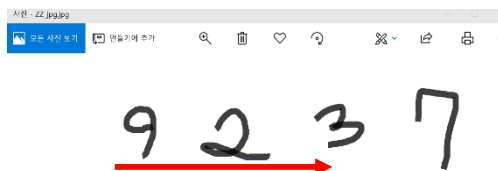
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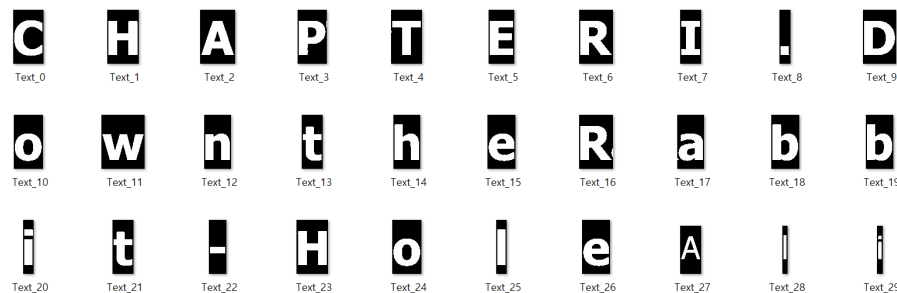
## 1. 의미 있는 영역만 추출



