Nano130 Communication With BT Module

Example Code Introduction for 32-bit NuMicro® Family

Information

Application	本範例代碼使用 Nano130 與藍牙模塊 VICTOR-BT4030 進行通訊
BSP Version	Nano100B_Series_BSP_CMSIS_v3.03.000
Hardware	NuEdu-EVB-Nano130+NuEdu-Basic01

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1 功能描述

本範例介紹如何和藍牙模組進行溝通, 達成無線通訊. 這次使用的藍牙模組型號為威凱特 VICTOR-BT4030, 能夠支援藍牙 4.0 標準協定的雙模(Dual-Mode)藍牙模組, 其使用的控制晶片也是來自新唐 M051 系列.

在 sample code 中, 我們使用 NuEdu-EVB-Nano130 板上的 UART1 連接藍牙模組.使用者可以安裝附檔 BT_Control.apk, 並透過 App 下指令給 NuEdu 板， 當 NuEdu 版接收到來自使用者的命令後, 將會控制相對應的 Basic01 板上元件, 如: LED, 七節管, 蜂鳴器

控制命令格式如下:

資料格式

Byte1	Byte2	Byte3	Byte4
LED 燈	七節管(左)	七節管(右)	蜂鳴器音階

由於一次傳輸 4 個字節命令, 因此設定

UART0->TLCTL |= UART_TLCTL_RFITL_4BYTES ;

使得 FIFO 收到 4 個字節才會觸發中斷, 並進入中斷處理, 接收這 4 個字節的控制命令。

2 代碼描述

首先初始化串口 1，設置波特率為 9600 接收藍牙發送的數據：

```
    void UART1_Init(void)
    {
        /* Enable IP clock */
        CLK_EnableModuleClock(UART1_MODULE);

        /* Select IP clock source */
        CLK_SetModuleClock(UART1_MODULE,CLK_CLKSEL1_UART_S_HIRC,CLK_UART_CLK_DIVIDER(1));

       /* Set PA multi-function pins for UART1 RXD and TXD */
        SYS->PC_H_MFP &= ~( SYS_PC_H_MFP_PC10_MFP_Msk | SYS_PC_H_MFP_PC11_MFP_Msk);
        SYS->PC_H_MFP |= (SYS_PC_H_MFP_PC10_MFP_UART1_RX |
SYS_PC_H_MFP_PC11_MFP_UART1_TX );

         SYS_ResetModule(UART1_RST);

        /* Configure UART1 and set UART1 Baudrate */
        UART_Open(UART1, 9600);
         /* Set RX FIFO Trigger Level to 4 bytes */
         UART0->TLCTL |= UART_TLCTL_RFITL_4BYTES ;

    }
```

通過串口 1 的中斷服務函數將收到的 4 字節數據存入 Command 數組中

```
void UART1_IRQHandler(void)
{
    /* Get all the input characters */
    while(UART_IS_RX_READY(UART1))
    {
                /* Get the character from UART Buffer */
        UART_Read(UART1, Command, 4);
    }
}
```

