

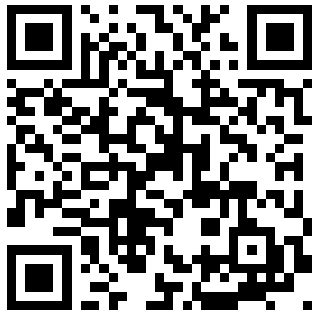
淺談 QR Code

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什麼是QR Code ?

- QR 來自英文「Quick Response」的縮寫
- 日本DENSO WAVE公司於1994年發明
 - 原本是用來記錄工廠生產線資訊的一種二維條碼
 - 在2000年獲得ISO 國際標準採用
 - ISO/IEC 18004:2006

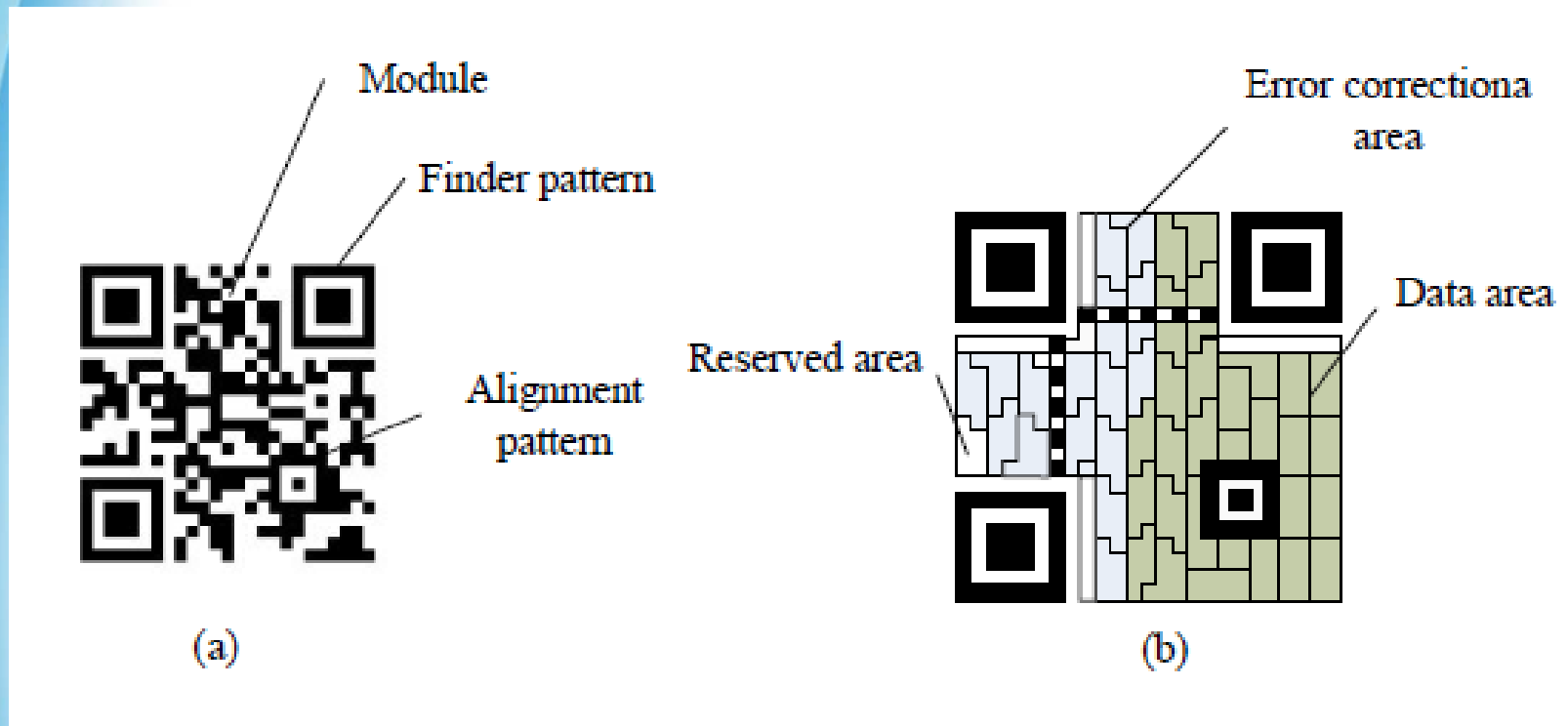


二維條碼比較

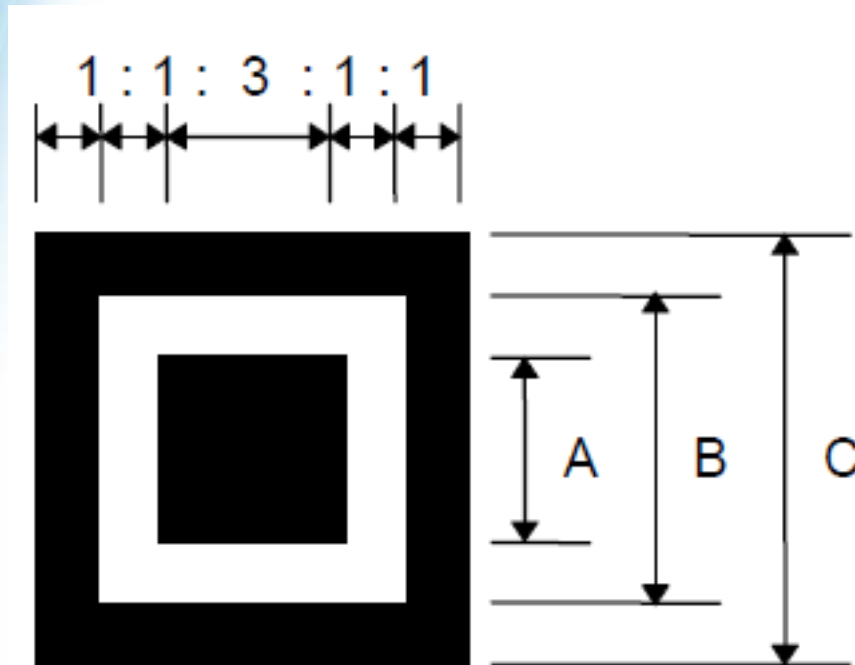
	PDF417	DATA MATRIX	MAXI CODE	QR Code	Aztec Code
					
