## Project 2 [smart home]

# Project Description

In this project it is required to implement a smart home system. The smart home system main components are:

1. 2 Tiva C boards
2. LCD
3. potentiometer

4- stepper motor

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Action |  | | | | |
| Rotating the Potentiometer | Adjust LED intensity | | | | |
| Point B | 87 | — |  |  |  |
| Point C | 64 | 56 | — |  |  |
| Point D | 37 | 32 | 91 | — |  |
| Point E | 93 | 35 | 54 | 43 | — |

The operation mode of push buttons should follow these rules:

# MCAL Drivers

Timer Functions

|  |  |  |
| --- | --- | --- |
| Name | delay\_MS | |
| Input | Unsigned long | delay |
| Return | void | |
| Description | Use the SysTick timer to wait for the input delay in milliseconds. | |

|  |  |  |
| --- | --- | --- |
| Name | delay\_US | |
| Input | Unsigned long | delay |
| Return | void | |
| Description | Use the SysTick timer to wait for the input delay in microseconds. | |

GPIO Functions

|  |  |  |
| --- | --- | --- |
| Name | Port\_Init | |
| Input | char | port |
| Return | void | |
| Description | Initialize the inserted port based on the input char. | |

|  |  |  |
| --- | --- | --- |
| Name | pin\_mode | |
| Input | char | port |
| uint8 | pin |
| enum mode | dirr |
| enum input\_mode | denr |
| enum set\_mode | afsel\_mode |
| Return | void | |
| Description | Set port pin direction, digital enable and analog function enable. | |

|  |  |  |
| --- | --- | --- |
| Name | getGPIOData | |
| Input | char | port |
| Return | Volatile unsigned long | |
| Description | Get the data in a certain inserted port | |

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| --- | --- | --- |
| Name | write\_data | |
| Input | char | port |
| uint8 | data |
| Return | void | |
| Description | Return the value of the port (data) selected by port | |

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|  |  |  |
| --- | --- | --- |
| Name | write\_pin | |
| Input | char | port |
| uint8 | pin |
| int | state |
| Return | void | |
| Description | Enable the selected pin to write in by inserting the port and the pin | |

UART Functions

|  |  |
| --- | --- |
| Name | UART5\_Init |
| Description | Initialize the UART5 on Port E4 and E5. |

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| --- | --- |
| Name | UART5\_Available |
| Return | uint8 |
| Description | Returns 1 if there is data available to be read from the UART5. Returns 0 otherwise. |

|  |  |
| --- | --- |
| Name | UART5\_Read |
| Return | uint8 |
| Description | Reads the data available from the UART5. |

|  |  |  |
| --- | --- | --- |
| Name | UART5\_Write | |
| Input | uint8 | data |
| Description | Write integer data into the UART5. | |

|  |  |  |
| --- | --- | --- |
| Name | UART5\_Out | |
| Input | char \* | pt |
| Description | Writes string/characters data into the UART5. | |

PWM Functions

|  |  |  |
| --- | --- | --- |
| Name | PWM\_Init | |
| Input | long | PWMENABLE |
| Description | Initializes the PWM component of the Tiva C on the specified input. | |

|  |  |  |
| --- | --- | --- |
| Name | PWM\_Set | |
| Input | long | data |
| Description | Sets the PWM to the specified input. | |

ADC Functions

|  |  |
| --- | --- |
| Name | ADC\_Init |
| Description | Initializes the ADC component of the Tiva C and initializes the timer to trigger ADC at 1 sample/sec. |

|  |  |  |
| --- | --- | --- |
| Name | WTIMER\_Init | |
| Input | uint16 | trigger |
| Description | Initializes the WTIMER component of the Tiva C on the specified input trigger. Used by ADC\_Init internally. | |

|  |  |
| --- | --- |
| Name | ADCAvailable |
| Return | char |
| Description | Returns 1 if the ADC input has changed since the last time. |

|  |  |  |
| --- | --- | --- |
| Name | getADC | |
| Input | long \* | variable |
| Description | Gets the available ADC value. Uses ADCAvailable internally. | |

# HAL Driver

LCD Functions

|  |  |
| --- | --- |
| Name | lcd\_init |
| Description | Initializes the LCD to display data. |

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|  |  |  |
| --- | --- | --- |
| Name | lcd\_char | |
| Input | unsigned char | dat |
| Description | Display the input character on LCD. | |

|  |  |  |
| --- | --- | --- |
| Name | lcd\_string | |
| Input | const char \* | msg |
| Description | Display the input string on LCD. | |

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|  |  |  |
| --- | --- | --- |
| Name | lcd\_integer | |
| Input | int | value |
| Description | Display the input integer on LCD. | |

|  |  |  |
| --- | --- | --- |
| Name | lcd\_cmd | |
| Input | unsigned char | command |
| Description | Used internally by above LCD functions to send display/clear commands to the LCD device. | |

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|  |  |
| --- | --- |
| Name | lcd\_clear |
| Description | Clear LCD |

Tiva 1: Motor Functions

|  |  |  |
| --- | --- | --- |
| Name | Motor\_Turn | |
| Input | char | Direction |
| Description | Turns the motor in a clockwise direction when direction is 1 and anti-clockwise otherwise. | |

Tiva 1: BlueLED Functions

|  |  |
| --- | --- |
| Name | BlueLED\_Init |
| Description | Initializes PWM and PF2 using PWM\_Init and pin\_mode. |

|  |  |  |
| --- | --- | --- |
| Name | BlueLED\_SetDutyCycle | |
| Input | uint8 | duty\_cycle |
| Description | Calculates the PWM value to set given the input “duty\_cycle”. Uses PWM\_Set. | |

Tiva 2: Push Button Functions

|  |  |
| --- | --- |
| Name | PushButtonsInit |
| Description | Initializes port F pins at PF0 and PF4. |

|  |  |
| --- | --- |
| Name | PushButton1Pressed |
| Return | uint8 |
| Description | Returns 1 if PF0 is pressed; does not return 1 while the button is held. Returns 0 otherwise. |

|  |  |
| --- | --- |
| Name | PushButton2Pressed |
| Return | uint8 |
| Description | Returns 1 if PF4 is pressed; does not return 1 while the button is held. Returns 0 otherwise. |

**project diagram:**

SMART HOME

MAIN2

MAIN1

APPLICATION

TIVA2

HAL

LCD

TIVA1

MCAL

TIMER

UART

ADC

PWM

GPIO