嵌入式系統設計作業-1
觸控式10位數計算機

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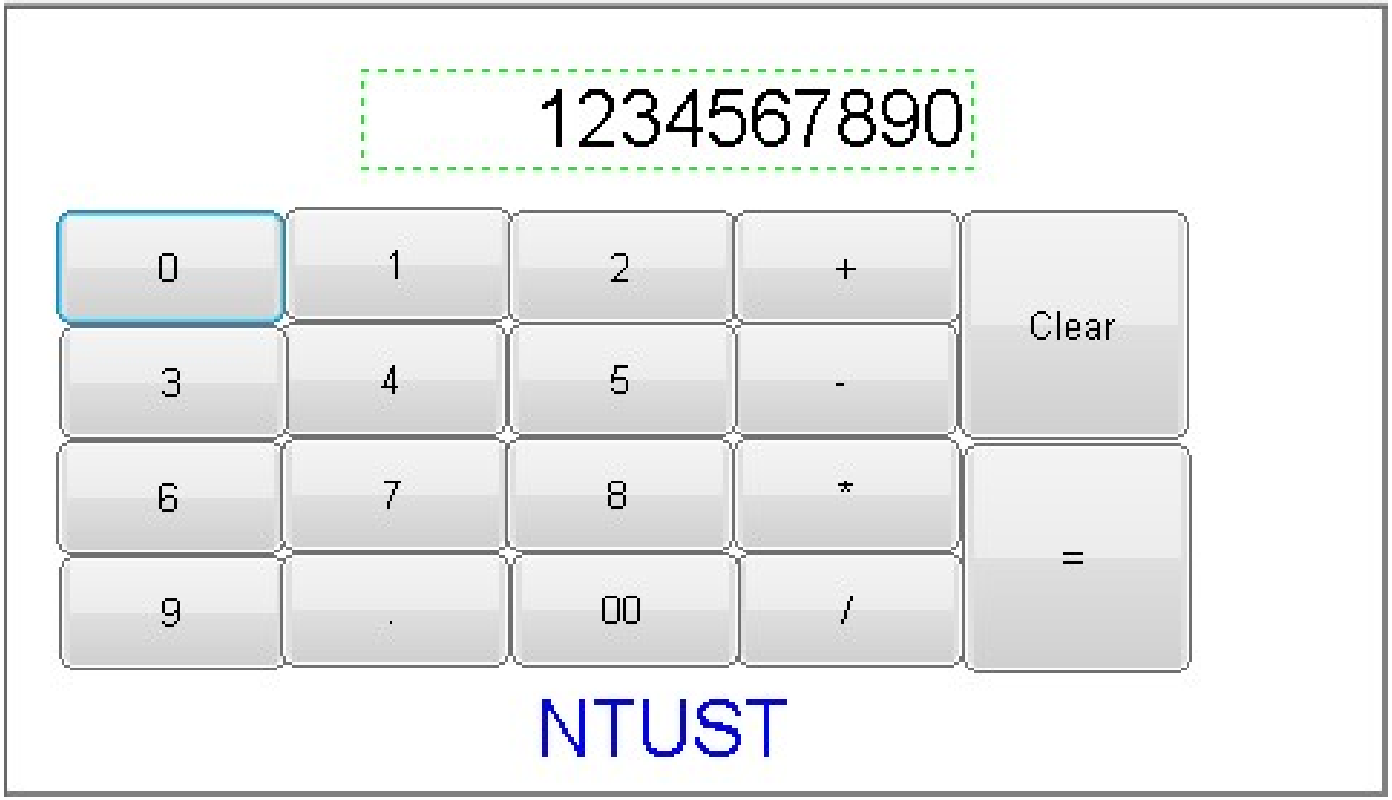
作業題目

- 設計觸控式10位數計算機，並有加、減、乘、除等四項功能。
- 使用STemWin完成GUI畫面。
- 計算機功能參考Windows[小算盤]程式。
- 須完成下頁[程式功能測試表]中全部測試項目後，才可上傳程式。