## 2. 영역 재배열

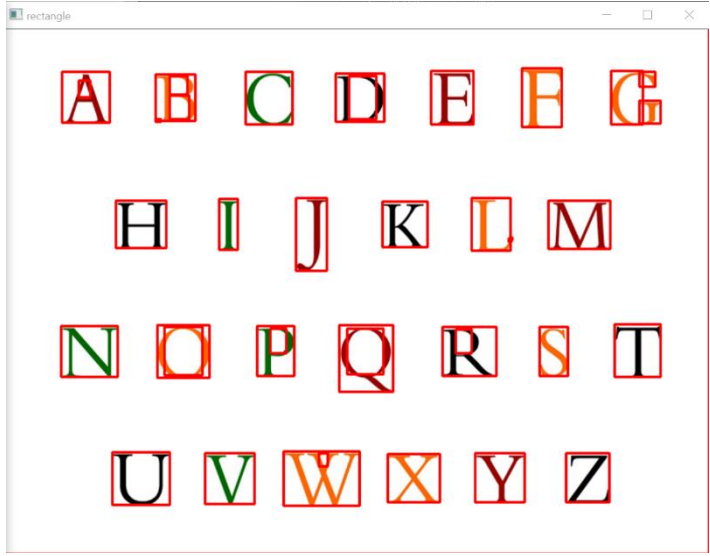


## 3. 띄어쓰기 검출

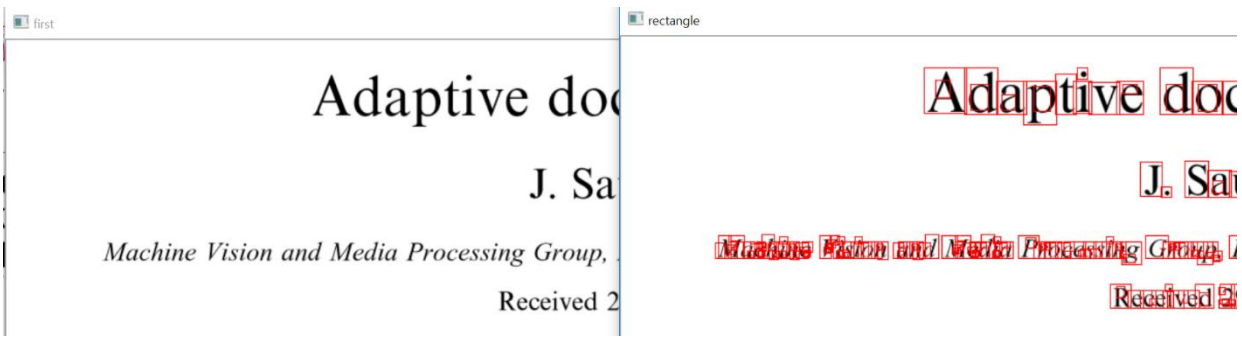
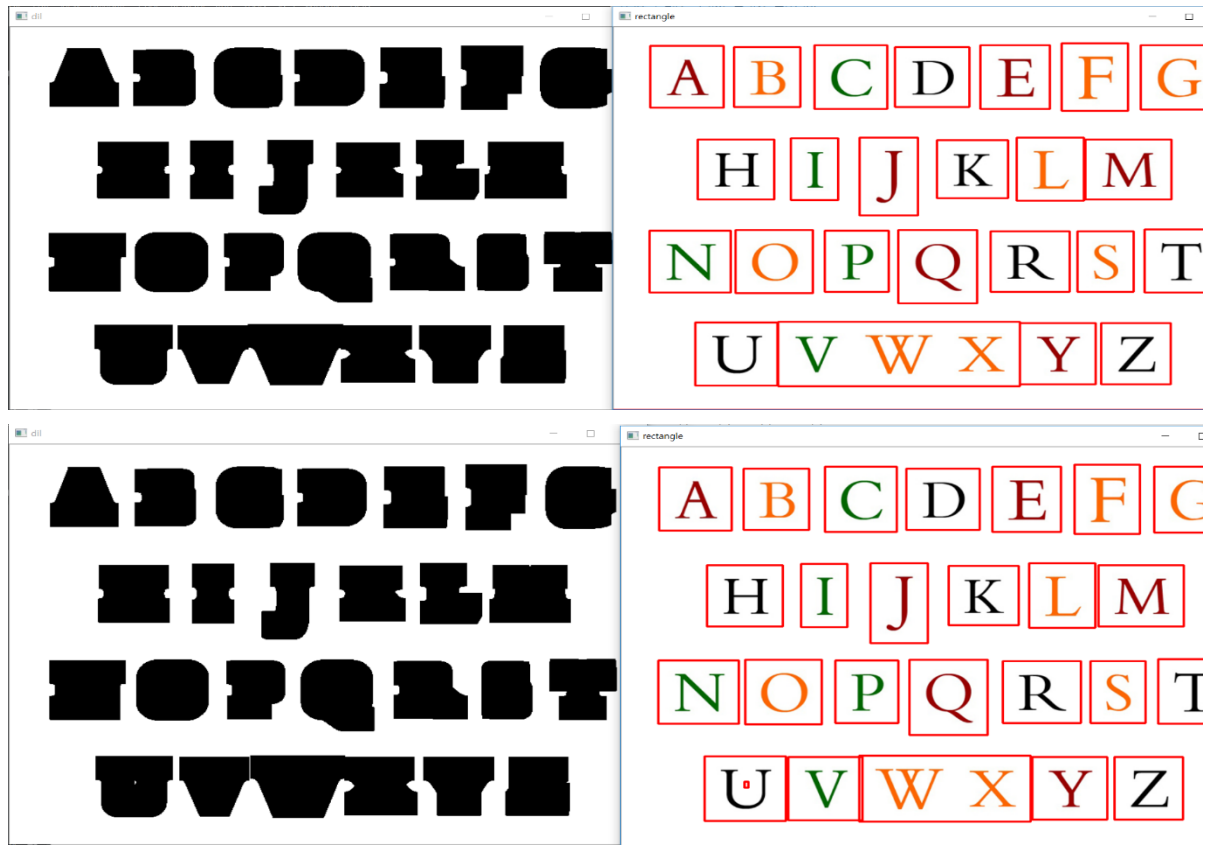


... Affine transform, API...

