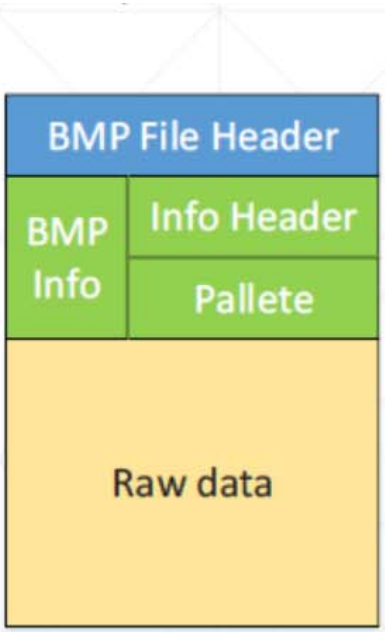
點陣圖 (Bitmap) 影像格式說明

Bitmap 影像格式



	8 bits gray image	24 bits color image
檔頭資訊	14 bytes	14 bytes
檔案詳細資訊	40 bytes	40 bytes
調色盤資訊(如果需要的話)	N*4 bytes (N=2^8)	0 bytes
影像資料	S bytes	S bytes
	File size = 14 + 40 + N*4 + S	14 + 40 + S

S = width * height * byte_per_pixel

Full color image (32 bits) : R、G、B、A channels

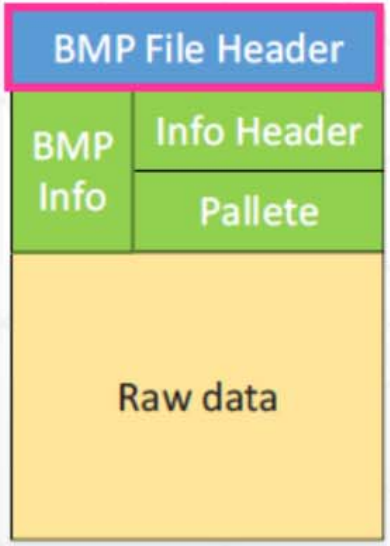
Color image (24 bits) : R、G、B channels

Gray image (8 bits) : 1 channels (gray level)

Gray level = 0.299*R+0.587*G+0.114*B

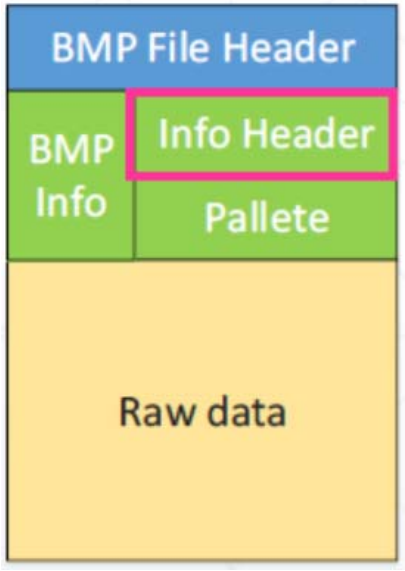
BMP Info 也稱為 DIB資料結構

Bitmap 影像格式(續)



Name	Size (bytes)	Content
Identifier (ID)	2	'BM'
File Size	4	整個點陣圖檔案的大小（單位：byte）
Reserved	4	保留欄位
Bitmap Data Offset	4	點陣圖資料開始之前的偏移量（單位：byte）

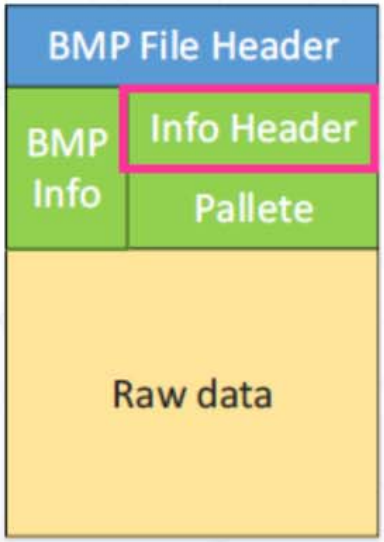
Bitmap 影像格式(續)