後面解析每個字節的數據然後控制 NuEdu-Basic01 板上的 LED 燈，七節管，蜂鳴器：

```
void LED_on(unsigned int temp)
{
    if((temp&1)!=1)
        LED1_OFF;
    else
        LED1_ON;

    temp=temp>>1;

    if((temp&1)!=1)
        LED2_OFF;
    else
        LED2_ON;

    temp=temp>>1;
    if((temp&1)!=1)
        LED3_OFF;
    else
        LED3_ON;

    temp=temp>>1;
    if((temp&1)!=1)
        LED4_OFF;
    else
        LED4_ON;

    temp=temp>>1;
    if((temp&1)!=1)
        LED5_OFF;
    else
        LED5_ON;

    temp=temp>>1;
    if((temp&1)!=1)
        LED6_OFF;
    else
        LED6_ON;
```

```
    temp=temp>>1;
    if((temp&1)!=1)
        LED7_OFF;
    else
        LED7_ON;

    temp=temp>>1;
    if((temp&1)!=1)
        LED8_OFF;
    else
        LED8_ON;

}
void Show_Seven_Segment(unsigned char no, unsigned char number)
{
    SEG_A_OFF;
    SEG_B_OFF;
    SEG_C_OFF;
    SEG_D_OFF;
    SEG_E_OFF;
    SEG_F_OFF;
    SEG_G_OFF;
    SEG_H_OFF;
    SEG_CONTROL1_OFF;
    SEG_CONTROL2_OFF;

    switch(number)
    {
    case 1:
        SEG_CONTROL1_ON;
        break;

    case 2:
        SEG_CONTROL2_ON;
        break;
    }

    switch(no)
    {
    //show 0
    case 0:
```

```
        SEG_A_ON;
        SEG_B_ON;
        SEG_C_ON;
        SEG_D_ON;
        SEG_E_ON;
        SEG_F_ON;
        break;

    //show 1
    case 1:
        SEG_B_ON;
        SEG_C_ON;
        break;

    //show 2
    case 2:
        SEG_A_ON;
        SEG_B_ON;
        SEG_G_ON;
        SEG_E_ON;
        SEG_D_ON;
        break;

    //show 3
    case 3:
        SEG_A_ON;
        SEG_B_ON;
        SEG_G_ON;
        SEG_C_ON;
        SEG_D_ON;
        break;

    //show 4
    case 4:
        SEG_F_ON;
        SEG_B_ON;
        SEG_G_ON;
        SEG_C_ON;
        break;

    //show 5
```

```
    case 5:
        SEG_A_ON;
        SEG_F_ON;
        SEG_G_ON;
        SEG_C_ON;
        SEG_D_ON;
        break;

    //show 6
    case 6:
        SEG_A_ON;
        SEG_F_ON;
        SEG_E_ON;
        SEG_G_ON;
        SEG_C_ON;
        SEG_D_ON;
        break;

    //show 7
    case 7:
        SEG_A_ON;
        SEG_B_ON;
        SEG_C_ON;
        SEG_F_ON;
        break;

    //show 8
    case 8:
        SEG_A_ON;
        SEG_B_ON;
        SEG_C_ON;
        SEG_D_ON;
        SEG_E_ON;
        SEG_F_ON;
        SEG_G_ON;
        break;

    //show 9
    case 9:
        SEG_A_ON;
        SEG_B_ON;
```

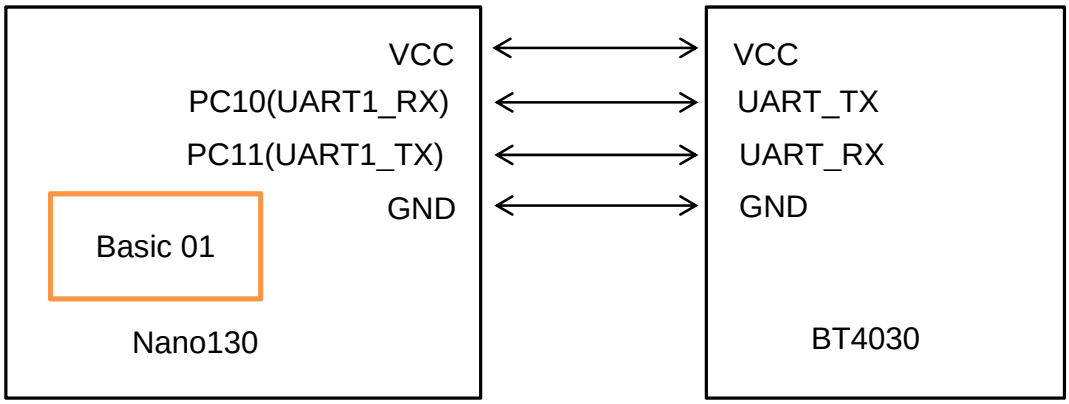
```
        SEG_C_ON;
        SEG_F_ON;
        SEG_G_ON;
        break;
    }
}
void Write_Buzzer(unsigned int frequence, unsigned int duty)
{

    // Config PWM1 channel 1
    PWM_ConfigOutputChannel(PWM1, 1, frequence, duty);
    // Enable PWM1 channel 1 to drive buzzer module
    PWM_EnableOutput(PWM1, 0x02);
}
```

