Automotive Door Control System Design Project

Static Design Analysis

Developed By :

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PROJECT SPECIFICATION

1- Hardware Requirements

1- Two microcontrollers connected via CAN bus
2- One Door sensor (D)
3- One Light switch (L)
4- One Speed sensor (S)
5- ECU 1 connected to D, S, and L, all input devices
6- Two lights, right (RL) and left (LL)
7- One buzzer (B)
8- ECU 2 connected to RL, LL, and B, all output devices

2- Static design analysis

For ECU 1:

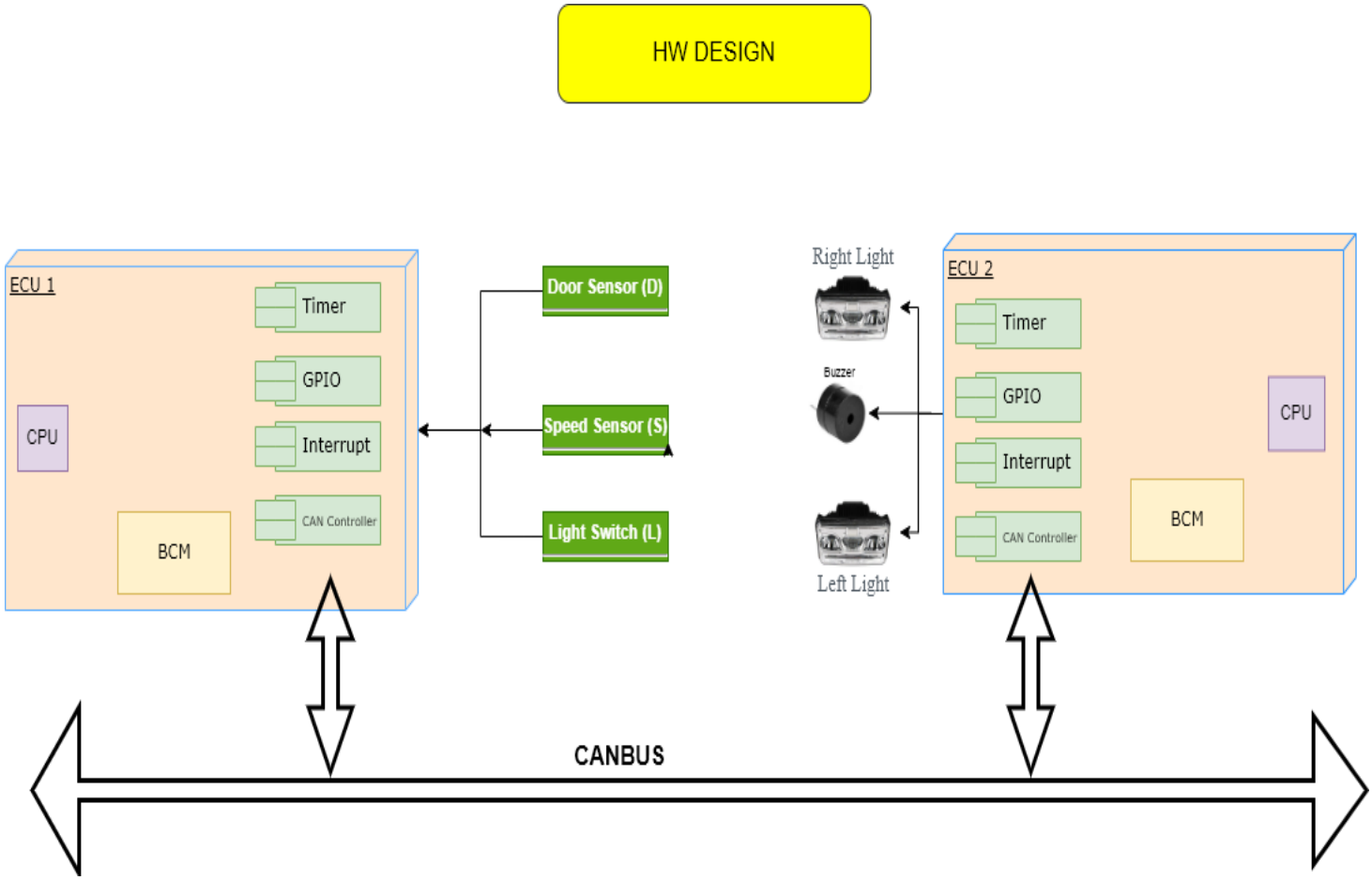
1. Make the layered architecture
2. Specify ECU components and modules
3. Provide full detailed APIs for each module as well as a detailed description for the used typedefs
4. Prepare your folder structure according to the previous points

For ECU 2:

1. Make the layered architecture
2. Specify ECU components and modules
3. Provide full detailed APIs for each module as well as a detailed description for the used typedefs
4. Prepare your folder structure according to the previous points