Name	Size (bytes)	Content
Bitmap Header Size	4	Bitmap Info Header 的長度
Width	4	點陣圖的寬度，以像素（pixel）為單位
Height	4	點陣圖的高度，以像素（pixel）為單位
Planes	2	點陣圖的位元圖層數
Bits Per Pixel	2	每個像素的位元數 1：單色點陣圖（使用 2 色調色盤） 4：4 位元點陣圖（使用 16 色調色盤） 8：8 位元點陣圖（使用 256 色調色盤） 16：16 位元高彩點陣圖（不一定使用調色盤） 24：24 位元全彩點陣圖（不使用調色盤） 32：32 位元全彩點陣圖（不一定使用調色盤）
Compression	4	壓縮方式： 0：未壓縮 1：RLE 8-bit/pixel 2：RLE 4-bit/pixel 3：Bitfields
Bitmap Data Size	4	點陣圖資料的大小（單位：byte）
H-Resolution	4	水平解析度（單位：像素/公尺）
V-Resolution	4	垂直解析度（單位：像素/公尺）
Used Colors	4	點陣圖使用的調色盤顏色數
Important Colors	4	重要的顏色數

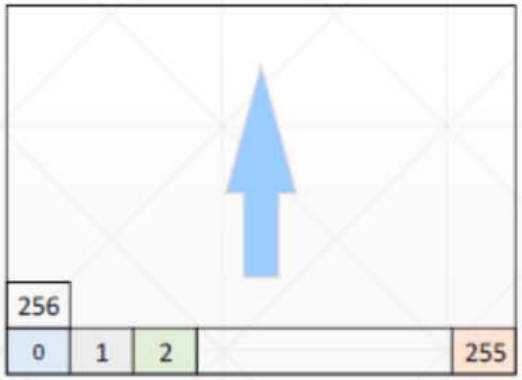
Bitmap 影像格式 (續)

Name	Size (bytes)	Content
Height	4	點陣圖的高度，以像素 (pixel) 為單位



高度為正值，掃描方向由下而上。

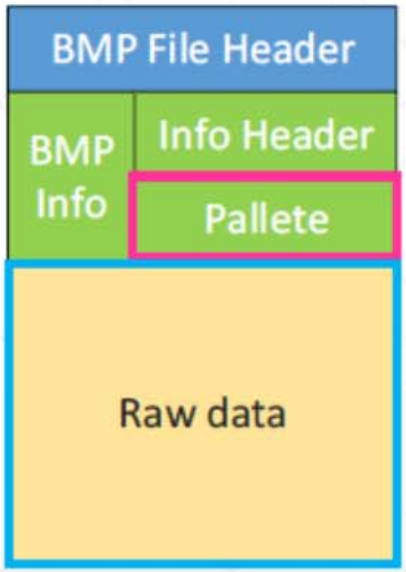
高度為負值，掃瞄方向由上而下，亦代表此點陣圖不能被壓縮 (Compression = 0)



pixel

Raw data

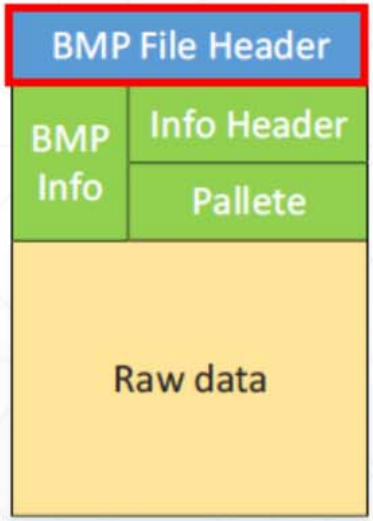
Bitmap 影像格式(續)