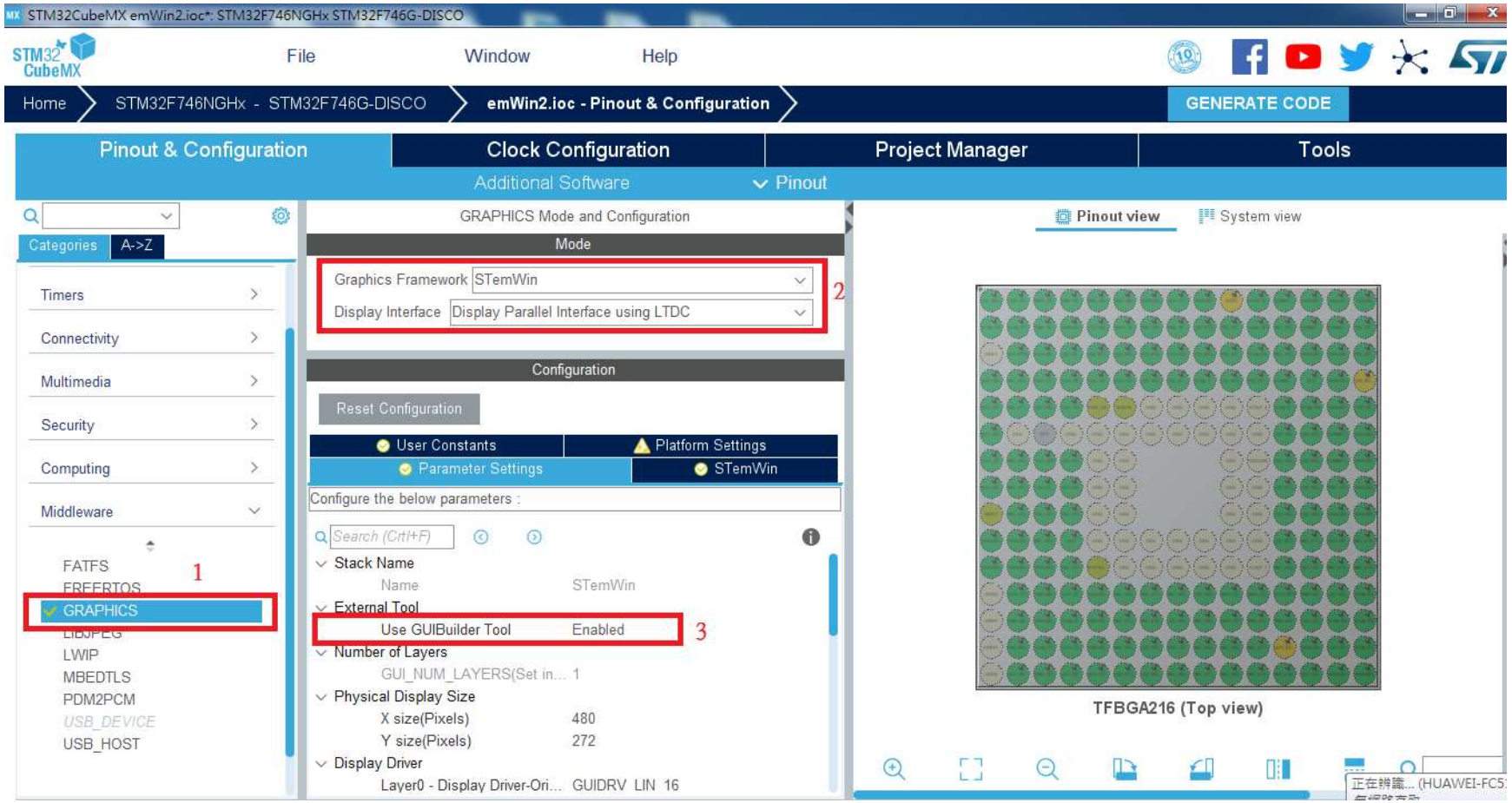
程式功能測試表

項次	輸入	輸出顯示	備註
1	Clear	0	按下clear歸0， 即可再次輸入做運算
2	=	0	
3	+=	0	
4	-=	0	
5	*=	0	
6	/=	0	
7	9999+123456789=	123466788	
8	123.456+7.004=	130.46	
9	666.67+3.33=	670	
10	1-100000001	-100000000	
11	11.01-11.009=	0.001	
12	3.88-1.88=	2	
13	789456123*456=	3599919920	只顯示前面10位
14	741*852=	631332	
15	1.123*1000=	1123	
16	789.1*0.33	260.403	
17	456/0=	error	
18	123/10=	12.3	
19	1/3=	0.33333333	
20	2/3=	0.66666667	4捨5入
21	100000/7=	14285.7143	4捨5入
22	1.5/5=	0.3	
23	452/1.25=	361.6	

