Group 9

Software layers report

Tiva 1 (Software layers)

Application

Receive stepper command

Receive LED intensity

Send temperature

OS

MCAL

ADC

SysTick

HAL

UART

DIO

PWM

LED

Stepper

Temperature sensor

Port

1. MCAL Layer
2. Port driver

Function definition:

|  |  |  |
| --- | --- | --- |
| Name | Port\_Init | |
| Input | uint8 | port\_index |
| Return | void | |
| Description | Initialize port based on selected port\_index (0 to 5) by enabling the clock, unlocking the port, and making the selected mode digital | |

|  |  |  |
| --- | --- | --- |
| Name | Port\_SetPinDirection | |
| Input | uint8 | port\_index |
| uint8 | pins\_mask |
| Port\_PinDirectionType | pins\_direction |
| Return | void | |
| Description | Change the direction of the selected pins by pins\_mask in the port selected by port\_index | |

1. DIO driver

Function definition:

|  |  |  |
| --- | --- | --- |
| Name | DIO\_ReadPort | |
| Input | uint8 | port\_index |
| uint8 | pins\_mask |
| Return | uint8 | pins\_level |
| Description | Return the value of the pins selected by pins\_masks in the port selected by port\_index | |

|  |  |  |
| --- | --- | --- |
| Name | DIO WritePort | |
| Input | uint8 | port\_index |
| uint8 | pins\_mask |
| uint8 | pins\_level |
| Return | void |  |
| Description | Change the value of the pins selected by pins\_masks in the port selected by port\_index to input pins\_level. | |

1. ADC driver

Function definition:

|  |  |
| --- | --- |
| Name | ADC0\_Init |
| Input | void |
| Return | void |
| Description | Enable clock to ADC, give priority to sequencer 3, select processor as trigger source, make ADC read from inner temperature sensor, enable analog mode and alternative function select. |

|  |  |  |
| --- | --- | --- |
| Name | ADC0\_SS3\_In | |
| Input | Uint16\* | data |
| Return | void | |
| Description | Read converted value from ADC FIFO and return it to data. | |

1. PWM driver

Function definition:

|  |  |
| --- | --- |
| Name | PWM1\_Init |
| Input | void |
| Return | void |
| Description | Enable clock to pwm, use pwm divisor by 64  Enable PWM to output pin, set initial value to load and compare registers, take action when counter is reloaded and when counter reaches compA while counting down. |

|  |  |  |
| --- | --- | --- |
| Name | SetDutyCycle | |
| Input | uint8 | Duty\_cycle |
| Return | void | |
| Range | 0 up to 100 percent | |
| Description | Overwrites compare A register to modify duty cycle. | |

1. SysTick driver

Function definition:

|  |  |
| --- | --- |
| Name | Systick\_init |
| Input | void |
| Return | void |
| Description | Put max value in Reload register, put zero in Current register, in control register enable systick and use internal clock source. |

|  |  |
| --- | --- |
| Name | Systick\_wait1ms |
| Input | void |
| Return | void |
| Description | Put in reload register number of clock cycles per one ms (80000 in case of PLL), wait until current register reaches to zero and count bit in ctrl register is set to 1. |

d) UART drivers

Function definition:

|  |  |
| --- | --- |
| Name | UART7\_init |
| Input | void |
| Return | void |
| Description | Enable clock to UART, use clock divisor 16, use baud rate 9600, enable FIFO, use word length of 8 bit, enable alternative function select, enable PCTL for UART |

|  |  |  |
| --- | --- | --- |
| Name | UART7\_available | |
| Input | void | |
| Return | uint8 | UART\_availability |
| Description | Check if the FIFO of receiver is empty to receive data | |

|  |  |  |
| --- | --- | --- |
| Name | UART7\_sendbyte | |
| Input | uint8 | data |
| Return | void | |
| Description | Check if the FIFO of transmitter isn’t full, then write data to UART data register. | |

|  |  |  |
| --- | --- | --- |
| Name | UART7\_receivebyte | |
| Input | void | |
| Return | uint8 | data |
| Description | Wait until UART is available to receive , then return UART data register. | |

1. HAL Layer
2. Temperature sensor driver

Function definition:

|  |  |
| --- | --- |
| Name | Temperature\_Sensor\_Init |
| Input | void |
| Return | void |
| Description | Enable the TS bit included in called ADC init function to make the adc read value from temoerature sensor not from the input channels. |

|  |  |  |
| --- | --- | --- |
| Name | Read\_Temp\_Sensor\_Value | |
| Input | void |  |
| Return | uint8\_t Temperature value | |
| Description | Calculate the temperature value in Celsius by insert the value from data argument in ADC0\_SS3\_In into temperature equation . | |

1. Stepper motor driver

Function definition:

|  |  |
| --- | --- |
| Name | stepper\_init |
| Input | void |
| Return | void |
| Description | Enable port d to have 4 pins of motor driver  Included in port init function for port d  And initialize the first half step avoiding error in . |

|  |  |
| --- | --- |
| Name | step\_forword |
| Input | void |
| Return | void |
| Description | Make the stepper rotate completely 30 degrees clockwise |

|  |  |
| --- | --- |
| Name | step\_backword |
| Input | void |
| Return | void |
| Description | Make the stepper rotate completely 30 degrees anti clockwise |

1. LED driver

Function definition:

|  |  |
| --- | --- |
| Name | LED\_Init |
| Input | void |
| Return | void |
| Description | Enable PF4 PIN in Portf to be alternative function as analog pin And enable the PWM Device by Calling PWM init function . |

|  |  |  |
| --- | --- | --- |
| Name | LED\_Intensity | |
| Input | uint8 | duty\_cycle |
| range | 0 up to 100 for intensity percentage | |
| Return | void | |
| Description | Determine the intensity of the led . | |

1. OS Layer

Function definitions:

|  |  |
| --- | --- |
| Name | Send\_temperature |
| Input | void\* pointer |
| Return | void |
| Description | Read temperature from sensor from (read\_temp\_sensor\_value) and send it via UART7 |

|  |  |
| --- | --- |
| Name | Receive\_stepper\_command |
| Input | void\* pointer |
| Return | void |
| Description | If we receive ‘\*’ from UART7 then the coming data is stepper command, if we receive ‘1’ then rotate 30 clockwise, and if we receive ‘3’ then rotate 30 anticlockwise |

|  |  |
| --- | --- |
| Name | Receive\_LED\_intensity |
| Input | void\* pointer |
| Return | void |
| Description | If we receive ‘$’ from UART7 then the coming data is LED intensity, then we write intensity in ‘LED\_intensity’ function. |