Name	Size (bytes)	Content
Palette	N*4	調色盤資料。 每個索引值指定一種顏色：0x00RRGGBB 其中最高位元組保留為零

Name	Size (bytes)	Content
Bitmap Data		點陣圖資料

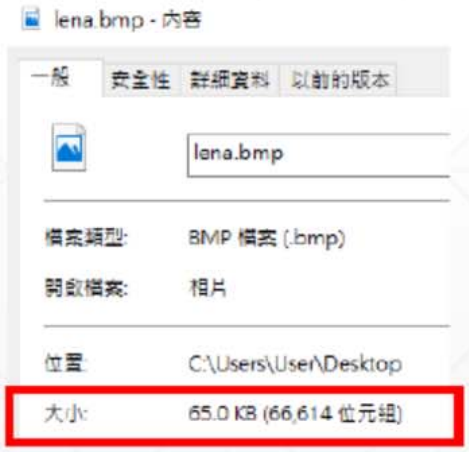
Bitmap 影像格式 (續)



Big-Endian
Little-Endian

```
Address   0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f  Dump
00000000 42 4d 36 04 01 00 00 00 00 00 36 04 00 00 28 00 BM6.......6...(.
00000010 00 00 00 01 00 00 00 01 00 00 01 00 08 00 00 00 ................
00000020 00 00 00 00 00 00 13 0b 00 00 13 0b 00 00 00 01 ................
```

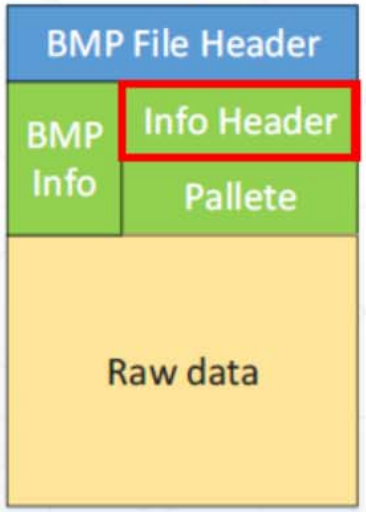
Name	Size (bytes)	Content
Identifier (ID)	2	'BM'
File Size	4	整個點陣圖檔案的大小 (單位 : byte)
Reserved	4	保留欄位
Bitmap Data Offset	4	點陣圖資料開始之前的偏移量 (單位 : byte)



陣圖檔案的大小 : 00 01 04 36 (Hex) ➔ 66,614 (Dec) Bytes

Bitmap 影像格式 (續)

Address	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f	D
00000000	42	4d	36	04	01	00	00	00	00	00	36	04	00	00	28	00	B
00000010	00	00	00	01	00	00	00	01	00	00	01	00	08	00	00	00	.
00000020	00	00	00	00	00	00	13	0b	00	00	13	0b	00	00	00	01	.
00000030	00	00	00	01	00	00	00	00	00	00	01	01	01	00	02	02	.