Developer (Country)	Symbol (USA)	CI Matrix (USA)	UPS (USA)	DENSO (Japan)	Hand Held Products (USA)
Code type	Multi-low	Matrix	Matrix	Matrix	Matrix
Data size (Alphanumeric)	1,850	2,355	93	4,296	3,067
Characteristics	High capacity	High capacity Small space	Fast reading	High capacity Small space Fast reading	High capacity
Main market	OA	FA, Medical	Logistics	All industries	Air Line, Railroad
Standard	AIMI ISO	AIMI ISO	AIMI ISO	AIMI ISO JIS	AIMI



QR Code 基本架構



Structure of finder pattern



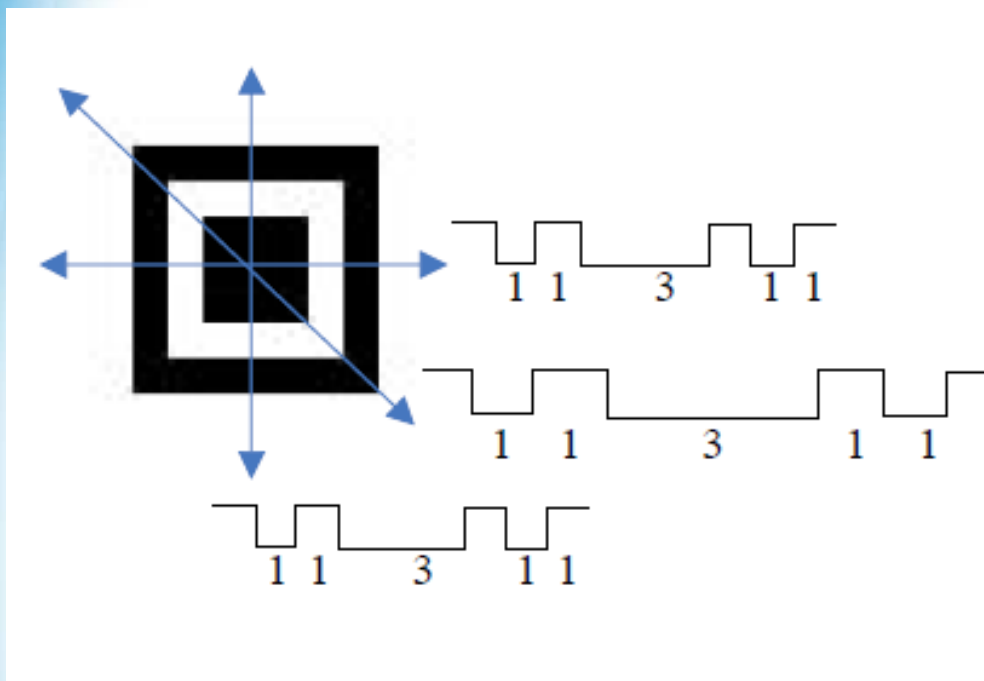
A: 3 modules

B: 5 modules

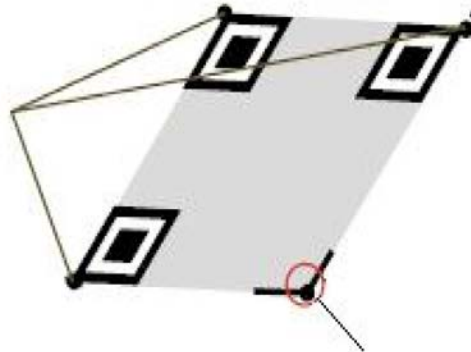
C: 7 modules



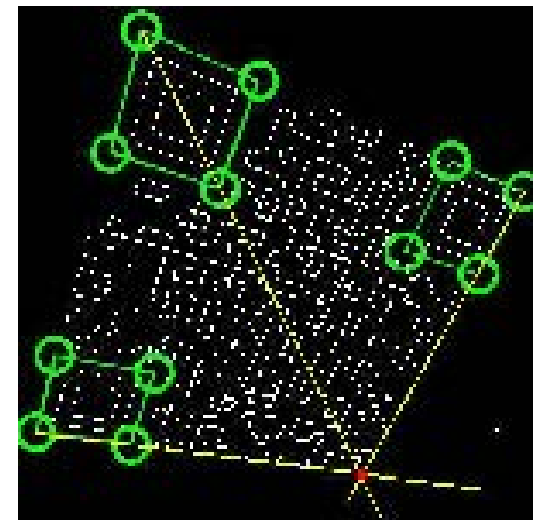
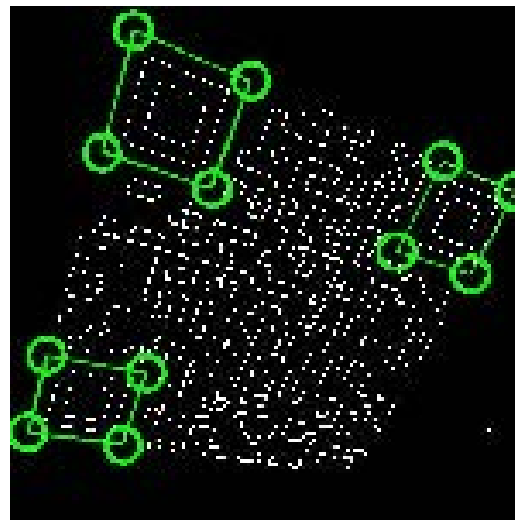
即使拍照時沒對正也能找到



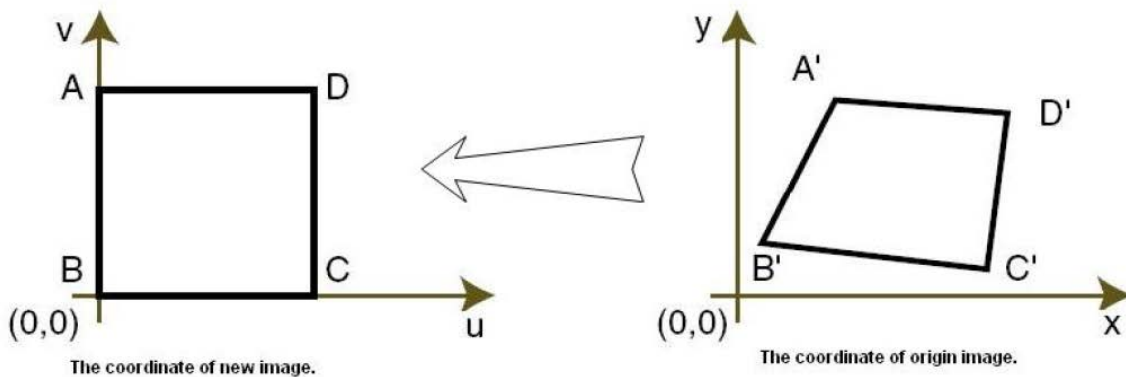
Three real existing corner points.



