Sprints

Design a Non-blocking LCD and Keypad

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Firstly: Project Description:

1. ***Hardware Requirements***
    1. *character LCD*
    2. KEPAD
2. ***Software Requirements***
        1. Use non-blocking delay functions

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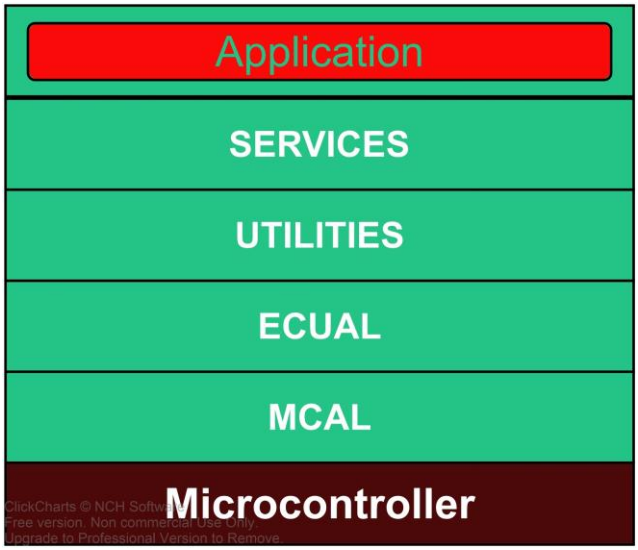
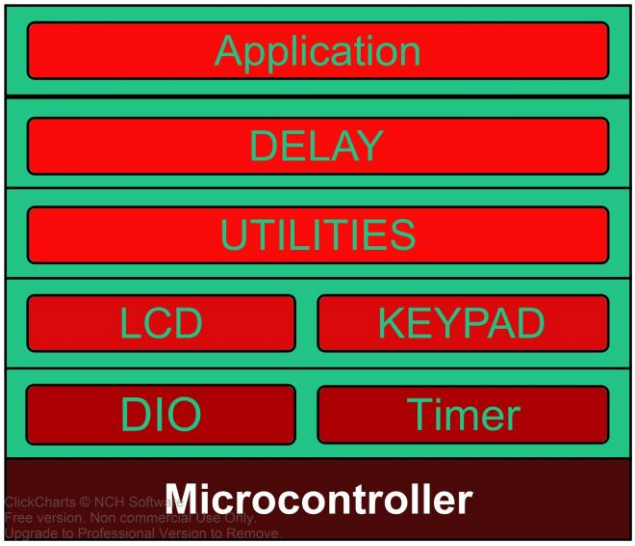
Secondly: Layered architecture:

1- Microcontroller
2- MCAL
3- ECUAL
4- UTILITIES
5- SERVICES



Thirdly : System modules:

1- **Specify system modules/drivers:**
   - DIO, TIMER, LCD, KEYPAD, DELAY
2- **Assign each module to its related layer:**
   - By drawing



Forthly: APIs:

1- DIO APIs:

```
void DIO_init (uint8_t portNumber,uint8_t
      pinNumber,uint8_t direction);
void DIO_write (uint8_t portNumber,uint8_t
      pinNumber,uint8_t value);
void DIO_read (uint8_t portNumber,uint8_t
```

Sprints

2- TIMER APIs:

```
void TIMER_init (uint8_t Mode,uint8_t intial_value);
void TIMER_start (uint8_t prescaler_value);
void TIMER_set(uint8_t intial_value);
void TIMER_getStatus(uint8_t *value);
void TIMER_Stop (void);
```

3- LCD APIs:

```
void LCD_init (void);
void LCD_sendcommand (uint8_t cmnd);
void LCD_sendcommand (uint8_t char_data);
```