Big-Endian
Little-Endian

以列(row)為單位對齊

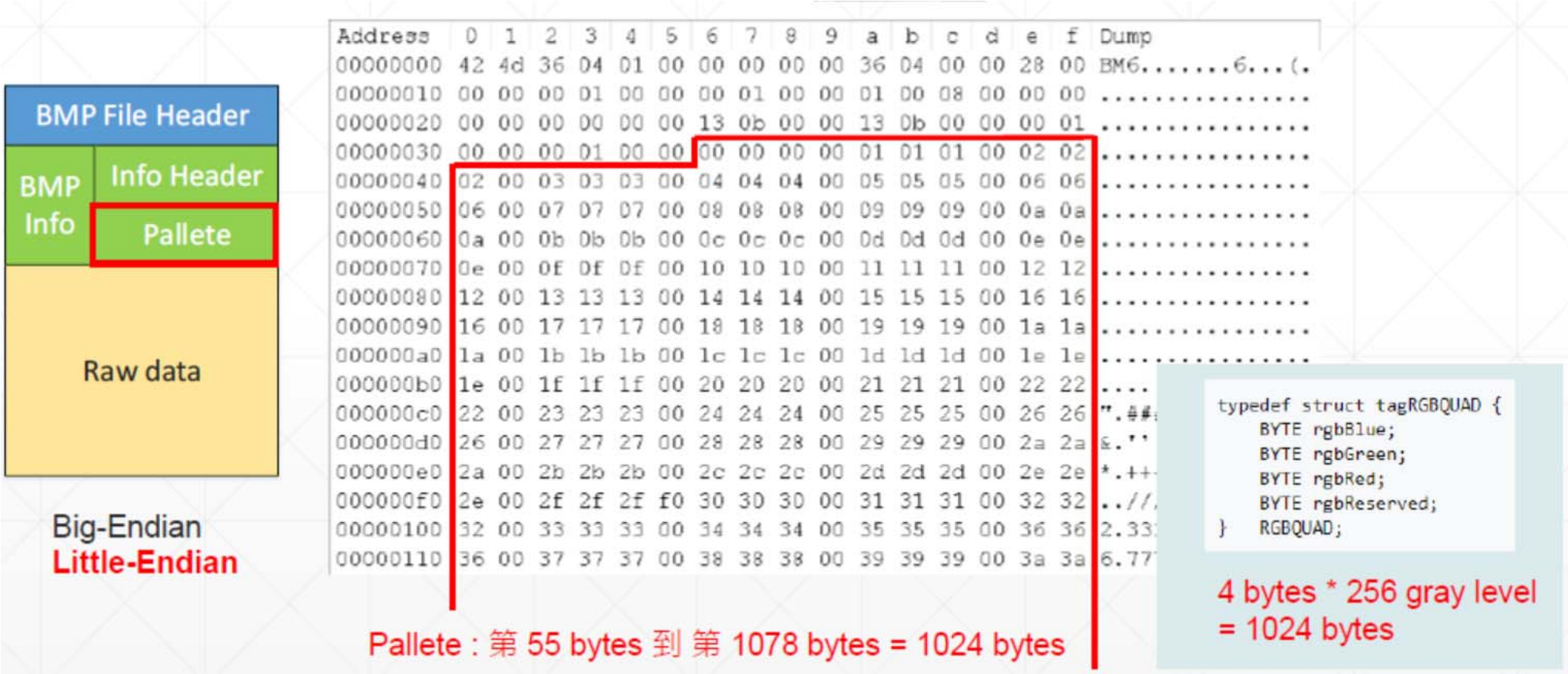
每一掃描列的長度必需是 4 bytes (32 bits) 的倍數

(width * Bits Per Pixel + 31) /32 *4

Row : 台灣 列 - 大陸 行
Column : 台灣 行 – 大陸 列

Name	Size (bytes)	Content	
		Hex	Dec
Bitmap Header Size	4	00000028	40
Width	4	00000100	256
Height	4	00000100	256
Planes	2	0001	8
Bits Per Pixel	2	0008	8
Compression	4	00000000	0
Bitmap Data Size	4	00000000	0
H-Resolution	4	00000b13	2834
V-Resolution	4	00000b13	2834
Used Colors	4	00000100	256
Important Colors	4	00000100	256

Bitmap 影像格式 (續)



Bitmap 影像格式 (續)