# 1. 이미 있는 영역만 추출



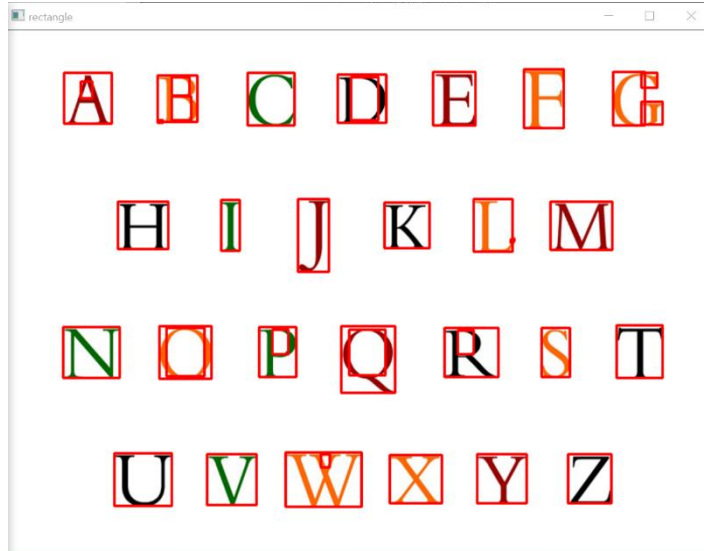
# dilation



# 1. 이미 있는 영역만 추출

## 해결책

```
cv2.findContours(img, cv2.RETR_TREE,  
cv2.CHAIN_APPROX_SIMPLE)
```



contours를 찾는 방법

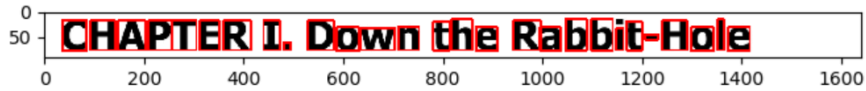
- `cv2.RETR_EXTERNAL` : contours line중 가장 바깥쪽 Line만 찾음.
- `cv2.RETR_LIST` : 모든 contours line을 찾지만, hierachy 관계를 구성하지 않음.
- `cv2.RETR_CCOMP` : 모든 contours line을 찾으며, hieracy관계는 2-level로 구성함.
- `cv2.RETR_TREE` : 모든 contours line을 찾으며, 모든 hieracy관계를 구성함.

```
cv2.findContours(img, cv2.RETR_EXTERNAL,  
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## CHAPTER I. Down the Rabbit-Hole

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(1640,2166)

## CHAPTER I. Down the Rabbit-Hole

(1640, 92)

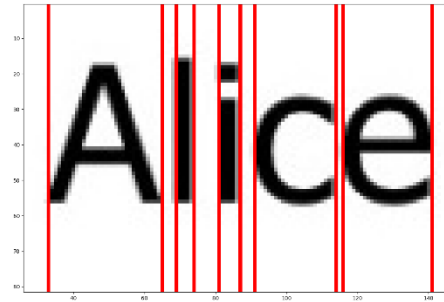
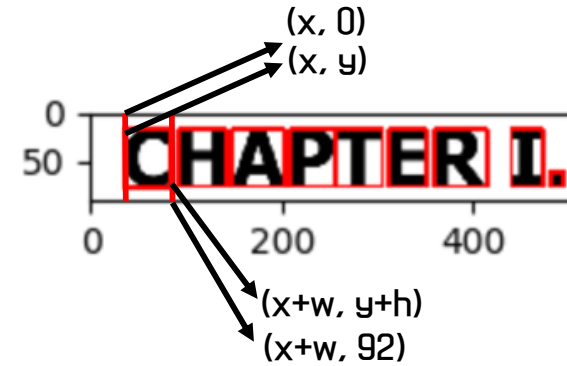
Alice was beginning to get very tired of sitting by her sister on the

(1640, 82)

- 
- 
- 

BoundingBox = (x, w, y, h)

