

Beágyazott Rendszerek

STM32F4 Discovery

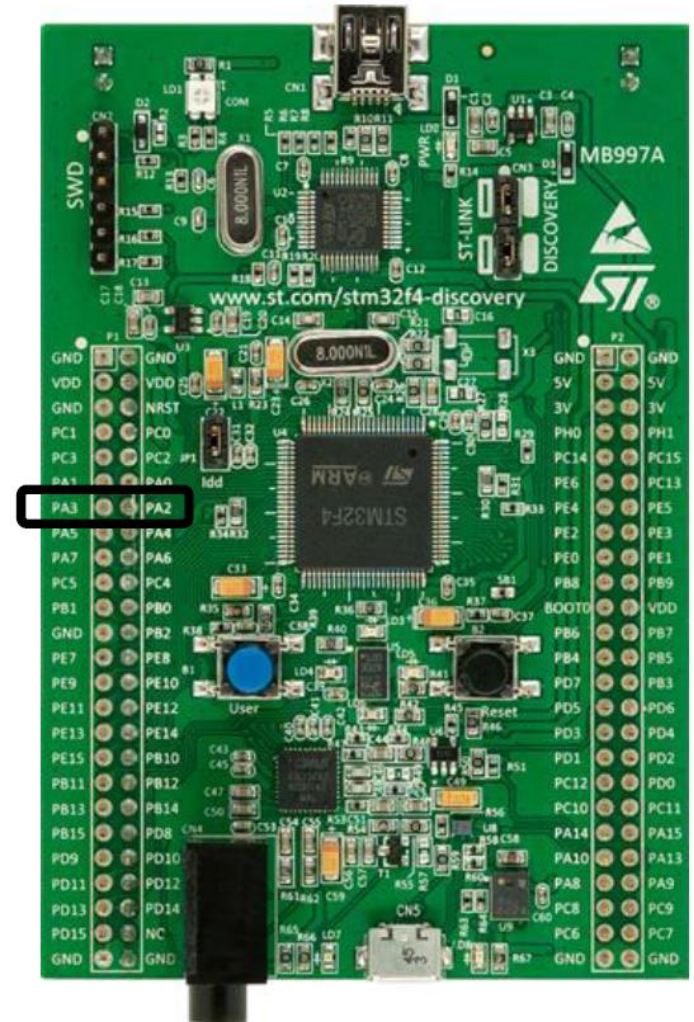
UART

Feladat 1.:

UART „üzenet” küldés

- Üzenet: ‘x’ karakter,
- Küldése EXTI0 interruptra
 - „BUTTON_USER”
- Üzenet küldése UART-on, TX (transmit) lábon
 - „On demand”
- Üzenet fogadása UART-on, RX (receive) lábon
 - Interrupt
 - Feldolgozás: ha ‘x’ jött, LED-ek invertálása

- Jumperrel lezárni PA2 + PA3-t
- Jumper: hátoldalon kettő is van 😊



Új projekt, stb...

- 😊

Main.c (1)

```
#include "stm32f4xx_usart.h"
```

```
...
```

```
void init_usart(void){
```

```
    GPIO_InitTypeDef GPIO_InitStructure;
```

```
    USART_InitTypeDef USART_InitStructure;
```

```
    /* enable peripheral clock for USART2 */
```

```
    RCC_APB1PeriphClockCmd(RCC_APB1Periph_USART2,  
    ENABLE);
```

```
    /* GPIOA clock enable */
```

```
    RCC_AHB1PeriphClockCmd(RCC_AHB1Periph_GPIOA,  
    ENABLE);
```

Main.c (2)

/* GPIOA Configuration: USART2 TX, RX on PA2 | PA3 */

```
GPIO_InitStructure.GPIO_Pin = GPIO_Pin_2 | GPIO_Pin_3;
GPIO_InitStructure.GPIO_Mode = GPIO_Mode_AF;
GPIO_InitStructure.GPIO_Speed = GPIO_Speed_50MHz;
GPIO_InitStructure.GPIO_OType = GPIO_OType_PP;
GPIO_InitStructure.GPIO_PuPd = GPIO_PuPd_UP ;
GPIO_Init(GPIOA, &GPIO_InitStructure);
```