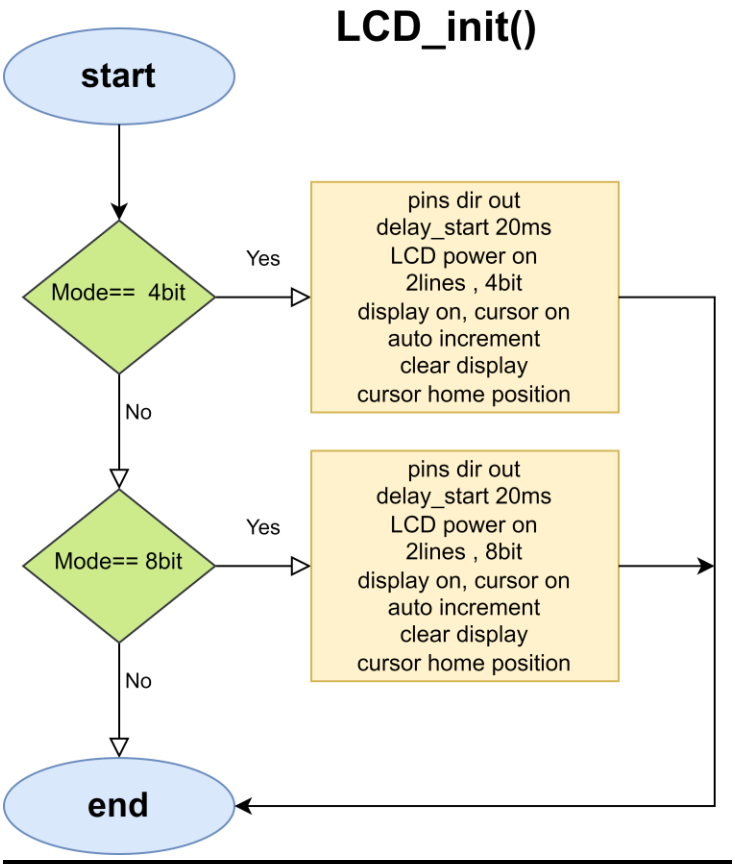
4- KEYPAD APIs:

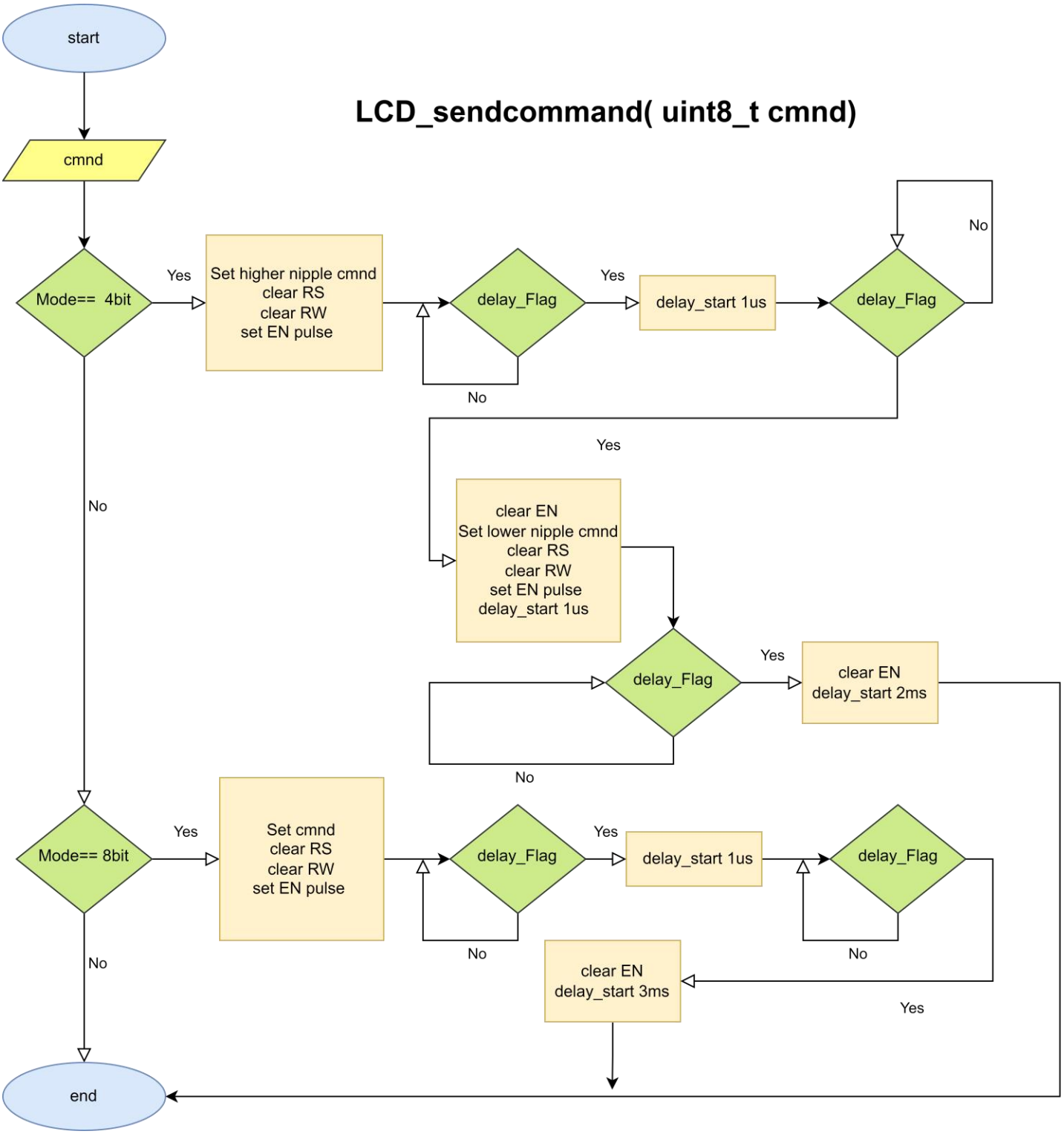
```
void KEYPAD_init (uint8_t port);
uint8_t KEYPAD_getkey (void);
```