(x, w, y, h) => (x, w, 0, 82)



# 1. 이미 있는 영역만 추출



Text\_0



Text\_1



Text\_2



Text\_3



Text\_4



Text\_5



Text\_6



Text\_7



Text\_0



Text\_1



Text\_2



Text\_3



Text\_4



Text\_5



Text\_6



Text\_7



Text\_8



Text\_9



Text\_8



Text\_9



Text\_10



Text\_11



Text\_12



Text\_13



Text\_14



Text\_15



Text\_10



Text\_11



Text\_12



Text\_13



Text\_14



Text\_15



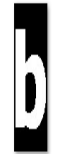
Text\_16



Text\_17



Text\_18




Text\_19



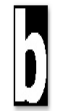
Text\_16



Text\_17



Text\_18



Text\_19



Text\_20



Text\_21



Text\_22



Text\_23



Text\_20



Text\_21



Text\_22



Text\_23



Text\_24



Text\_25



Text\_26



Text\_27



Text\_28



Text\_29

## 2. 영역 재배열

### CHAPTER I. Down the Rabbit-Hole

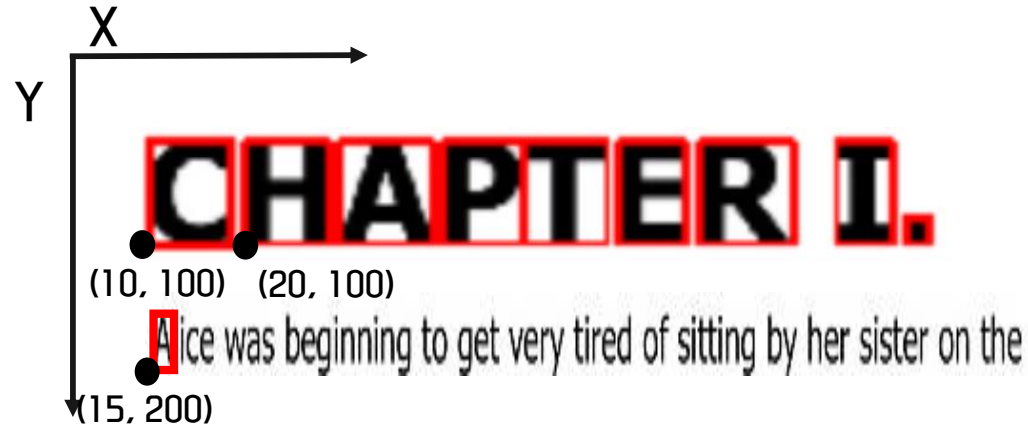
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Line1 : (10, 100) (20, 100) (30, 100) (40, 100) (50, 100) ...  