This corner point is usually a virtual one.



Inverse perspective transformation

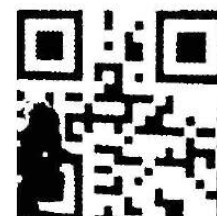




(a)



(b)

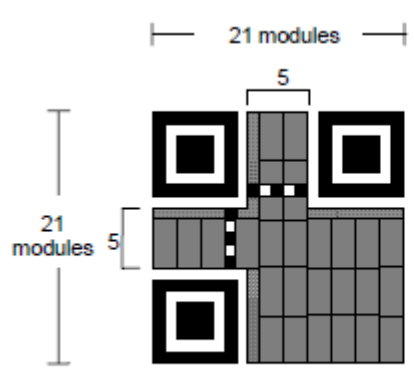


(c)

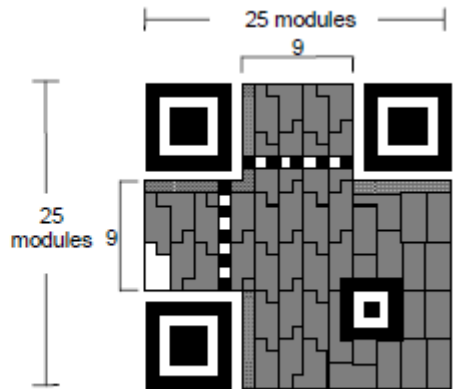
Alignment Pattern



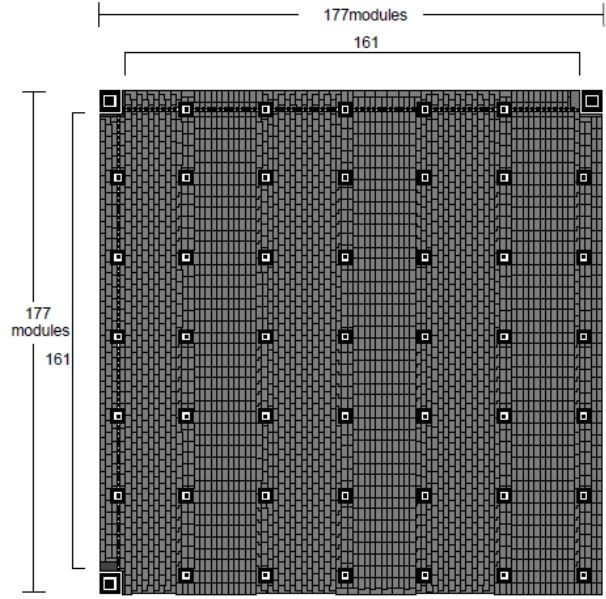
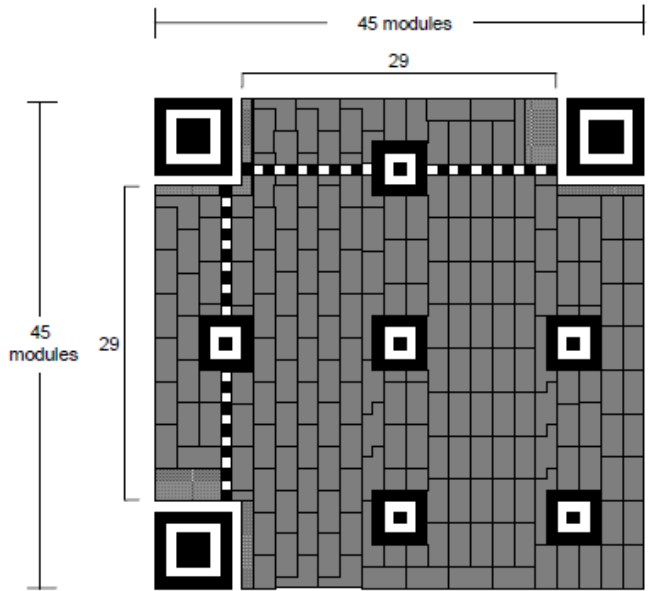
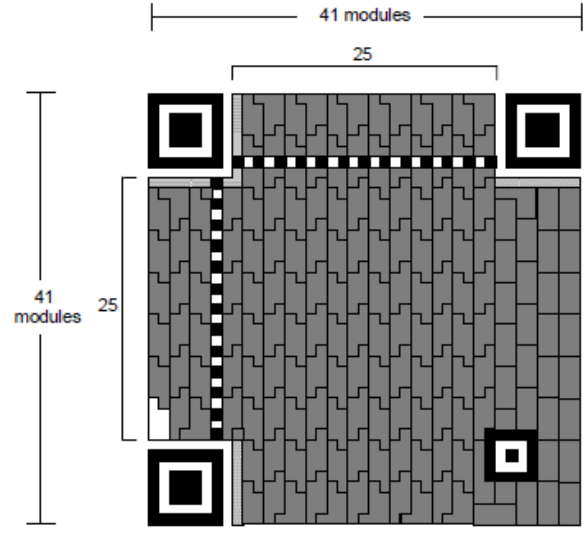
各種不同的版本



