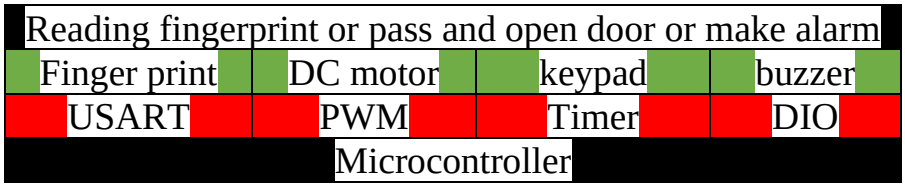
System description:

1. Description for whole system.
   This project of an embedded security door lock system is described with the help of a digital lock that is interfaced with a microcontroller. The principle aim of this embedded security door lock system is to enable a door with a security password and fingerprints .
   For this purpose, a power supply is intended for the complete security door circuit & microcontroller which are appropriate for the mechanism of the circuit. The other required devices in this project are a DC motor, buzzer , a keypad to enter the password& fingerprint sensor .
   To enter the door or exit its power supply is required, for entering "*" has to be pressed while for closing "#" has to be pressed. After pressing * or # password needs to be punched or right fingerprint . If the password matches the one entered in the microcontroller or the right finger then the microcontroller will pass the command and the door will be opened or locked. The password can be reset in the microcontroller.

2. System Architectural Pattern is Monolithic.
3. System Constrains

Layered Architecture

1. Layered Architecture diagram



2. Layer descriptions:
   i. MCAL :
      Consist from 4 modules
      A. USART for data transmission between fingerprint and microcontroller
      B. PWM to control DC motor
      C. Timer for delay
      D. DIO to control pins
   ii. On-bord
      Consist from 4 modules

A. Finger print : read finger and sent it to USART
B. DC motor to open the door
C. Keypad enter pass word and chick it
D. Buzzer to make sound

iii. Application layer

3. Layer type all of them are close

SW Data Type Tables

1. Global value

Name	Data_read
Type	Static uinte8
Range	8byit
Discerption	Read data from eerom

Name	Data_recored
Type	Static uinte8
Range	8byit
Discerption	Read data from fingerprint

SW layer

1. MCAL
   A. DIO
      a. Description : to initialize the pin as in input or output and read or write in pin
      b. APIs:

Name	Port_name
Type	Unsigned char
Range	0:8
Description	Port name in contraller

Name	Pin_number
Type	Unsigned char
Range	0:8
Description	pin number in port

Name	value
Type	Unsigned char
Range	0:8
Description	Read or write value

c.

Function name	DIO_intial		
Argument	input	Port_name	Unsigned char
		What port I will use	
		Pin number	Unsigned char
		What pin I will use	
		direction	Unsigned char
		Set it as input or out put	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Set pin and port ,write on pin, read from port		

Function name	DIO_write		
Argument	input	Port_name	Unsigned char
		What port I will use	
		Pin number	Unsigned char
		What pin I will use	
		value	Unsigned char(pointer)
		Write 1or 0	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Write 1or 0		

Function name	DIO_read		
Argument	input	Port_name	Unsigned char
		What port I will use	
		Pin number	Unsigned char
		What pin I will use	
		value	Unsigned char(pointer)
		Read pin value	
	Output	The value of pin	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Read from pin		

B. Timer

a. Description:set timer

b. APIS:

Name	timerConfig
Type	Structure
Range	0:28
Description	Timer number ,mode ,prescaler

c. APIS tables:

Function name	Timer_start		
Argument	input	Timer_con	Structure
		Timer number ,mode ,prescaler	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	no		
Description	Write 1or 0		

Function name	Timer_stop		
Argument	input	Timer_con	Structure
		Timer number ,mode ,prescaler	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	no		
Description	Write 1or 0		

C. PWM
   a. Description : motor controller
   b. APIS:

Name	PWM_con
Type	enum
Range	1:9
Description	start a PWM signal with the specified frequency and duty cycle

Name	a_pwm_config
Type	enum
Range	0:8
Description	Stop PWM

Name	ch
Type	enum
Range	0:8
Description	changing the duty cycle of specific

Name	duty
Type	foalt
Range	0:8
Description	Duty cycle

c.

Function name	PWM_start		
Argument	input	a_pwm_con	enum
		specified frequency and duty cycle	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	start a PWM signal with the specified frequency and duty cycle		

Function name	PWM_stop		
Argument	input	chanal	enum
		Chanal of PWM	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Stop PWM		

Function name	PWM_change_DutyCycle		
Argument	input	Channel	enum
		Selet timer pin	
		duty	Uint16
		New cycle number	
	Output	The value of pin	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Read from pin		

D. USART

a. Description :use to read and write in eerom

b.

Name	data
Type	Uinte8
Range	1:9
Description	Sent char

Name	size
Type	uinte
Range	0:8
Description	Size of string

Name	Re_cor
Type	Uinte8
Range	0:8
Description	Recored data in eerom

c.