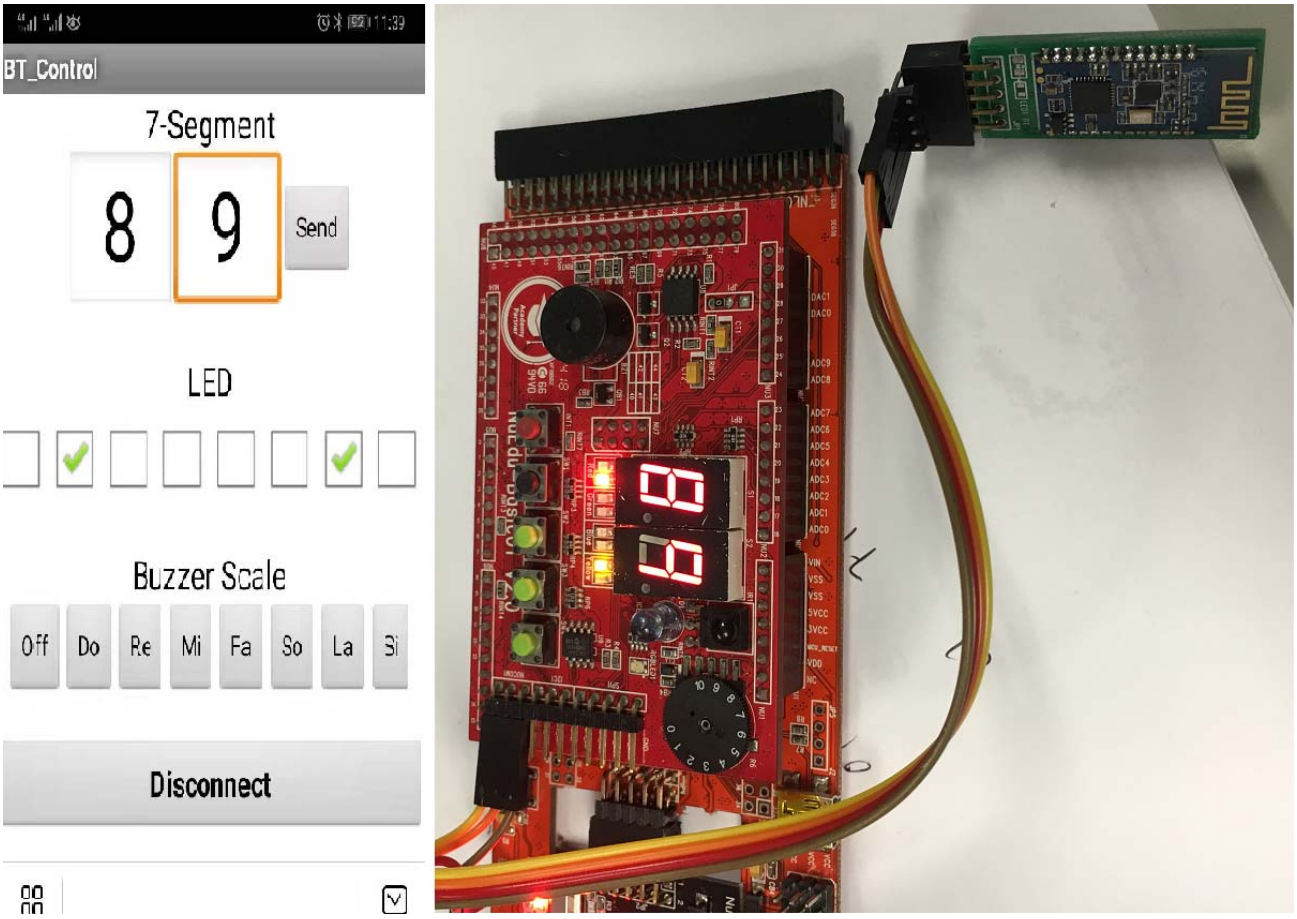
3 軟件和硬件環境

- **軟體環境**
  - BSP 版本
    - Nano100B_Series_BSP_CMSIS_v3.03.000
  - IDE 版本
    - Keil uVersion 4.6
- **硬體環境**
  - 電路元件
    - NuEdu-EVB-Nano130
    - NuEdu-Basic01
    - VICTOR-BT4030
  - 示意圖

Nano130 使用 UART1 接收 BT4030 的數據，然後解析數據後控制 Basic01 板上的 LED 燈，七節管，蜂鳴器。



演示效果


BT_Control
7-Segment
8
9
Send
LED
Buzzer Scale
Off
Do
Re
Mi
Fa
So
La
Si
Disconnect

4 目錄信息

- EC_Nano130_Wireless_Communication_With_Bluetooth_Module_V1.00
  - Library — Sample code header and source files
    - CMSIS — Cortex® Microcontroller Software Interface Standard (CMSIS) by Arm® Corp.
    - Device — CMSIS compliant device header file
    - NuEdu — Library for NuEdu board
    - StdDriver — All peripheral driver header and source files
  - SampleCode
    - ExampleCode — Source file of example code

5 如何執行示例代碼

1. 根據目錄信息章節進入 ExampleCode 路徑中的 KEIL 資料夾，雙擊 Nano130_Communication_With_Bluetooth
2. 進入編譯模式介面
   a. 編譯
   b. 下載代碼至記憶體
   c. 進入 / 離開除錯模式
3. 進入除錯模式介面
   a. 執行代碼

6 修訂記錄

Date	Revision	Description
Sep.25, 2019	1.00	1. 初始發佈

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