Version 1



Version 2

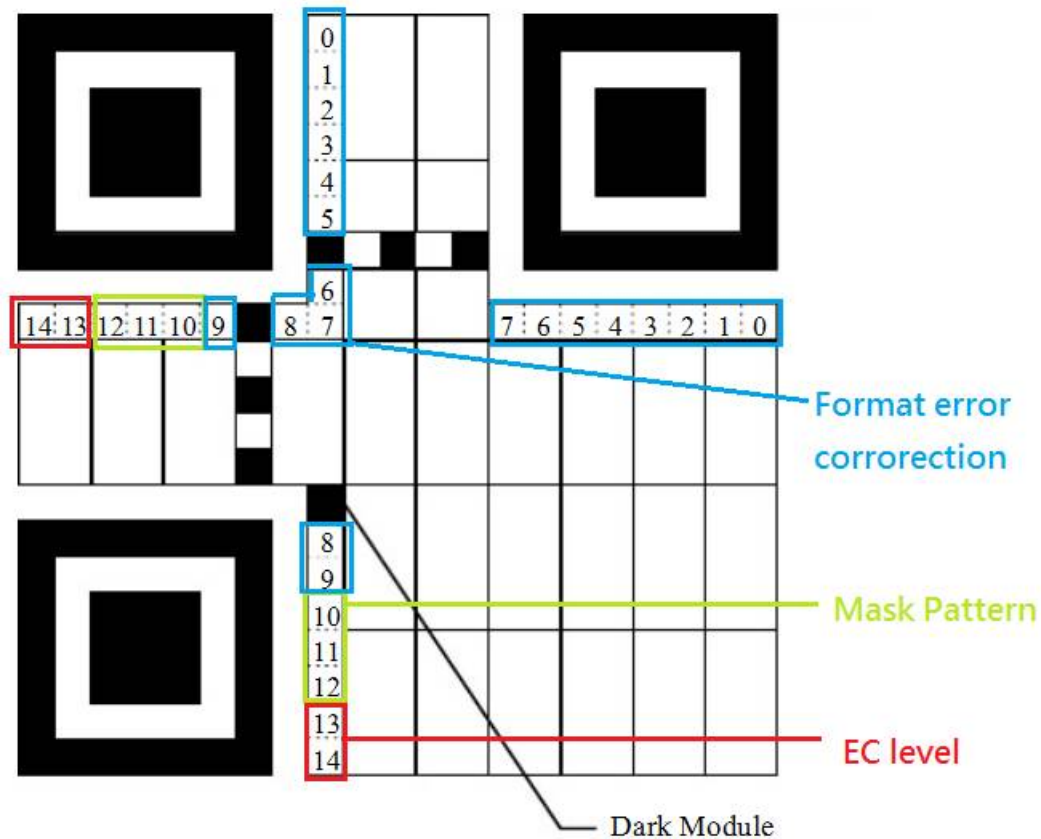


Version 7

Version 40



QR Code 資訊位置



EC LEVEL Mask pattern

Format error correction



容錯等級

二進制表示	容錯等級	容錯率
01	L	7%
00	M	15%
11	Q	25%
10	H	30%



Soiled



Damaged



QR Code資料容量

資料型別	編號位元串例	可儲存容量
數字	0001	7089字元
英數字	0010	4296字元
位元組	0100	2953字元
日語漢字	1000	1817字元



英數字

Char.	Value	Char.	Value	Char.	Value	Char.	Value	Char.	Value	Char.	Value	Char.	Value	Char.	Value
0	0	6	6	C	12	I	18	O	24	U	30	SP	36	.	42
1	1	7	7	D	13	J	19	P	25	V	31	\$	37	/	43
2	2	8	8	E	14	K	20	Q	26	W	32	%	38	:	44
3	3	9	9	F	15	L	21	R	27	X	33	*	39		
4	4	A	10	G	16	M	22	S	28	Y	34	+	40		
5	5	B	11	H	17	N	23	T	29	Z	35	-	41		