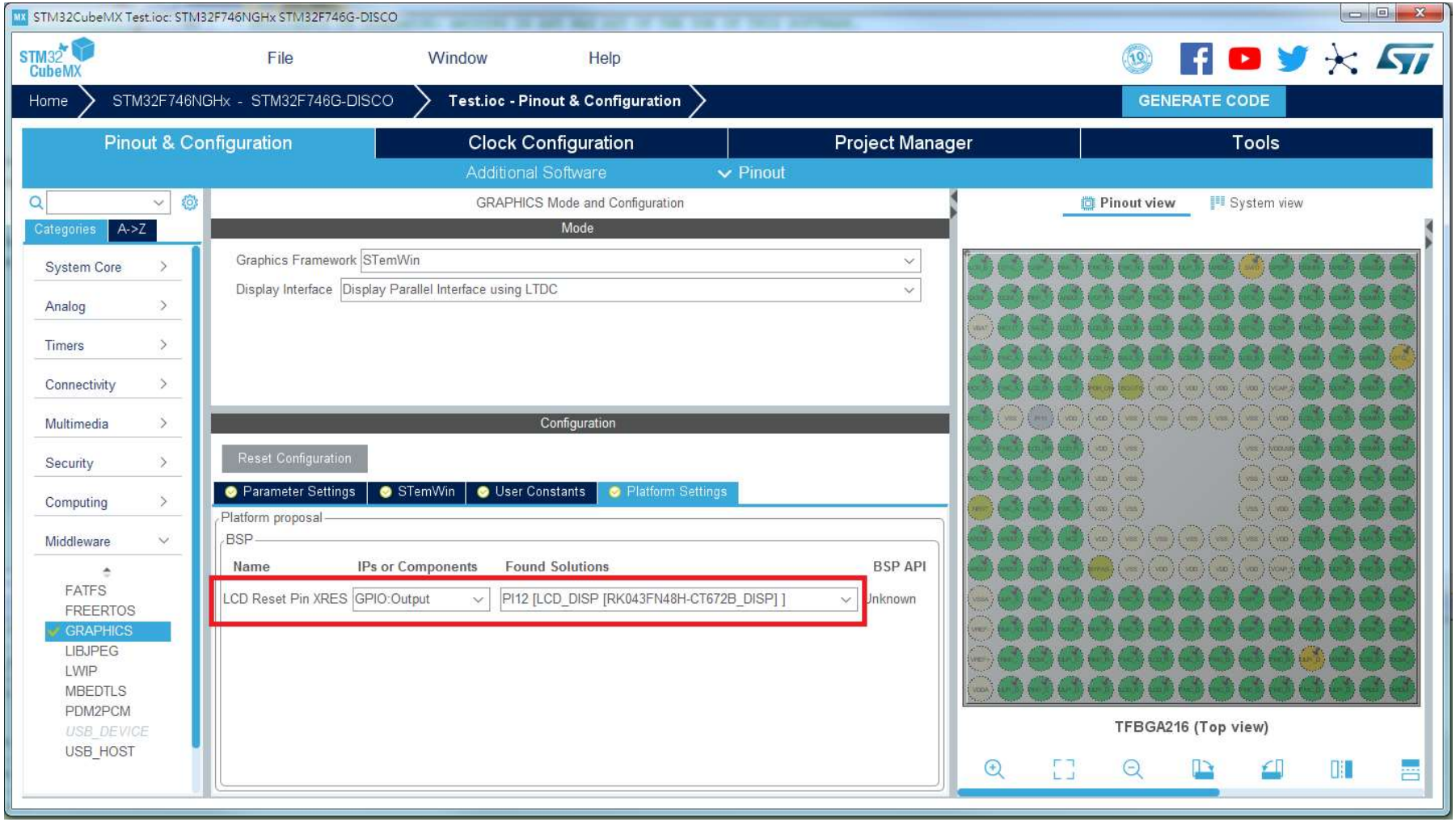
LCD執行畫面



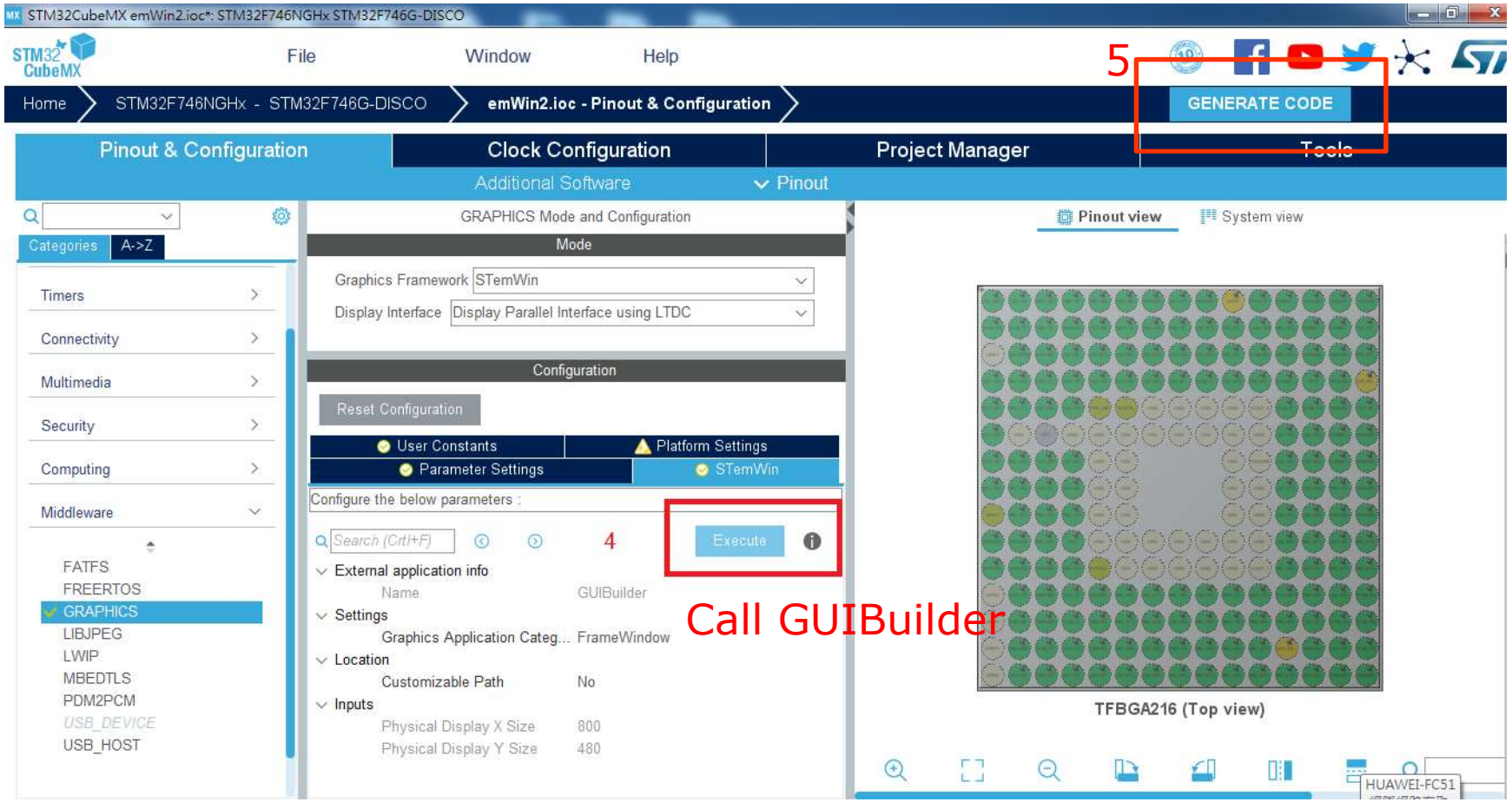
STM32CubeMX – STemWin Setting 1



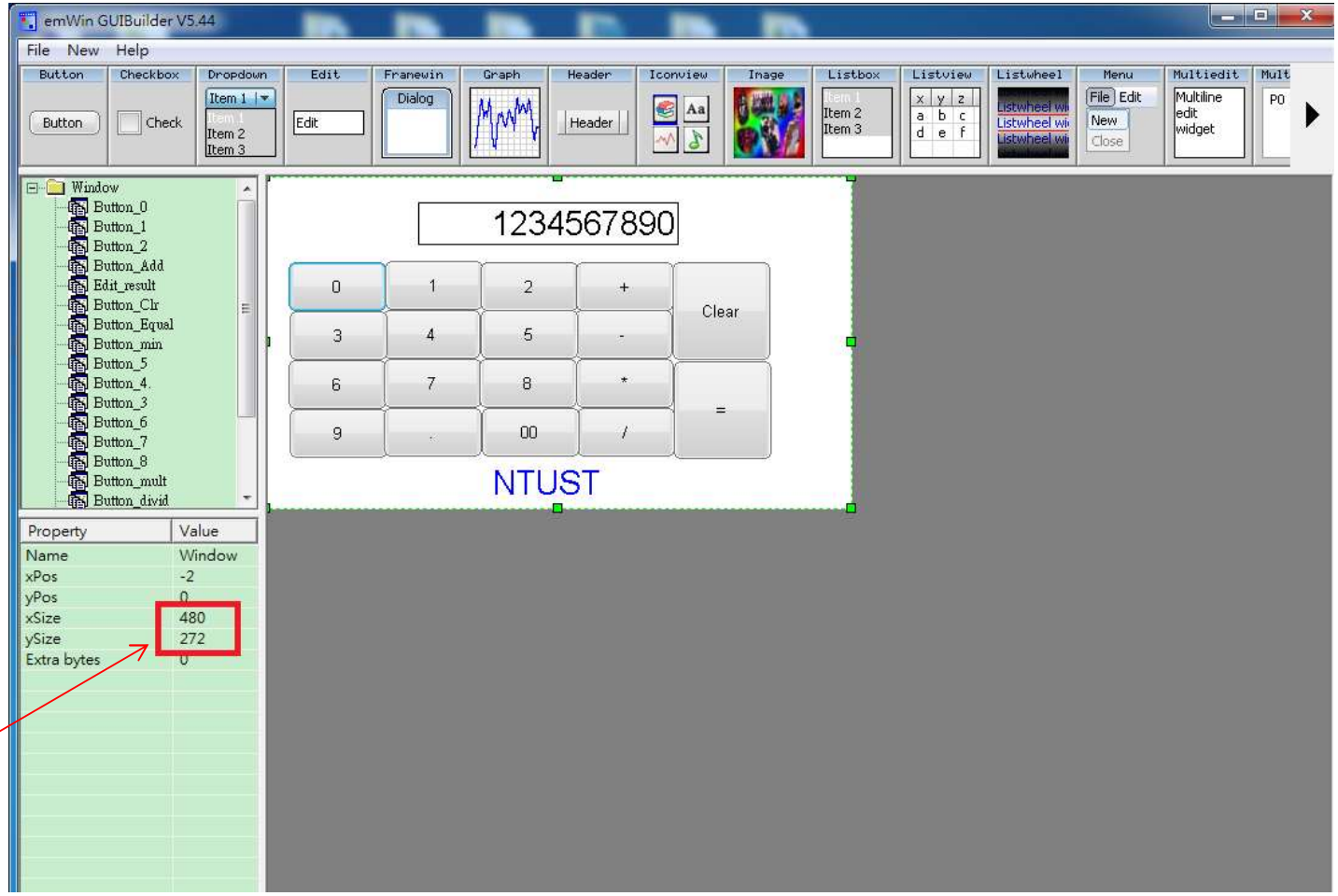
STM32CubeMX – STemWin Setting 2



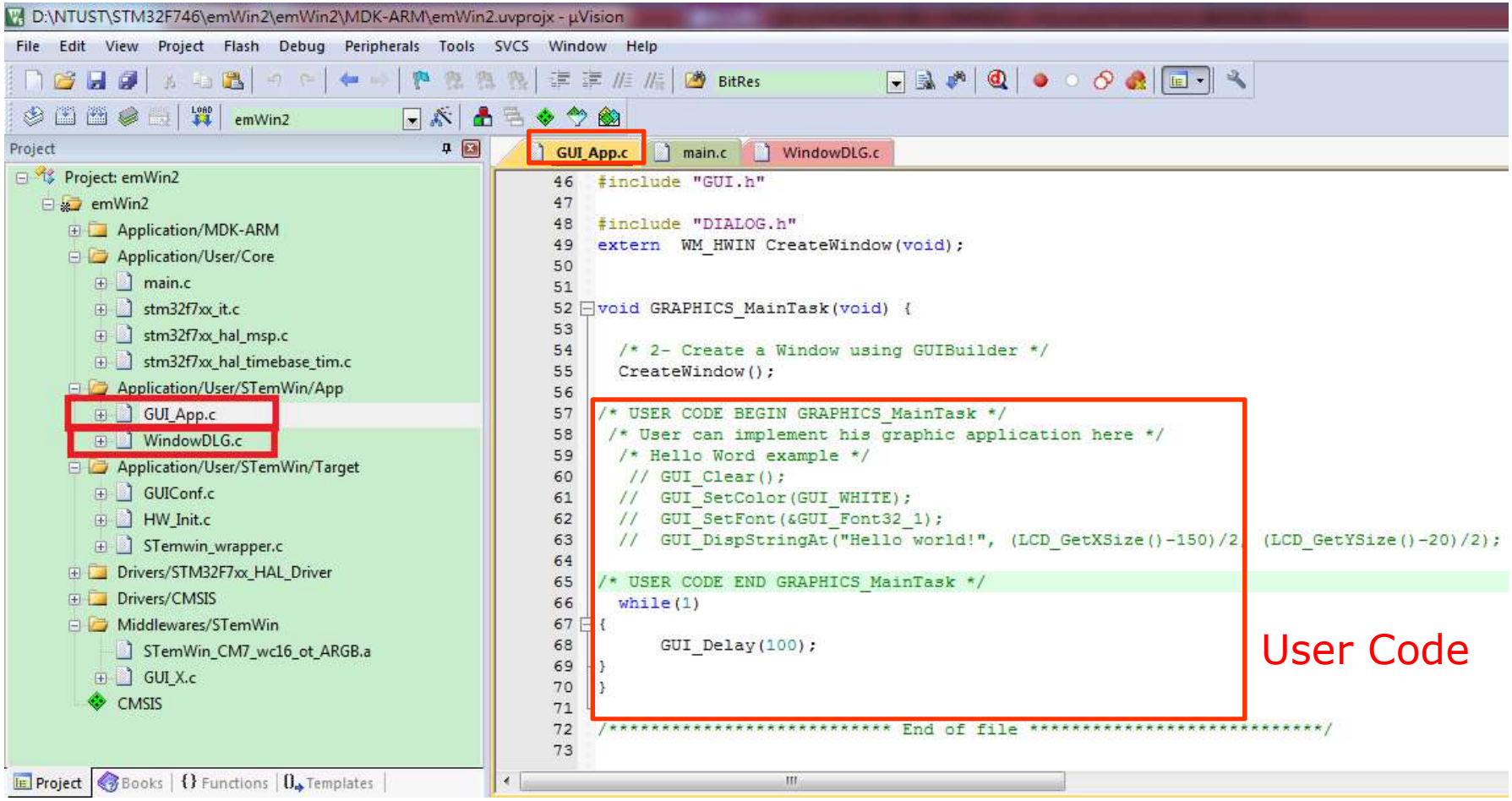
STM32CubeMX – STemWin Setting 3



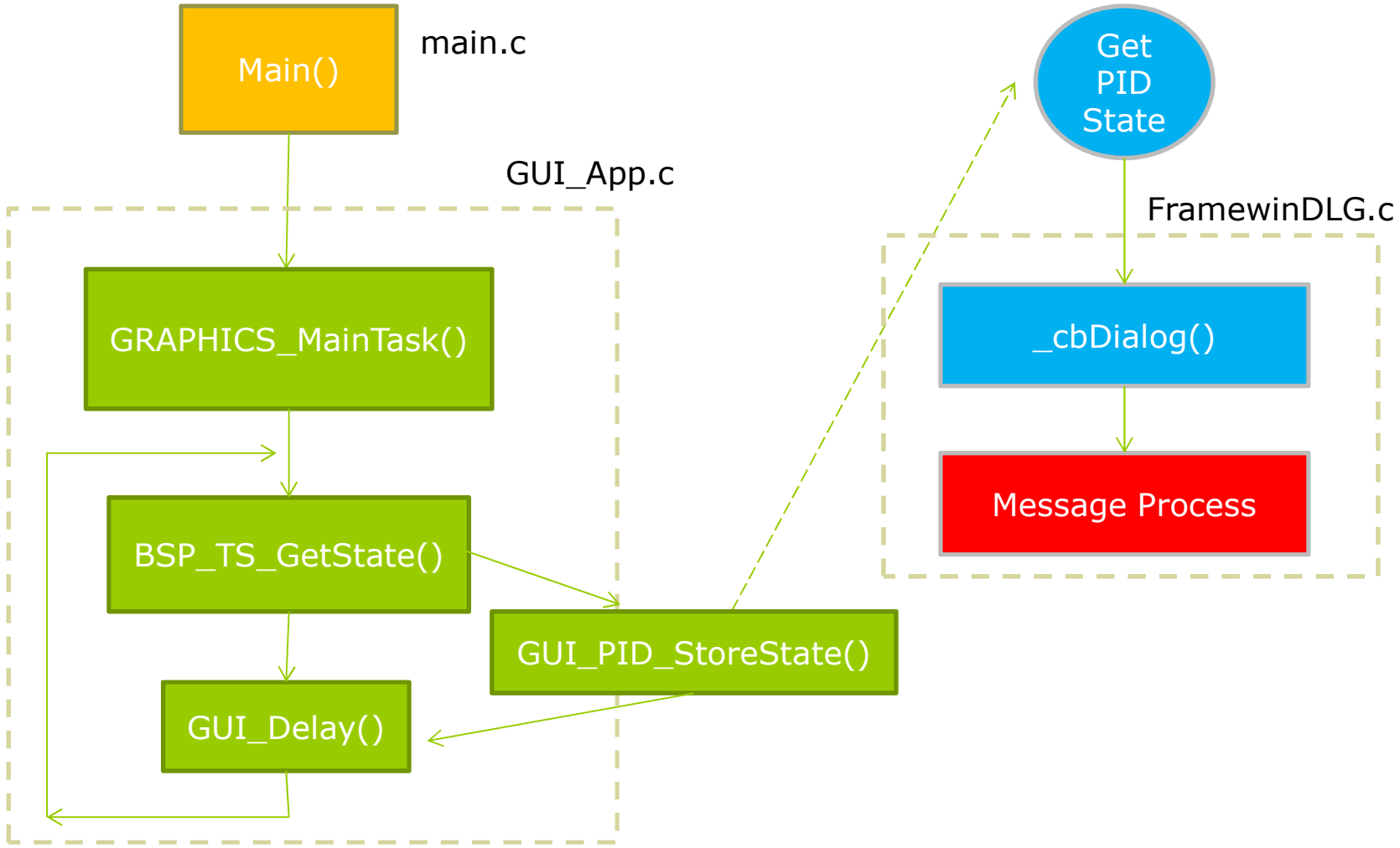
STemWin - GUIBuilder



STM32CubMX – Generate Code Result



STemWin 程式流程



STemWin Time Tick