 Line2 : (15, 200) (20, 200) (25, 200) (30, 200) (35, 200) ...

→ Sort...

$$3000 * Y + X$$

Line1 : 3010, 3020, 3030, 3040, 3050 ...  
 Line2 : 6015, 6020, 6025, 6030, 6035 ...

← Why? (2481, 267)

Line : 3010, 3020, 3030, 3040, 3050 ... 6015, 6020, 6025, 6030, 6035 ...

**C** **H** **A** **P** **T** ... A l i c e ...

실패!



## 2. 영역 재배열

Line1

X	Y
116	274
209	273
400	273
589	268
780	269
872	265
1160	266
1349	265
1439	263
1725	264
1816	267
1905	266
1997	266
2271	269
2481	267

$$3000 * Y + X \begin{matrix} \longrightarrow & 822,116 & 810,116 \\ \longrightarrow & 795,872 & 810,265 \end{matrix}$$

Line2

545
541
540
539
541
538
537
536
535
534
534
533
533
532
535
535

Line3

799
797
810
813
810
810
813
810
809
811
807
808
805
802
803

$$30000 * \text{Round}(Y/100) + X$$

7.99	8.13
8	8
240000	240000
240001	240007

## CHAPTER I. Down the Rabbit-Hole

## 2. 영역 재배열

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(1640,2166)