/* Alternate Functions on GPIOA 2|3*/

```
GPIO_PinAFConfig(GPIOA, GPIO_PinSource2, GPIO_AF_USART2);
GPIO_PinAFConfig(GPIOA, GPIO_PinSource3, GPIO_AF_USART2);
```

Main.c (3)

```
USART_InitStructure.USART_BaudRate = 9600;  
USART_InitStructure.USART_WordLength =  
    USART_WordLength_8b;  
USART_InitStructure.USART_StopBits = USART_StopBits_1;  
USART_InitStructure.USART_Parity = USART_Parity_No;  
USART_InitStructure.USART_HardwareFlowControl =  
    USART_HardwareFlowControl_None;  
USART_InitStructure.USART_Mode = USART_Mode_Tx |  
    USART_Mode_Rx;  
USART_Init(USART2, &USART_InitStructure);  
USART_Cmd(USART2, ENABLE); // enable U(S)ART2
```


Main.c (4)

```
USART_ITConfig(USART2, USART_IT_RXNE, ENABLE);
```

```
NVIC_InitTypeDef NVIC_InitStructure;
```

```
/* Configure the NVIC Preemption Priority Bits */
```

```
NVIC_PriorityGroupConfig(NVIC_PriorityGroup_0);
```

```
/* Enable the USART2 Interrupt */
```

```
NVIC_InitStructure.NVIC_IRQChannel = USART2_IRQn;
```

```
NVIC_InitStructure.NVIC_IRQChannelPreemptionPriority = 0;
```

```
NVIC_InitStructure.NVIC_IRQChannelSubPriority = 0;
```

```
NVIC_InitStructure.NVIC_IRQChannelCmd = ENABLE;
```

```
NVIC_Init(&NVIC_InitStructure);
```

```
} // end of init_usart(void)
```

stm32f4xx_it.c (1)

```
#include "stm32f4xx_usart.h"
```

```
#include "stm32f4_discovery.h"
```

```
/* Private variables -----*/
```

```
char StringLoop[0xFF]; // Receive buffer, 256 byte
```

stm32f4xx_it.c (2)

karakter küldés EXTI0-ra

```
void EXTI0_IRQHandler(void)
{
    if(EXTI_GetITStatus(EXTI_Line0) != RESET)
    {
        /* Sending a single character */
        USART_SendData(USART2, 'x'); //in: stm32f4xx_usart.h
        /* Clear the EXTI line 0 pending bit */
        EXTI_ClearITPendingBit(EXTI_Line0);
    }
}
```

tm32f4xx_it.c (3)

karakter fogadás és feldolgozás

```
void USART2_IRQHandler(void)
{
    static int rx_index = 0;
    if (USART_GetITStatus(USART2, USART_IT_RXNE) != RESET)
    {
        StringLoop[rx_index++] = USART_ReceiveData(USART2);
        if (StringLoop[rx_index-1]=='x')
        {
            STM_EVAL_LEDToggle(LED3); //g
            STM_EVAL_LEDToggle(LED4); //r
            STM_EVAL_LEDToggle(LED5); //o
            STM_EVAL_LEDToggle(LED6); //b
        }
        if (rx_index >= (sizeof(StringLoop) - 1)) //StringLoop
            rx_index = 0;
    }
}
```

Utolsó lépés

Main.c (5)

```
int main(void)
{
    /* Initialize LEDs */
    ...
    /* Turn on LEDs */
    ...
    init_usart();
    STM_EVAL_PBInit(BUTTON_USER, BUTTON_MODE_EXTI);
    while(1)
    {
    }
}
```

Fordít, ellenőriz, javít 😊



Feladat 2.:

- USART „üzenet” küldés
 - Üzenet: ‘r’ | ‘g’ | ‘b’ | ‘o’ | ... karakter,
 - Küldése EXTI0 megszakításra
 - „BUTTON_USER”
 - Üzenet küldése USART-on, TX lábon
 - Üzenet fogadása USART-on, RX lábon
 - Feldolgozás: karakternek megfelelő színű led bekapcsolása, a többi kikapcsolva
 - Ha egyéb karakter jön, mind kikapcsolva
 - Tesztelni a szomszéd paneljével összekötve