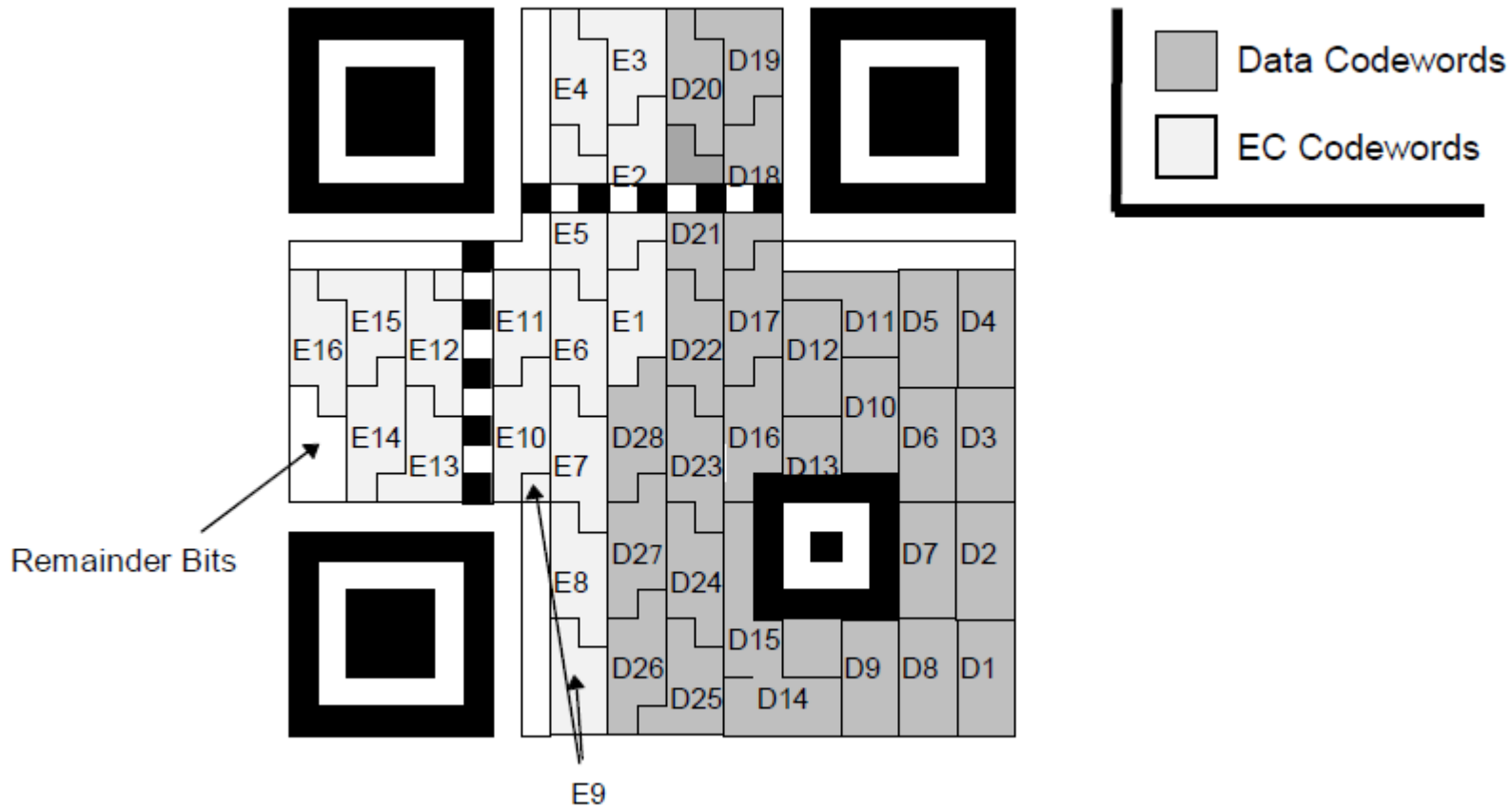


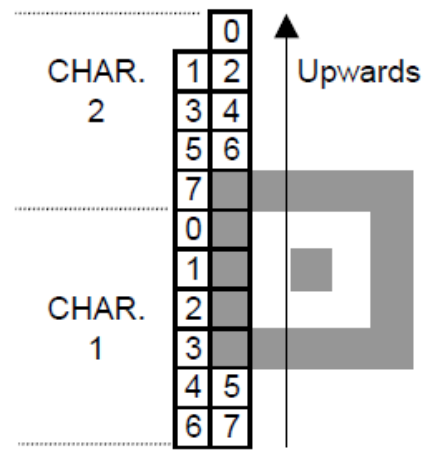
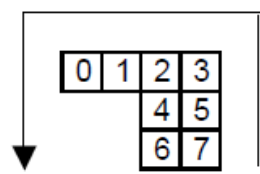
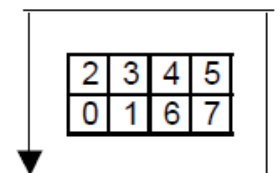
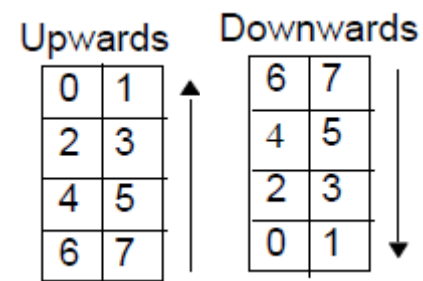
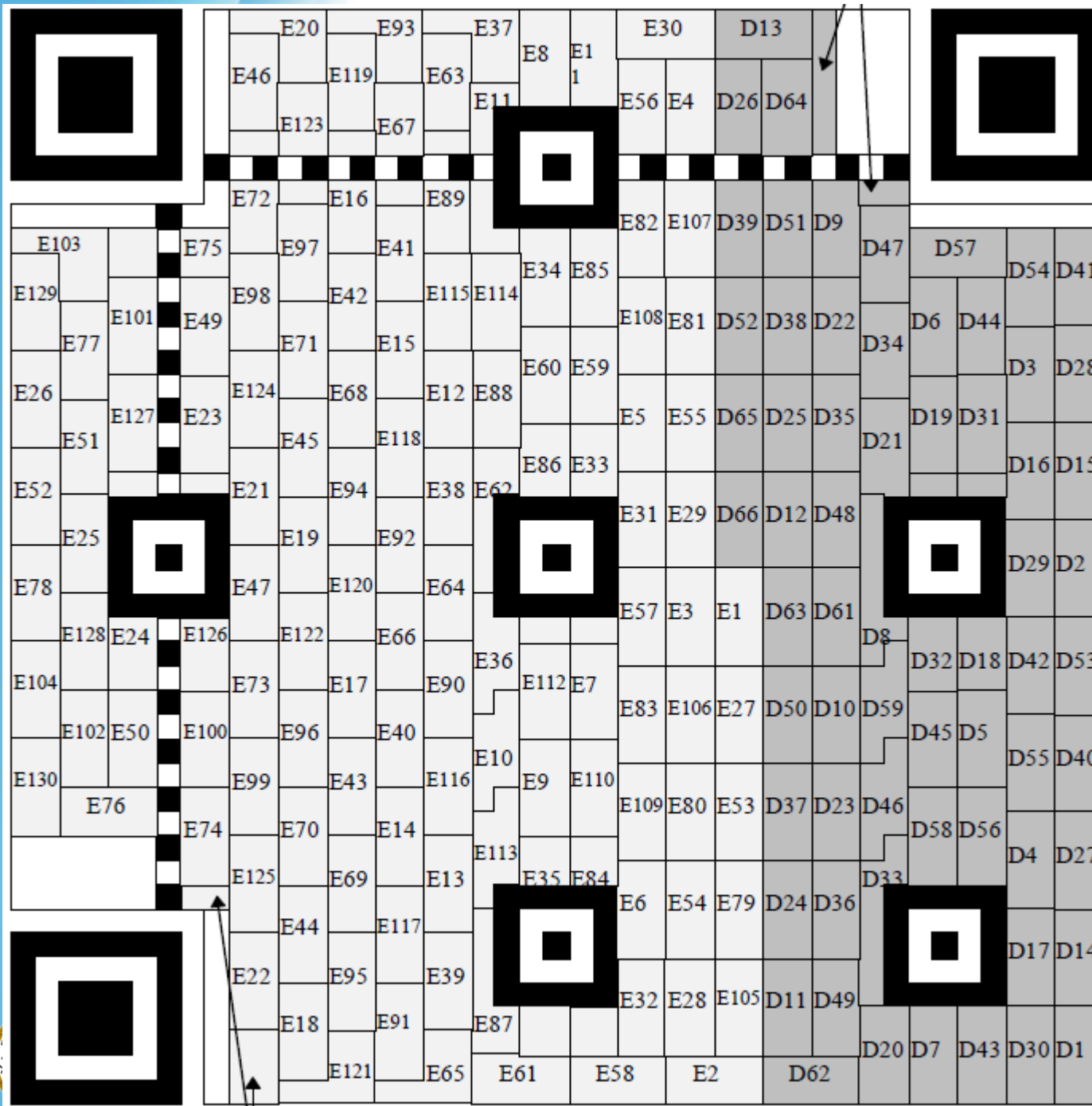
資料區及錯誤修正區排列