CHAPTER I. Down the Rabbit-Hole → (850)

Alice was beginning to get very tired of sitting by her sister on the bank, and of having nothing to do: once or twice she had peeped → (900)

9로 동일..

$30000 * \text{Round}(Y/100) + X$

실패!

# 2. 영역 재배열

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(1640.2166)



$0 * \text{Round}(Y/100) + X$

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(1640,2166)

1 image



### CHAPTER I. Down the Rabbit-Hole

(1640, 92)

Alice was beginning to get very tired of sitting by her sister on the

(1640, 82)

·  
·  
·

falling down a very deep well.

(1640, 82)

28 image

## 2. 영역 재배열\_line 검출

### CHAPTER I. Down the Rabbit-Hole

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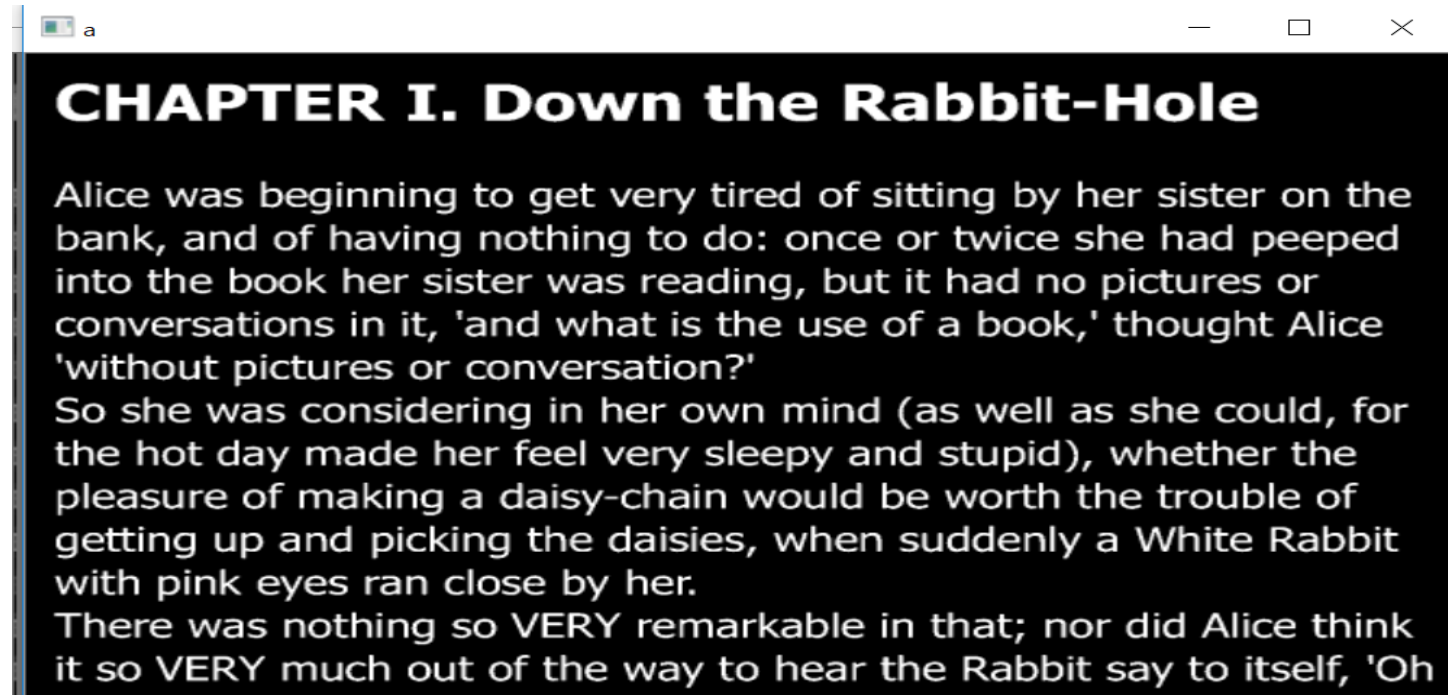
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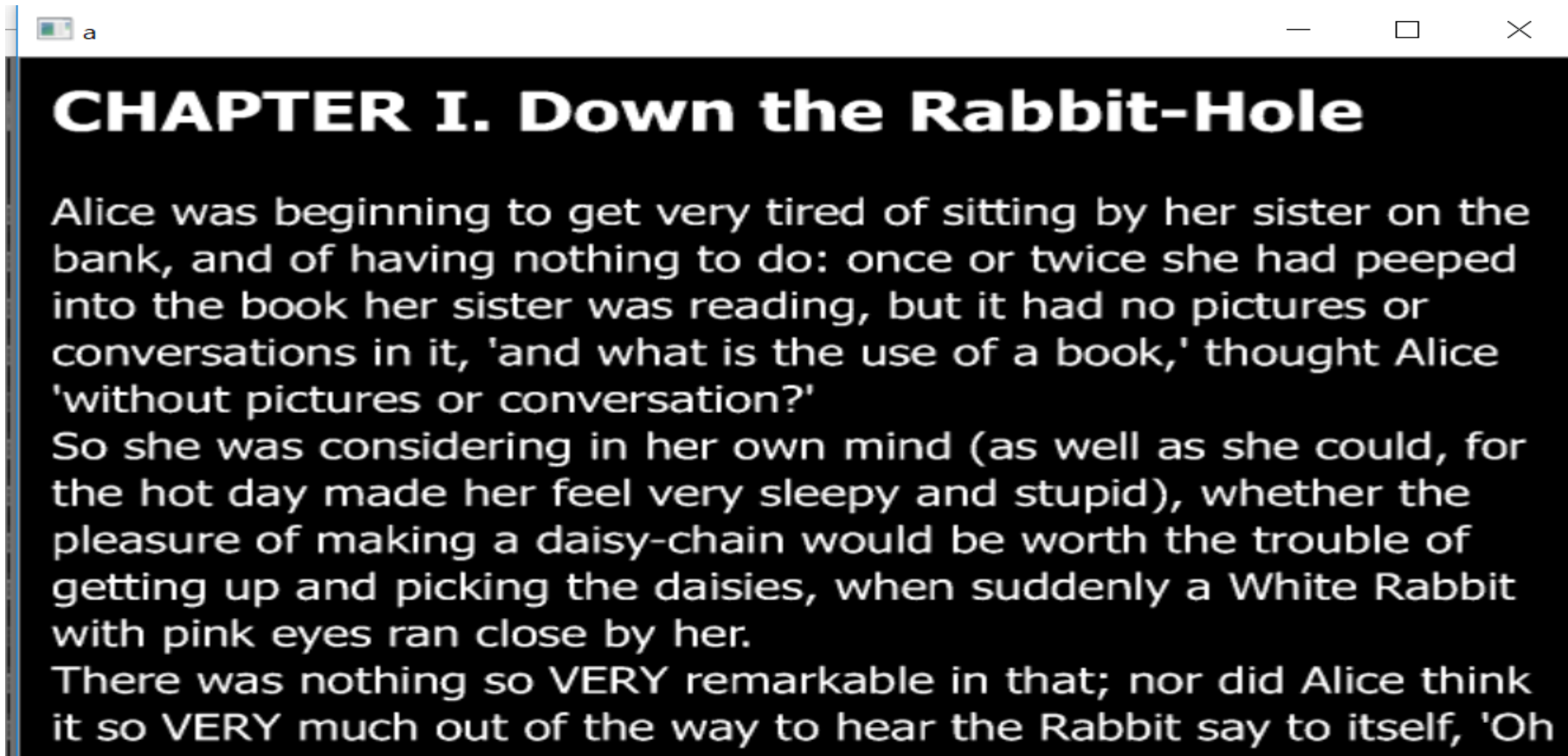
(1640,2166)