Address	0	1	2	3	4	5	6	7	8	9	a	b	c	d	e	f
00000420	c3	86	c3	86	c3	86	00	c3	87	c3	87	c3	87	00	c3	88
00000430	c3	88	c3	88	00	c3	89	c3	89	c3	89	00	c3	8a	c3	8a
00000440	c3	8a	00	c3	8b	c3	8b	c3	8b	00	c3	8c	c3	8c	c3	8c
00000450	00	c3	8d	c3	8d	c3	8d	00	c3	8e	c3	8e	c3	8e	00	c3
00000460	8f	c3	8f	c3	8f	00	c3	90	c3	90	c3	90	00	c3	91	c3
00000470	91	c3	91	00	c3	92	c3	92	c3	92	00	c3	93	c3	93	c3
00000480	93	00	c3	94	c3	94	c3	94	00	c3	95	c3	95	c3	95	00
00000490	c3	96	c3	96	c3	96	00	c3	97	c3	97	c3	97	00	c3	98
000004a0	c3	98	c3	98	00	c3	99	c3	99	c3	99	00	c3	9a	c3	9a
000004b0	c3	9a	00	c3	9b	c3	9b	c3	9b	00	c3	9c	c3	9c	c3	9c
000004c0	00	c3	9d	c3	9d	c3	9d	00	c3	9e	c3	9e	c3	9e	00	c3
000004d0	9f	c3	9f	c3	9f	00	c3	a0	c3	a0	c3	a0	00	c3	a1	c3
000004e0	a1	c3	a1	00	c3	a2	c3	a2	c3	a2	00	c3	a3	c3	a3	c3
000004f0	a3	00	c3	a4	c3	a4	c3	a4	00	c3	a5	c3	a5	c3	a5	00
00000500	c3	a6	c3	a6	c3	a6	00	c3	a7	c3	a7	c3	a7	00	c3	a8
00000510	c3	a8	c3	a8	00	c3	a9	c3	a9	c3	a9	00	c3	aa	c3	aa
00000520	c3	aa	00	c3	ab	c3	ab	c3	ab	00	c3	ac	c3	ac	c3	ac
00000530	00	c														c3
00000540	af	c														c3
00000550	b1	c														c3
00000560	b3	00	c3	b4	c3	b4	c3	b4	00	c3	b5	c3	b5	c3	b5	00
00000570	c3	b6	c3	b6	c3	b6	00	c3	b7	c3	b7	c3	b7	00	c3	b8
00000580	c3	b8	c3	b8	00	c3	b9	c3	b9	c3	b9	00	c3	ba	c3	ba
00000590	c3	ba	00	c3	bb	c3	bb	c3	bb	00	c3	bc	c3	bc	c3	bc
000005a0	00	c3	bd	c3	bd	c3	bd	00	c3	be	c3	be	c3	be	00	c3
000005b0	bf	c3	bf	c3	bf	00	15	1e	19	1b	1f	17	1b	48	c2	99
000005c0	c2	bc	c2	be	c2	be	c2	bd	c2	ba	c2	ab	7a	53	60	6d
000005d0	c2	83	c2	8c	c2	95	c2	9d	c2	a2	c2	a1	c2	a1	c2	a3
000005e0	c2	a3	c2	9d	c2	95	4a	46	26	25	16	10	0e	22	29	0d
000005f0	28	12	30	32	22	2a	25	2d	34	25	1c	40	3b	c2	88	33
00000600	1c	2f	11	20	47	5e	12	28	34	2b	46	6e	31	21	78	45
00000610	11	1b	13	19	29	39	2d	21	18	1a	4c	2d	19	4c	37	51
00000620	19	2f	30	33	3a	38	3f	44	47	49	4c	51	53	57	56	57
00000630	59	57	5a	61	62	5a	5d	5c	5b	5d	5b	60	62	60	64	60

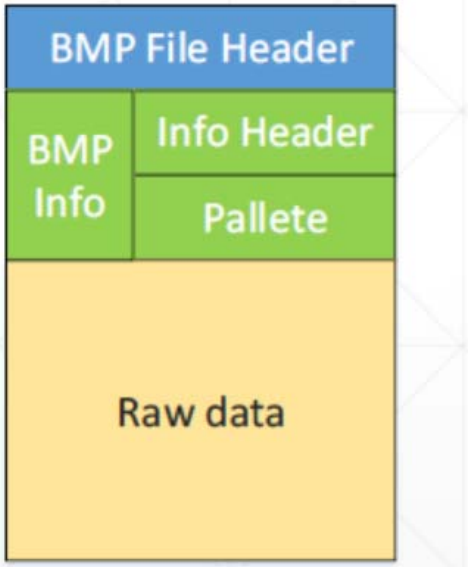
Raw data :
第 1079 bytes 到 第 66,614 bytes