	Data codewords					Error correction codewords				
Block 1	D_1	D_2	.....	D_{11}		E_1	E_2	.....	E_{22}
Block 2	D_{12}	D_{13}	.....	D_{22}		E_{23}	E_{24}	.....	E_{44}
Block 3	D_{23}	D_{24}	.....	D_{33}	D_{34}	E_{45}	E_{46}	.....	E_{66}
Block 4	D_{35}	D_{36}	.....	D_{45}	D_{46}	E_{67}	E_{68}	.....	E_{88}



QR Code 資料區塊排列





實際例子

Content: 20160329

Mode: 0001

Length: 0000001000

Data: 0011001001 1001011011 0011101

terminator: 0000

padding to 8 bits: 000

pad codewords: 11101100 00010001

D1=00010000

D2=00100000

D3=11001001

D4=10010110

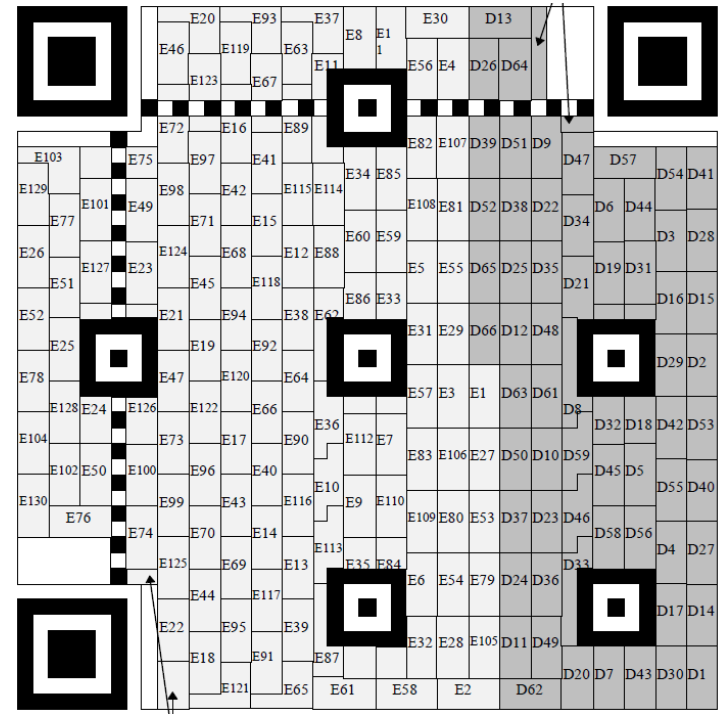
D5=11001110

D6=10000000

D7=11101100

D8=00010001



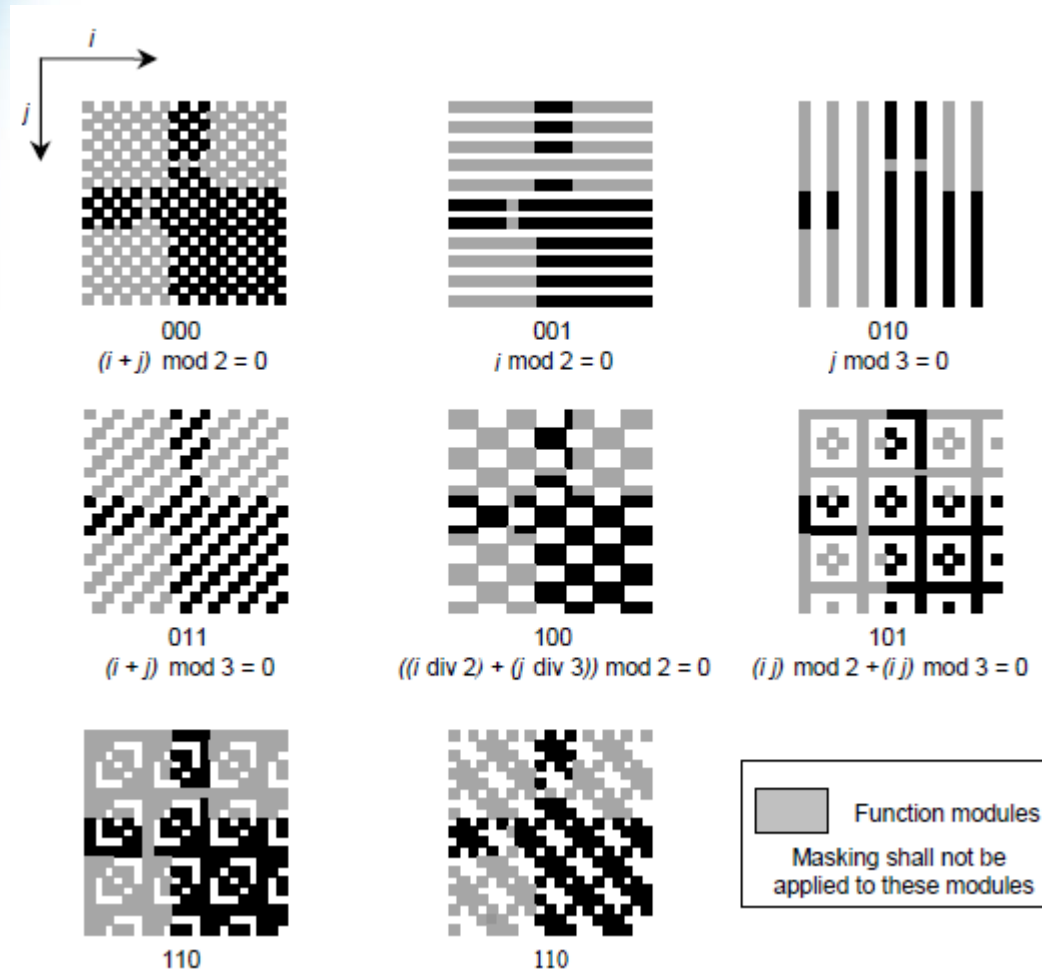


- D1=00010000
- D2=00100000
- D3=11001001
- D4=10010110
- D5=11001110
- D6=10000000
- D7=11101100
- D8=00010001

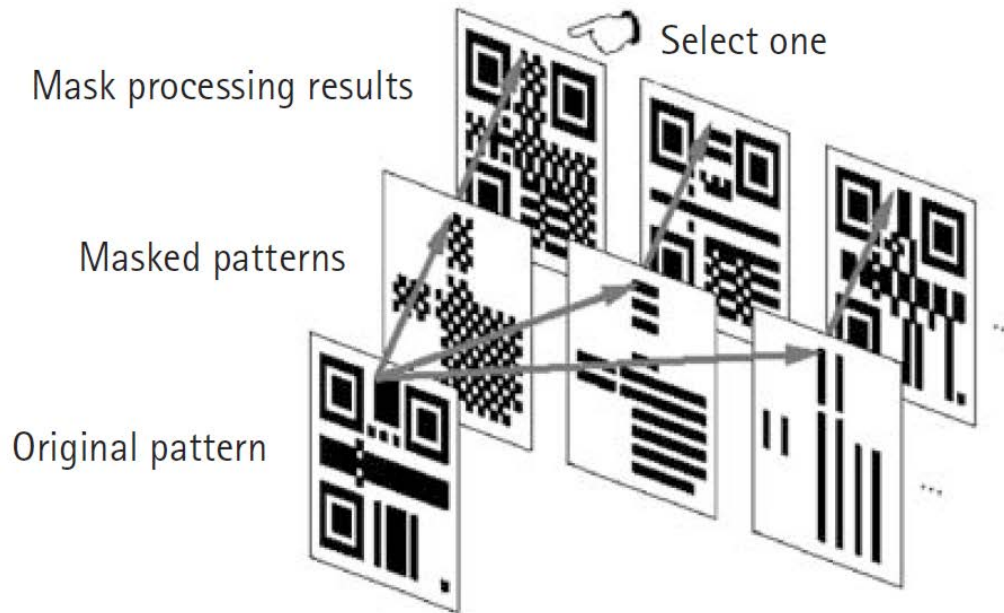


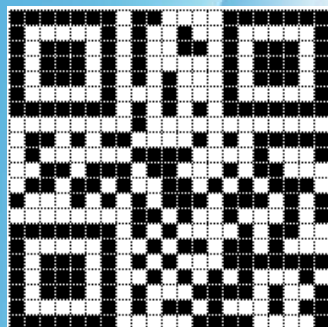
計算機概論

Mask Pattern

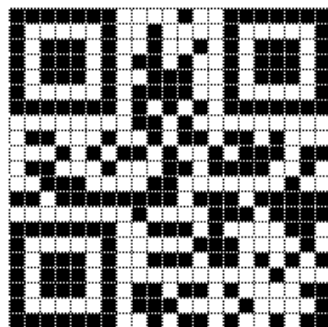


Mask Pattern

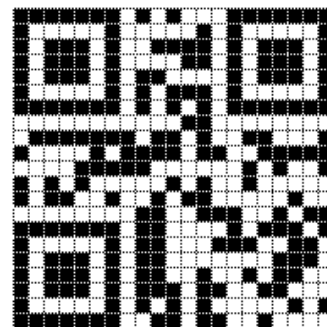