```
img = cv2.imread('C:/Users/Pixvnt/Desktop/Code/OpenCv/Pic/Line.jpg')
```

```
hist = cv2.reduce(threshed, 1, cv2.REDUCE_AVG).reshape(-1)
```



## 2. 영역 재배열\_line 검출



## 2. 영역 재배열\_line 검출

```
th, H, W = 2, 2166, 1640 # 2166 = y , 1640 = x
uppers = [y for y in range(H-1) if hist[y] <= th and hist[y+1] > th]
lowers = [y for y in range(H-1) if hist[y] > th and hist[y+1] <= th]
```

```
[45, 203, 272, 341, 409, 479, 547, 616, 684, 753, 822, 891...]
[107, 255, 323, 392, 460, 520, 598, 667, 736, 805, 863, 941...]
```

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(1640,2166)

1 image

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(1640, 82)

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(1640, 82)

28 image

$30000 * \text{Round}(Y/100) + X$



X



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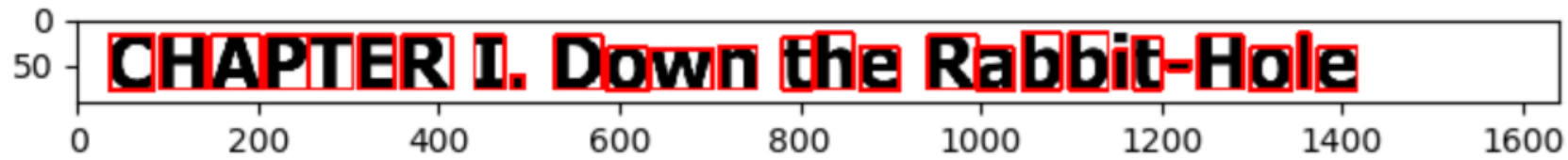
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### 3. 띄어쓰기 검출



Spacing\_space = w

threshold\_space = 최대값 - 평균값