Raw data size :
每個row的資料量 * 行數(高度)
= ((256*8+31) /32)*4 * 256
= 65536 bytes

每一掃描列的長度必需是
4 bytes (32 bits) 的倍數
Ex:
wid = 64
64 * 8bits = 512 bits
512 / 32 = 16 OK
所以寬度64pixel的影像，
每個row的資料量為：512 bits = 64 bytes
wid = 65
65 * 8bits = 520 bits
520 / 32 = 16.25 NG ➔ 應為17
(520 + 31) / 32 = 17.21875 ➔ 取實數
17 * 4 = 68 bytes
所以寬度65pixel的影像，
每個row的資料量為：68 bytes。

Bitmap 影像格式(續)

- 自建影像讀取類別
  - BMP檔案讀、存檔




```
typedef struct tagBITMAPFILEHEADER {
  WORD  bfType;
  DWORD bfSize;
  WORD  bfReserved1;
  WORD  bfReserved2;
  DWORD bfOffBits;
} BITMAPFILEHEADER, *LPBITMAPFILEHEADER, *PBITMAPFILEHEADER;
```

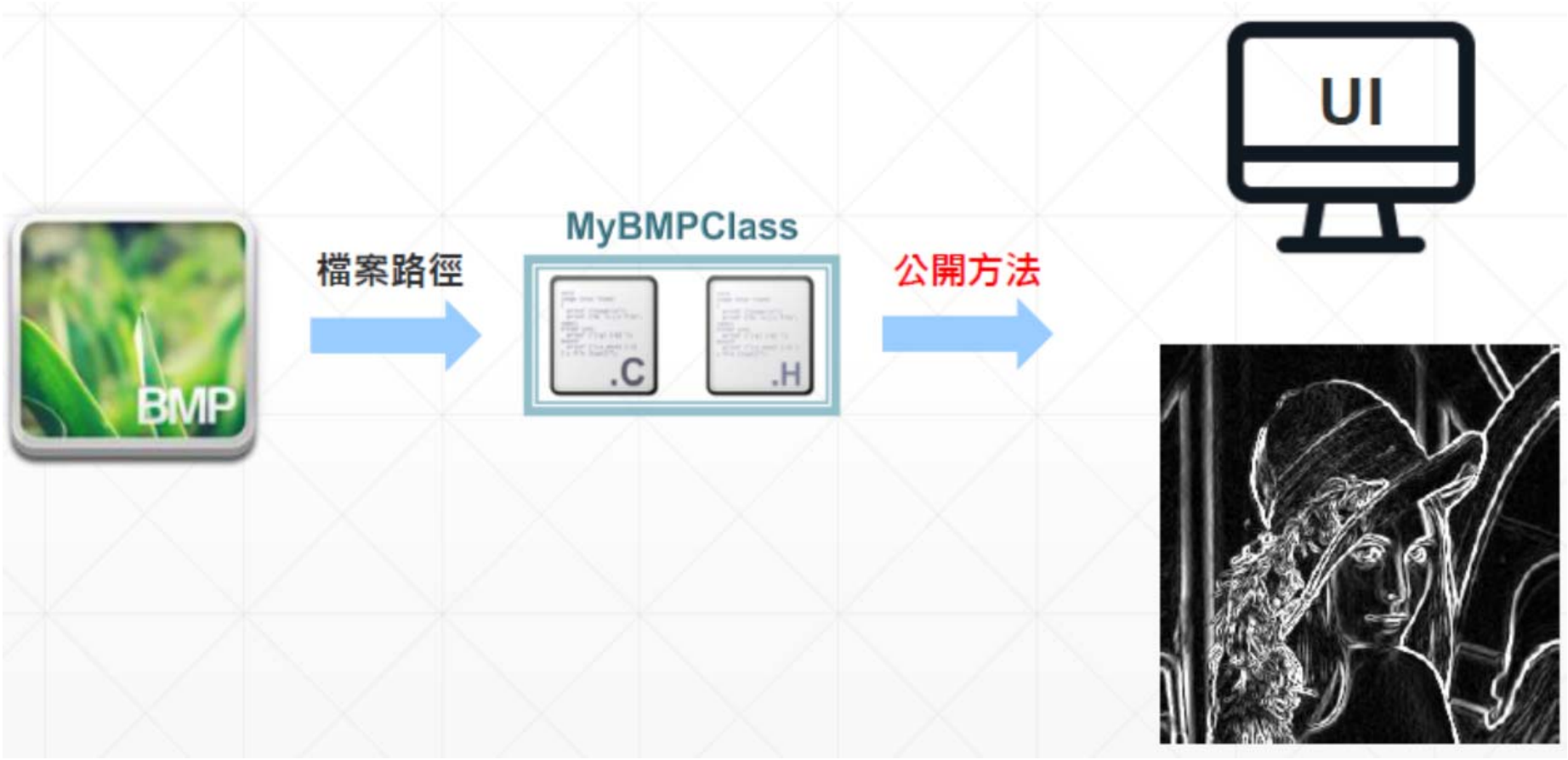
```
typedef struct tagBITMAPINFOHEADER {
  DWORD biSize;
  LONG  biWidth;
  LONG  biHeight;
  WORD  biPlanes;
  WORD  biBitCount;
  DWORD biCompression;
  DWORD biSizeImage;
  LONG  biXPelsPerMeter;
  LONG  biYPelsPerMeter;
  DWORD biClrUsed;
  DWORD biClrImportant;
} BITMAPINFOHEADER, *PBITMAPINFOHEADER;
```

```
typedef struct tagBITMAPINFO {
  BITMAPINFOHEADER bmiHeader;
  RGBQUAD          bmiColors[1];
} BITMAPINFO, *LPBITMAPINFO, *PBITMAPINFO;
```

```
typedef struct tagRGBQUAD {
  BYTE rgbBlue;
  BYTE rgbGreen;
  BYTE rgbRed;
  BYTE rgbReserved;
} RGBQUAD;
```