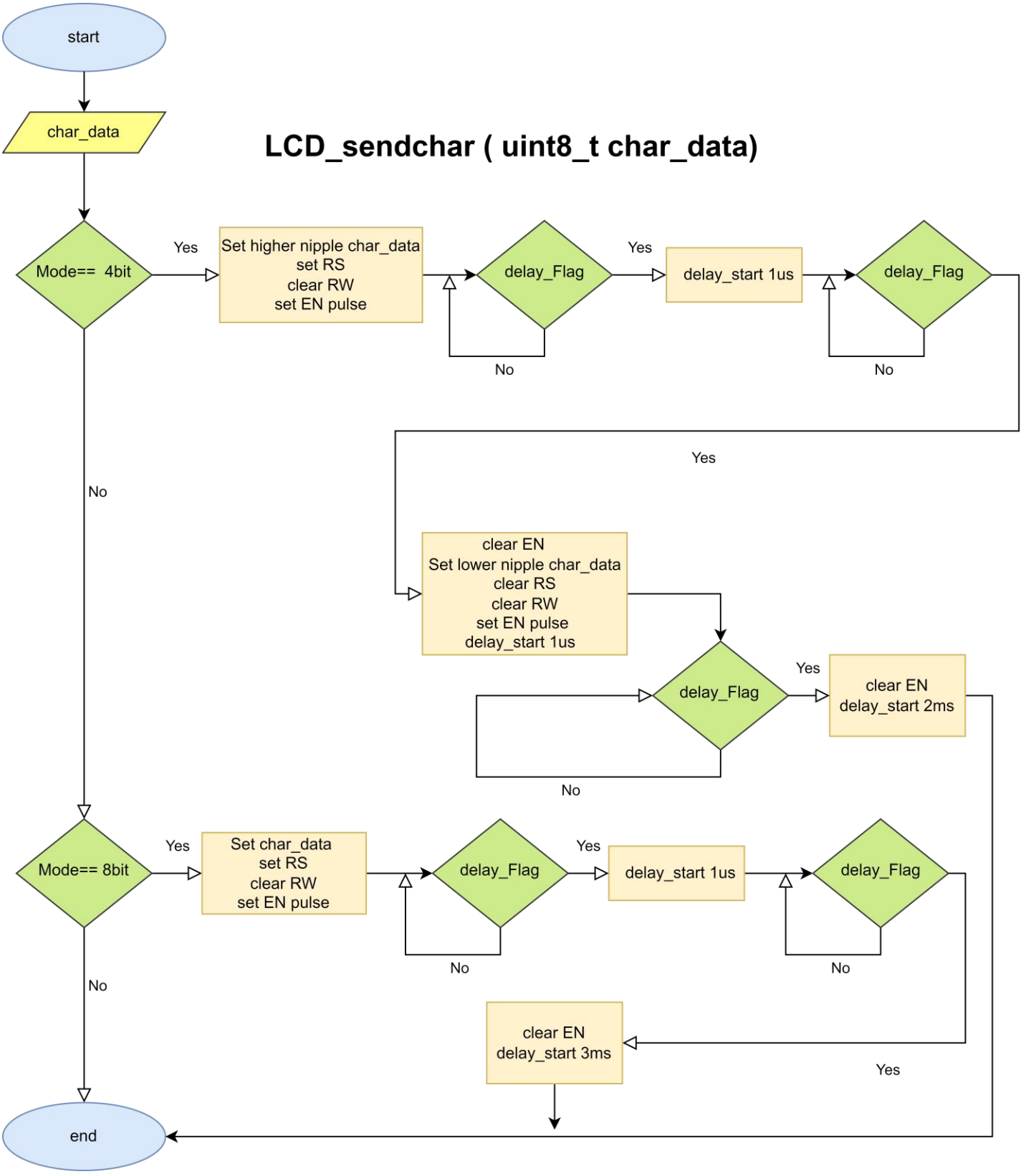
5- DELAY APIs:

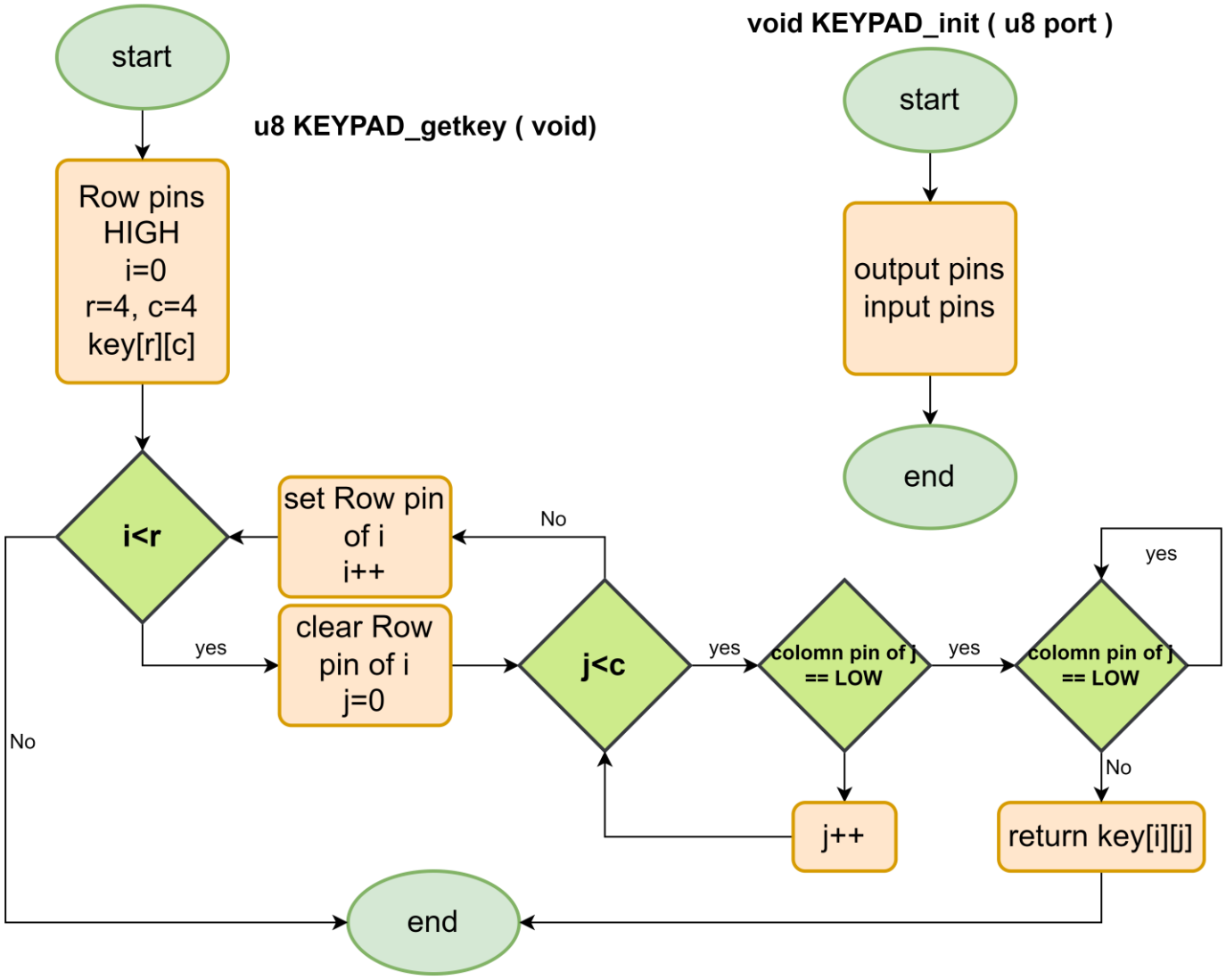
```
void delay_start_ms (uint32_t ms);
void delay_start_us (uint32_t us);
```

Fifthly: Flowcharts APIs:

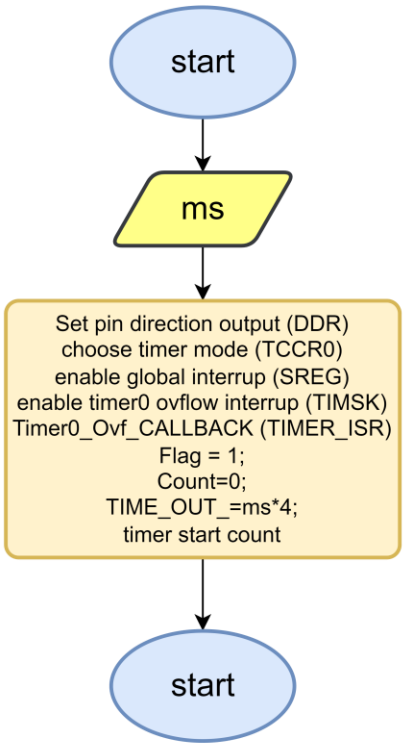



LCD_sendcommand(uint8_t cmnd)
start
cmnd
Mode== 4bit
Yes
Set higher nipple cmnd
clear RS
clear RW
set EN pulse
delay_Flag
Yes
delay_start 1us
delay_Flag
No
No
Yes
No
clear EN
Set lower nipple cmnd
clear RS
clear RW
set EN pulse
delay_start 1us
delay_Flag
Yes
clear EN
delay_start 2ms
No
Mode== 8bit
Yes
Set cmnd
clear RS
clear RW
set EN pulse
delay_Flag
Yes
delay_start 1us
delay_Flag
No
No
No
clear EN
delay_start 3ms
Yes
end

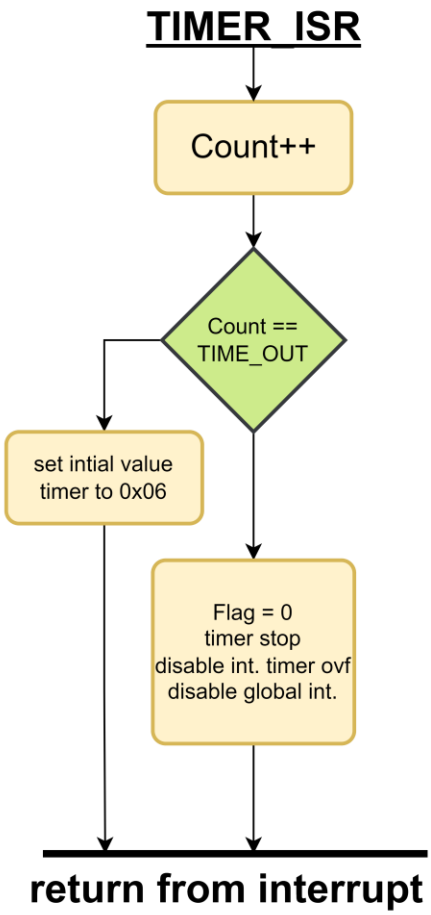
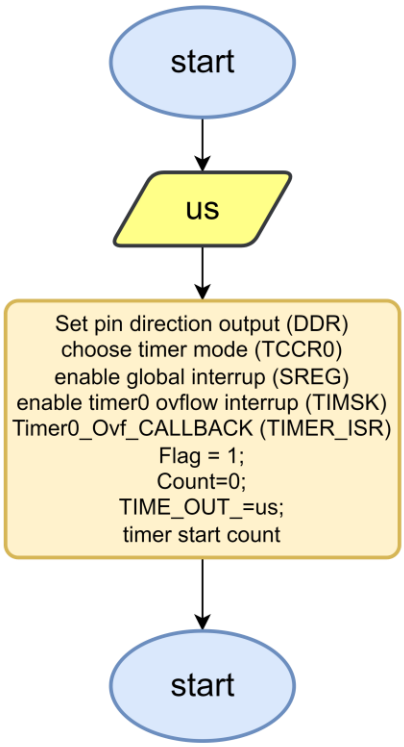

start
char_data
LCD_sendchar (uint8_t char_data)
Mode== 4bit
Yes
Set higher nipple char_data
set RS
clear RW
set EN pulse
delay_Flag
No
Yes
delay_start 1us
delay_Flag
No
Yes
No
clear EN
Set lower nipple char_data
clear RS
clear RW
set EN pulse
delay_start 1us
delay_Flag
No
Yes
clear EN
delay_start 2ms
Mode== 8bit
Yes
Set char_data
set RS
clear RW
set EN pulse
delay_Flag
No
Yes
delay_start 1us
delay_Flag
No
No
clear EN
delay_start 3ms
Yes
end


void KEYPAD_init (u8 port)
start
output pins
input pins
end
u8 KEYPAD_getkey (void)
start
Row pins
HIGH
i=0
r=4, c=4
key[r][c]
i<r
set Row pin
of i
i++
No
yes
clear Row
pin of i
j=0
j<c
yes
colomn pin of j
== LOW
yes
colomn pin of j
== LOW
yes
No
j++
return key[i][j]
No
end

void delay_start_ms (u8 ms)



TIMER_ISR



void delay_start_us (u8 us)