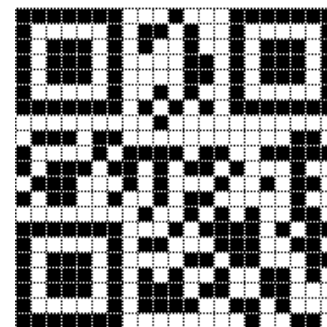
Mask Pattern 0
 Penalty 1: 180
 Penalty 2: 90
 Penalty 3: 80
 Penalty 4: 0
 Total: 350



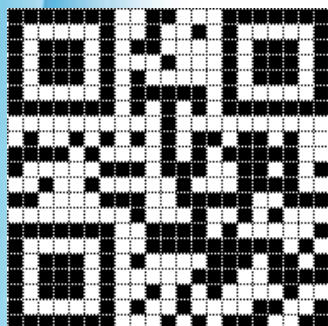
Mask Pattern 1
 Penalty 1: 172
 Penalty 2: 129
 Penalty 3: 120
 Penalty 4: 0
 Total: 421



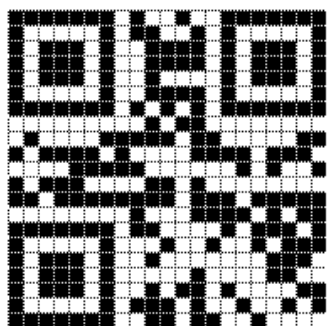
Mask Pattern 2
 Penalty 1: 206
 Penalty 2: 141
 Penalty 3: 160
 Penalty 4: 0
 Total: 507



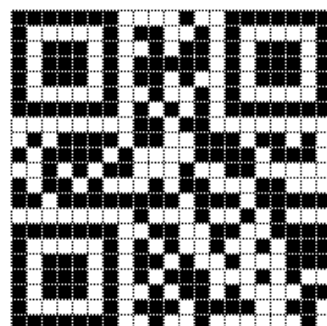
Mask Pattern 3
 Penalty 1: 180
 Penalty 2: 141
 Penalty 3: 120
 Penalty 4: 2
 Total: 443



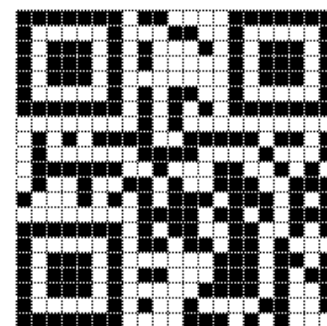
Mask Pattern 4
 Penalty 1: 195
 Penalty 2: 138
 Penalty 3: 200
 Penalty 4: 0
 Total: 553



Mask Pattern 5
 Penalty 1: 189
 Penalty 2: 156
 Penalty 3: 200
 Penalty 4: 2
 Total: 547



Mask Pattern 6
 Penalty 1: 171
 Penalty 2: 102
 Penalty 3: 80
 Penalty 4: 4
 Total: 357



Mask Pattern 7
 Penalty 1: 197
 Penalty 2: 123
 Penalty 3: 200
 Penalty 4: 0
 Total: 520



Beautify QR Code



(a)



(b)



(c)



(d)



(e)



(f)