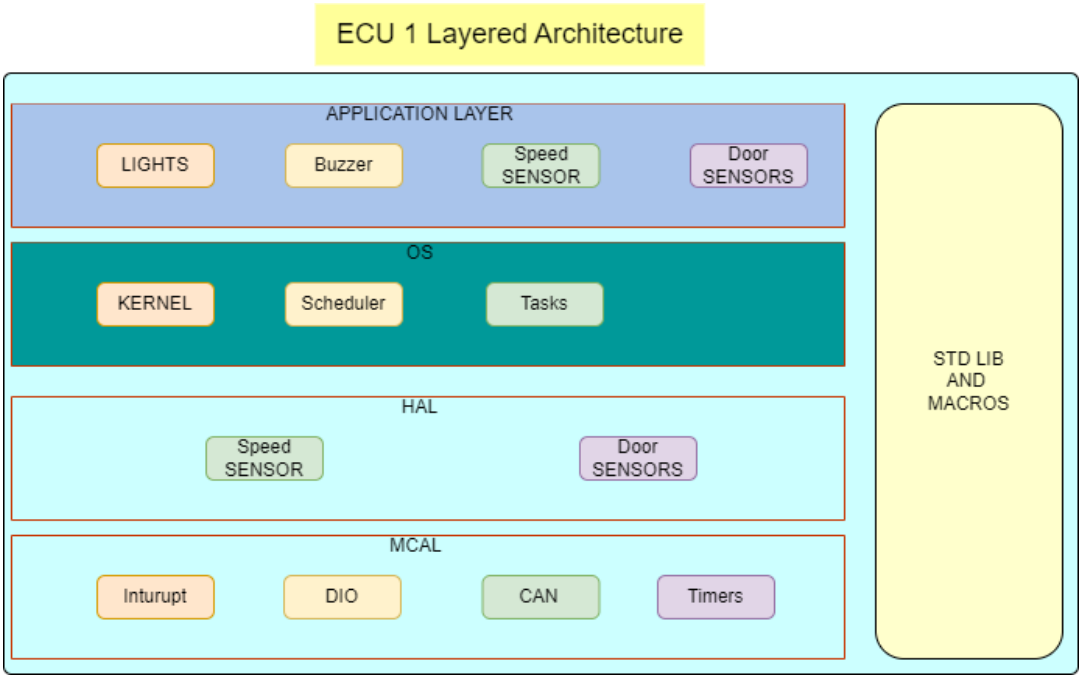
PROJECT Development

1-Hardware Design Block Diagram

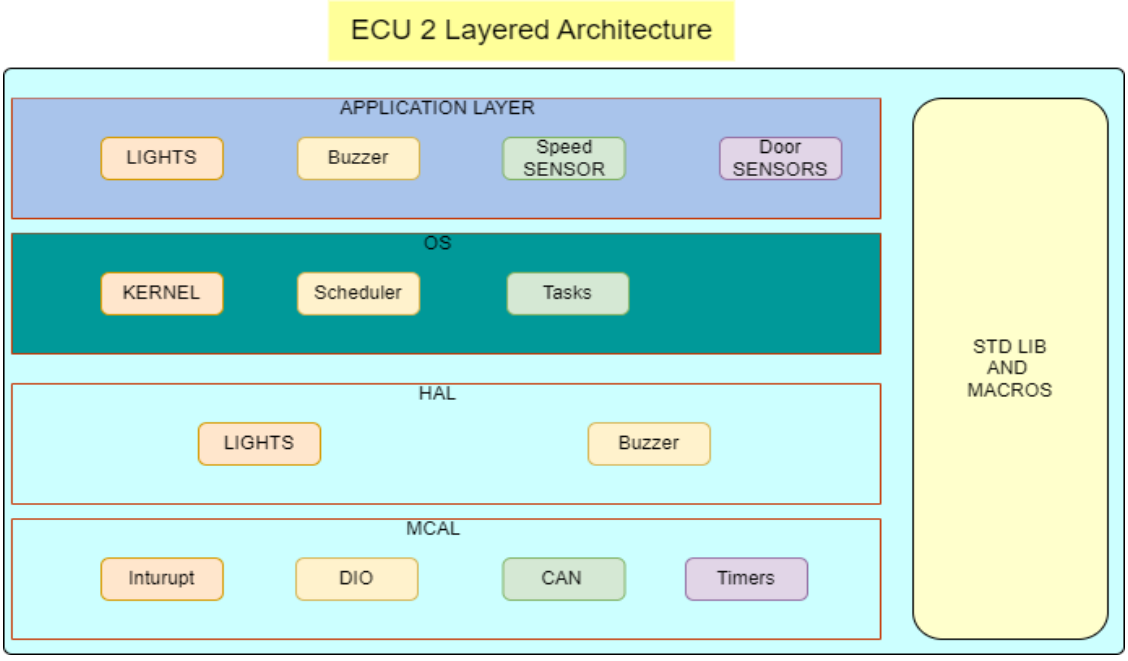


2-Layered Architecture

FOR ECU 1



FOR ECU 2



3-ECU Component and Modules

FOR ECU 1

ECU1 has 6 modules :