BYTE *rawdata

Bitmap 影像格式 (續)



Bitmap 影像格式(續)

```
typedef struct tagBITMAPFILEHEADER {
  WORD  bfType;
  DWORD bfSize;
  WORD  bfReserved1;
  WORD  bfReserved2;
  DWORD bfOffBits;
} BITMAPFILEHEADER, *LPBITMAPFILEHEADER, *PBITMAPFILEHEADER;
```

```
typedef struct tagBITMAPINFOHEADER {
  DWORD biSize;
  LONG  biWidth;
  LONG  biHeight;
  WORD  biPlanes;
  WORD  biBitCount;
  DWORD biCompression;
  DWORD biSizeImage;
  LONG  biXPelsPerMeter;
  LONG  biYPelsPerMeter;
  DWORD biClrUsed;
  DWORD biClrImportant;
} BITMAPINFOHEADER, *PBITMAPINFOHEADER;
```

```
typedef struct tagRGBQUAD {
  BYTE rgbBlue;
  BYTE rgbGreen;
  BYTE rgbRed;
  BYTE rgbReserved;
} RGBQUAD;
```

BYTE *rawdata

MyBMPClass


```
class MyImageClass
{
private:
    //Data
    //BMP Info
    int wid;
    int hei;
    //...

    BYTE *rawdata;

public:
    MyImageClass();
    ~MyImageClass();

public:
    bool LoadBMPfile(char *file);
    //...

    int GetImageWidth();
    int GetImageHeight();
    //...

};
```