Beautify QR Code

Changing Module Shape/Color



Embedding a Picture





計算機



作業一

- 請以QR Code 介紹一個新的軟體"、新的網路服務或構想未來QR Code的前瞻性應用
- 內容如下
 1. 官方網址
 2. 軟體名稱
 3. 介紹文字 (可中文或英文)



作業一 – 內容格式

- 將上的介紹文字內容以下面的格式製作成 QR Code

```
[網址] http://xxxxx/  
[名稱] XXXXXX  
[介紹] XXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
```



作業一 - 繳交方式

- 上傳網址：
 - <https://goo.gl/j2NnzZ>

2016 計算機概論

作業一上傳網址，截止時間 2016/04/11 23:59

學號 Student ID *必填 required

請將說明文字儲存成 *.txt 檔後上傳 *必填 required

未選擇任何檔案

將製作 QR code 的圖檔儲存成 *.jpg 或 *.png 上傳 *必填 required

未選擇任何檔案

© Kun Chen and Kun-Mao Chao, CSIE.NTU 2016, [Source Code](#)



計算機概論

作業評分方式

- 評分時會將所繳交的 QR Code 顯示在螢幕上，然後再用智慧型手機拍攝，看是否能讀的出內容。
- 分數依據：
 - 內容：所介紹的內容敘述
 - 美化：美化的可看性



QRCode Generator

- <https://goo.gl/DQneUc>

Create your QR code

URL Text Phone WiFi

Website (URL)

QR Code Size



Error Correction Label

L M Q H

Border size

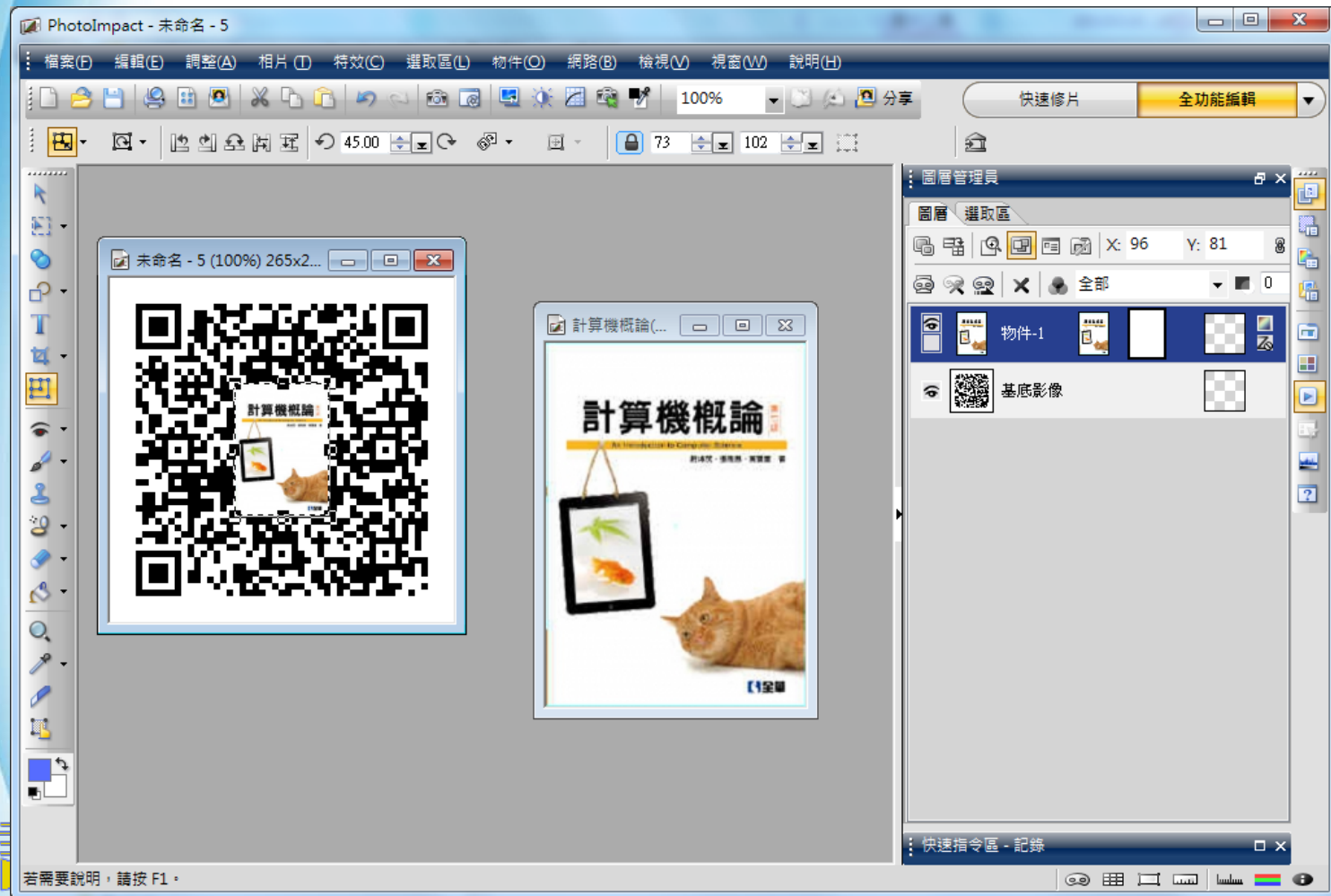
0 1 2 3 4 5



PhotoImpact

- <http://download.cc.ntu.edu.tw>

請用學校信箱登入



Reference

1. ISO/IEC 18004:2006, http://www.iso.org/iso/catalogue_detail?csnumber=43655
2. A Sun, Y Sun, C Liu, *The QR-code reorganization in illegible snapshots taken by mobile phones*, ICCSA 2007, 2007
3. Y-H Chang, C-H Chu and M-S Chen, A General Scheme for Extracting QR Code from a non-uniform background in Camera Phones and Applications, IEEEISM, 2007
4. SAMRETWIT and WAKAHARA, *Measurement of Reading Characteristics of Multiplexed Image in QR Code*, INCoS 2011, 2011
5. Garateguy, Arce, Lau and Villarreal, *QR Images: Optimized Image Embedding in QR Codes*, IEEE Trans. Image Process, 2014
6. S-S Lin, M-C Hu, C-H Lee and T-Y Lee, Efficient QR Code Beautification With High Quality Visual Content, IEEE Trans. Multimedia, 2015