1- DIO module 2-CAN Module 3- Timer Module 4- Interrupt Module

5-speed sensor Module 6- Door Switch Module

FOR ECU 2

ECU2 has 6 modules :

1-DIO module 2-CAN Module 3- Timer Module 4- Interrupt Module

5-Lights Module 6- Buzzer Module

4- Provide full detailed APIs for each module as well as a detailed description for the used typedefs for ECU1 & ECU2

1. DIO Module

1 TypeDefs			
Name	**Type**	**range**	**Discription**
DIO_PinLevel	Enum	Low :0 High : 1	
DIO_PinDir	Enum	Input :0 Output : 1	
DIO_PinDigEnType	Enum	Disable :0 Enable : 1	
DIO_PortIDType	Enum	From(0 - 2)	Port A to Port C
DIO_PinIDType	Enum	From(0 - 7)	Pin 0 to Pin 7

2 Dio API			
Function Name	**Arguments**	**range**	**Discription**
DIO_Init	GPIO_CfgPtr		**Pointer to cfg parameter**
DIO_PinWrite	Pin_id Port_id Pin_Level	DIO_PinIDType DIO_PortIDType DIO_PinLevel	
DIO_PinRead	Pin_id Port_id	DIO_PinIDType DIO_PortIDType	**Return pin level type (High :low)**

2. CAN Module

1 TypeDefs			
Name	**Type**	**range**	**Discription**
Can_ch	Enum	Ch1 :0 Ch2 : 1	

2 CAN API			
Function Name	**Arguments**	**range**	**Description**
CAN_Init	Can_ch		
CAN_SendMessage	- Can_ch type - *pointer to messsage	**Ch1 or Ch2**	**Return 1 send ok** **0 send failed**
CAN – Receivemessage	- Can_ch type	**Ch1 or Ch2**	**Return Message that received** **-1 if receive failed**

3. **Timer Module**

1 TypeDefs			
Name	**Type**	**range**	**Description**
TIM_CH	Enum	TIMER0 0 TIMER1 1 TIMER2 2	
Tim_COUNT_DIR	Enum	up :0 Down : 1	
TIM_sense	Enum	LEVEl :0 Edge : 1	
TIM_LOAD	Uint32	From(0 - 2 ^31)	

2 TimerAPI			
Function Name	**Arguments**	**range**	**Description**
TIMER_Init	TIM_CH		
Timer_start	TIM_CH	TIMER0 TIMER1 TIMER2	
Timer_stop	- TIM_CH	TIMER0 TIMER1 TIMER2	

4. **Interrupt Module**

1 TypeDefs			
Name	**T**ype	**r**ange	**Description**
EXT_Int_ch	Enum	INT0 0 INT 1 1 INT 2 2	
INT_EN_BIT	Enum	0:7	
INT_sense	Enum	Low LEVEl :0 Logic change : 1 Faling Edge :2 Rising Edge:3	

2 Interrupt API			
Function Name	**Arguments**	**range**	**Description**
EN_Glpl_Int	void		
Enable_Ext_INT	EXT_Int_ch	TIMER0 TIMER1 TIMER3	
Disable_Ext_INT	EXT_Int_ch	TIMER0 TIMER1	

		TIMER3	
INT_SensCfg	EXT_Int_ch INT_sense	Low LEVEl :0 Logic change : 1 Faling Edge :2 Rising Edge:3	

5. Door Module

1 TypeDefs			
Name	**Type**	**range**	**Discription**
Door_status	Enum	Is_closed :0 Is_opend : 1	

2 Door API			
Function Name	**Arguments**	**range**	**Description**
Door_Init	Non		
Door_read_status	- non		**Return** Is_closed :0 Is_opend : 1

6. Speed Sensor

1 TypeDefs			
Name	**Type**	**range**	**Discription**
speed_status	Enum	Is_stoped :0 Is_moving : 1	

2 Speed API			
Function Name	**Arguments**	**range**	**Description**
Speed_sens_Init	Non		
Speed_read_status	- non		**Return** Is_stoped :0 Is_moving : 1

7. Buzzer Module

1 TypeDefs			
Name	**Type**	**range**	**Discription**
Buzzer_status	Enum	Buz_off :0 Buz_On : 1	

2 Buzzer API			
Function Name	**Arguments**	**range**	**Description**
Buzer_Init	Non		
Buzer_set_status	Buz_off :0 Buz_On : 1		

8. Light Module

1 TypeDefs			
Name	**Type**	**range**	**Discription**
Light_status	Enum	Light_off :0 Light_On : 1	

2 Light API			
Function Name	**Arguments**	**range**	**Description**
Light _Init	Non		
Light _set_status	Light_off :0 Light_On : 1		