### 3. 띄어쓰기 검출

**CHAPTER I. Down the Rabbit-Hole**

  
[0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0]

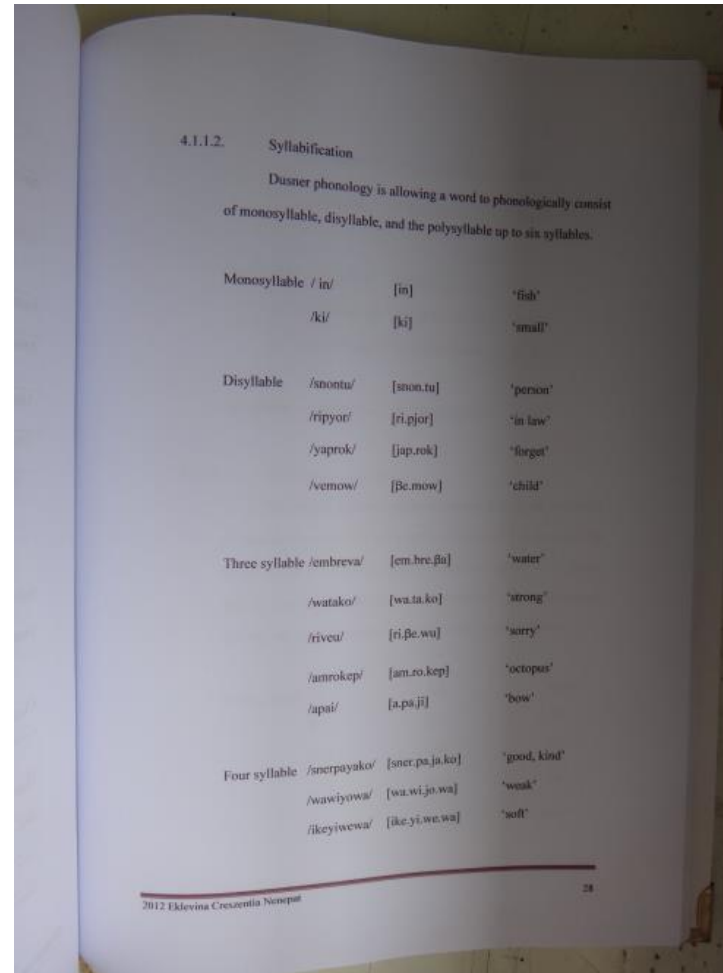
# 4. NEXT?

이미 있는 영역 추출



i ! j ?

## Page dewarping



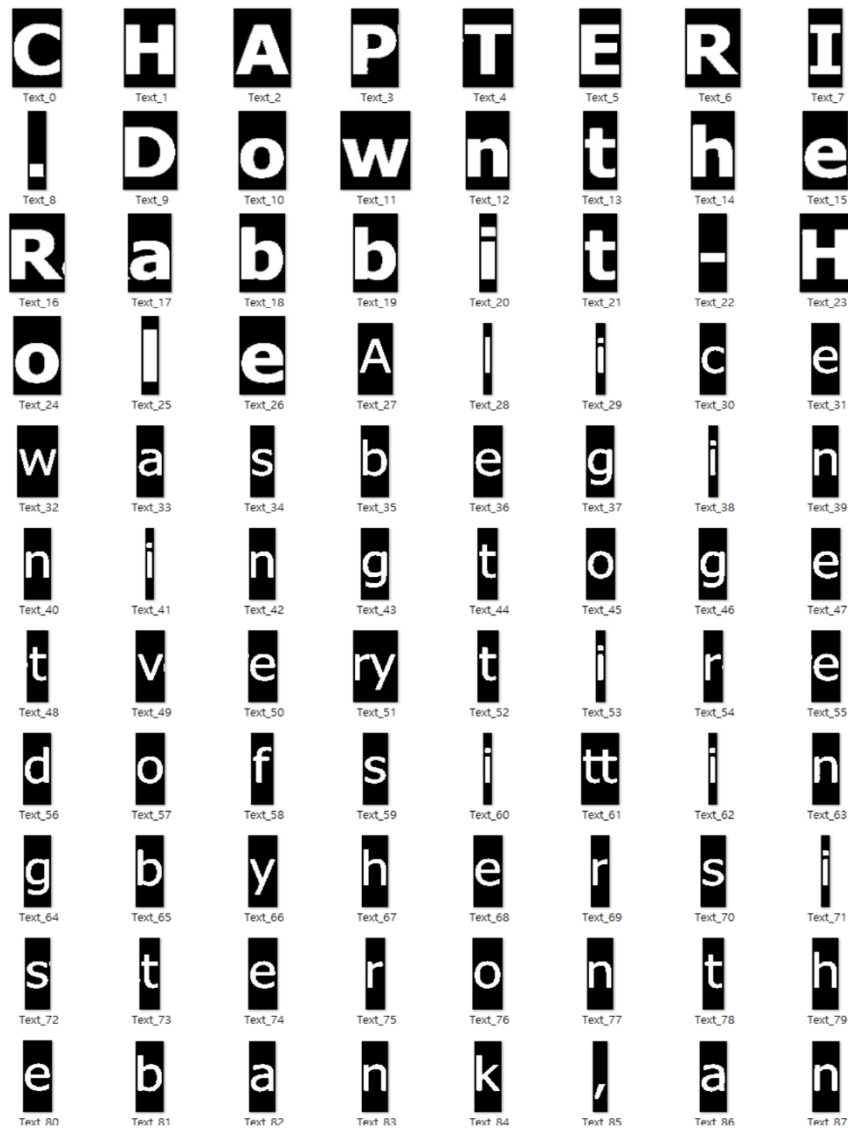
### 4.1.1.2. Syllabification

Dusner phonology is allowing a word to phonologically consist of monosyllable, disyllable, and the polysyllable up to six syllables.

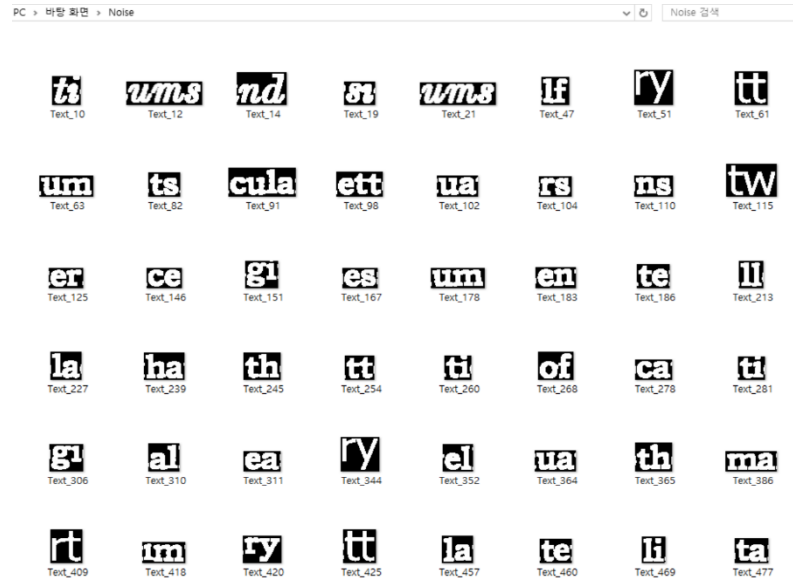
Monosyllable	/in/	[in]	'fish'
	/ki/	[ki]	'small'
Disyllable	/snontu/	[snon.tu]	'person'
	/ripyor/	[ri.pjor]	'in law'
	/yaprok/	[jap.rok]	'forget'
	/vemow/	[βe.mow]	'child'
Three syllable	/embreva/	[em.bre.βa]	'water'
	/watako/	[wa.ta.ko]	'strong'
	/riveu/	[ri.βe.wu]	'sorry'
	/amrokep/	[am.ro.kep]	'octopus'
	/apai/	[a.pa.ji]	'bow'
Four syllable	/snerpayako/	[sner.pa.ja.ko]	'good, kind'
	/wawiyowa/	[wa.wi.jo.wa]	'weak'
	/ikeiyewa/	[ike.yi.we.wa]	'soft'

# 4. NEXT?

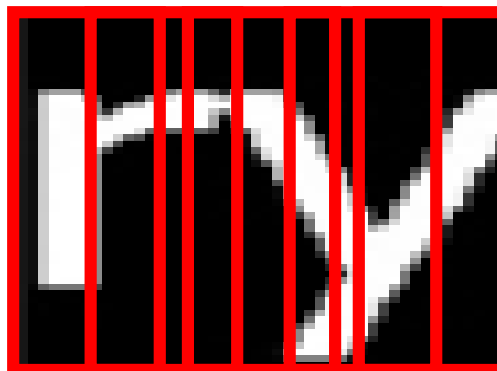
## 붙어있는 글자



## 1. 글자가 붙어있는지 판별



## 2. RCNN? MASK?



# 4. NEXT?

## 2. CTC?

### 기술 분류 : 글자 인식

DEVIEW  
2018