We start in '$Project_name\Src\stm32f7xx_it.c' which takes care of interrupts and exceptions. In here is a function:

```
void SysTick_Handler(void)
    {
        ...
        HAL_SYSTICK_IRQHandler();
    }
```

which is executed each millisecond. This one calls another function:

```
void HAL_SYSTICK_IRQHandler(void)
    {
        HAL_SYSTICK_Callback();
    }
```

This one also calls another "__weak" function:

```
__weak void HAL_SYSTICK_Callback(void)
    {
        /* NOTE : This function Should not be modified, when the callback is needed,
        the HAL_SYSTICK_Callback could be implemented in the user file
        */
    }
```

__weak means that if compiler needs function with this name it uses __weak function unless there is strong (non __weak) function defined.

We will be making strong function inside main:

```
/* USER CODE BEGIN PFP */
/* Private function prototypes -----------------------------------------------*/
extern volatile GUI_TIMER_TIME OS_TimeMS;
void HAL_SYSTICK_Callback(void)
    {
        OS_TimeMS++;
    }
/* USER CODE END PFP */
```

And this function will increment OS_TimeMS each millisecond.

Now we need driver for display. We can make our own or we can just copy it from

需增加這段程式碼,
才能啟動STemWin
Time Tick

計分方式

1. 程式完成後將所有程式壓縮7z檔後上傳至Moodle[繳交作業]，並在檔名依序寫上作業題目號碼、 學號。(檔名:HW_1_學號.7z)
2. 上傳程式後助教會再確認功能是否完全正確，若不正確，會通知修改程式後，再行上傳程式。
3. 計分標準依完成上傳順序及程式功能完成度給分，若發現程式有互相抄襲狀況，該兩人分數皆為0分。

參考資料

- Getting started with STM32F746G discovery software development tools.pdf
- STM32F746xx_HAL_User_Manual.chm
- Description of STM32F7xx HAL drivers.pdf
- Getting started with STemWin Library.pdf