Function name	UART_transmit		
Argument	input	data	Uinte8
		Reseve data	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	start a PWM signal with the specified frequency and duty cycle		

Function name	UART_receive	
Argument	input	No input
	Output	No output
return	Resaved data	
Synchronous	yes	
Reentrant	yes	
Description	Stop PWM	

Function name	UART_transmitString		
Argument	input	data	Uint8
		Data resave	
		size	Uint8
		Size of sending resave	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Read from pin		

Function name	UART_receiveString		
Argument	input	Drec_data	Uint8
		Data recored	
		size	Uint8
		Size of sending resave	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Read from pin		

2. On-Bored

A. EErom

a. Description : read and write from EErom

b.

Name	addr
Type	Uinte16
Range	0:8
Description	Give adress

Name	data
Type	Uinte8(pointer)
Range	0:8
Description	Hold data

Name	Size
Type	Uinte16
Range	0:8
Description	Size of data

Name	Received_data
Type	Uinte8
Range	0:8
Description	Read data

d.

Function name	EEPROM_init	
Argument	input	No input
	Output	No output
return	No return	
Synchronous	yes	
Reentrant	yes	
Description	Set pin and port ,write on pin, read from port	

Function name	EEPROM_write		
Argument	input	addr	Uint16
		Address to put data	
		data	Uint8
		Data to put	
		size	Uint16
		Size of data	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Write in EEprom		

Function name	EEPROM_read		
Argument	input	addr	Uint16
		Address to put data	
		reciveed	Uint8
		Data to out	
		size	Uint16
		Size of data	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	read in EEprom		

B. Keypad
   a. Description: control Keypad
   b. APIS: No API data table
   c. APIS tables:

Function name	KEYPAD_pressposition	
Argument	input	No input
	Output	No output
return	The position of the pressed key	
Synchronous	yes	
Reentrant	no	
Description	Get the pressed key position	

Function name	KEYPAD_keyRelaesed	
Argument	input	No input
	Output	No output
return	O / 1	
Synchronous	yes	
Reentrant	yes	
Description	See if key is pressed or not	

Function name	KEYPAD_getCharacter	
Argument	input	No input
	Output	No output
return	No returen	
Synchronous	yes	
Reentrant	yes	
Description	Get pressed key as char	

Function name	KEYPAD_getNumber	
Argument	input	No input
	Output	No output
return	Get pressed key number	
Synchronous	yes	
Reentrant	yes	
Description	Get pressed key as char	

C. Motor
   a. Description : control motor
   b. APIS:

Name	Motorconf
Type	structure
Range	1:4
Description	have pins,PWM,direction

Name	speed
Type	Uinte8
Range	0:8
Description	Motor speed

Name	direction
Type	enum
Range	0:1
Description	Motor dicrection

c.

Function name	Motor_int		
Argument	input	Motor_config	Structure
		Moter pin ,direction &speed	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Initialize moror		

Function name	Motor_start		
Argument	input	Motor_config	Structure
		Moter pin ,direction &speed	
		speed	Uinte8
		Motor speed	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Set motor		

Function name	Motor_stop		
Argument	input	Motor_config	Structure
		Moter pin ,direction &speed	
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Stop motor		

Function name	MOTOR_changeDirection		
Argument	input	Motor_config	Structure

		Moter pin ,direction &speed	
		dir	enum
	Output	No output	
return	No return		
Synchronous	yes		
Reentrant	yes		
Description	Change motor direction		

E. Finger print

a. Description :use to read fingerprint

d.

Name	data
Type	Uinte8
Range	1:9
Description	Sent data to usart

Name	leanth
Type	Uinte8
Range	0:8
Description	Leath of the data

Name	code
Type	Uinte8_t
Range	0:8
Description	Code for the sensor respond

Name	Buff_id
Type	Uinte16_t
Range	0:8
Description	The id of data to send in USRAT

Name	location
Type	Uinte16_t
Range	0:8
Description	The place where the data storage in EErpm

e.

Function name	sendcmd2fb	
Argument	input	comand
	Output	No output
return	Sucssed	
Synchronous	no	
Reentrant	no	
Description	Contorall fingerprint and display in LCD	

Function name	GET_id	
Argument	input	No input
	Output	No output
return	ids	
Synchronous	No	
Reentrant	No	
Description	Open finger print to save new finger	

Function name	enrol	
Argument	input	No input
	Output	No output
return	No	
Synchronous	no	
Reentrant	No	
Description	Save new finger print	

Function name	search	
Argument	input	No
	Output	No output
return	Finger id	
Synchronous	No	
Reentrant	No	
Description	See if the data have the finger or not	

F. lcd
   a. Description :LCD contraller

   b.

Name	X,y
Type	Int
Range	0:8
Description	Where to write

Name	string
Type	char
Range	0:100
Description	Data to write

c.

Function name	LCD_INTIAL	
Argument	input	no
	Output	No output
return	No	
Synchronous	yes	
Reentrant	yes	
Description	Make lcd work	

Function name	writeString	
Argument	input	string
	Output	No output
return	no	
Synchronous	yes	
Reentrant	yes	
Description	Open finger print to save new finger	

Function name	Setplace	
Argument	input	x,y
	Output	No output
return	No	
Synchronous	no	
Reentrant	No	
Description	Set LCD write place	

Function name	Delete	
Argument	input	No
	Output	No output
return	no	
Synchronous	No	
Reentrant	No	
Description	deletLCD	