Automotive door control system design

STATIC DESIGN

System Block Diagram:

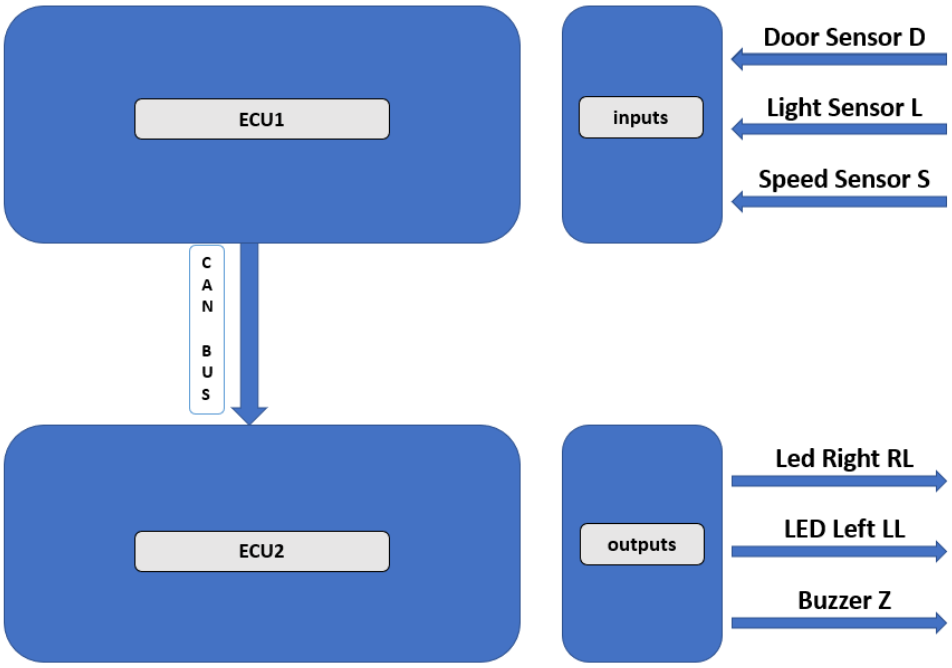

Figure 1: System Block Diagram

ECU1 Layered Architecture:

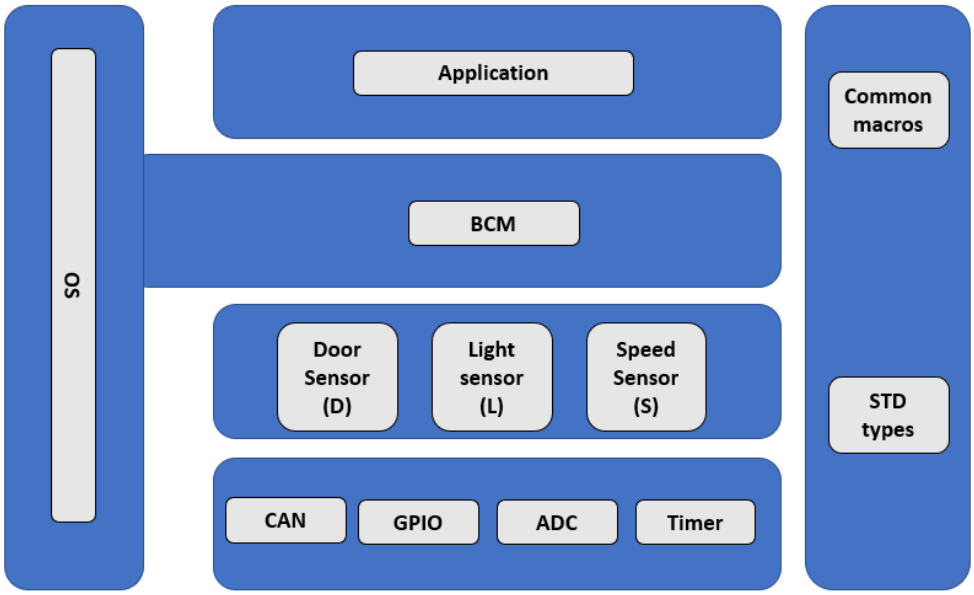

Figure 2: ECU1 Layered Architecture Diagram

ECU1 Components and modules:

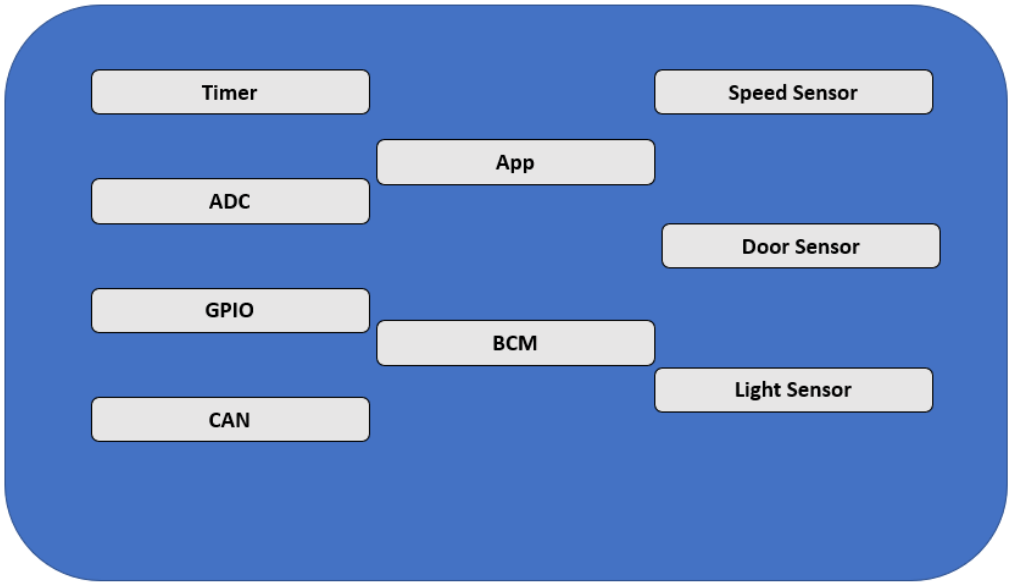

Figure 3: ECU1 components and modules

ECU2 Layered Architecture:

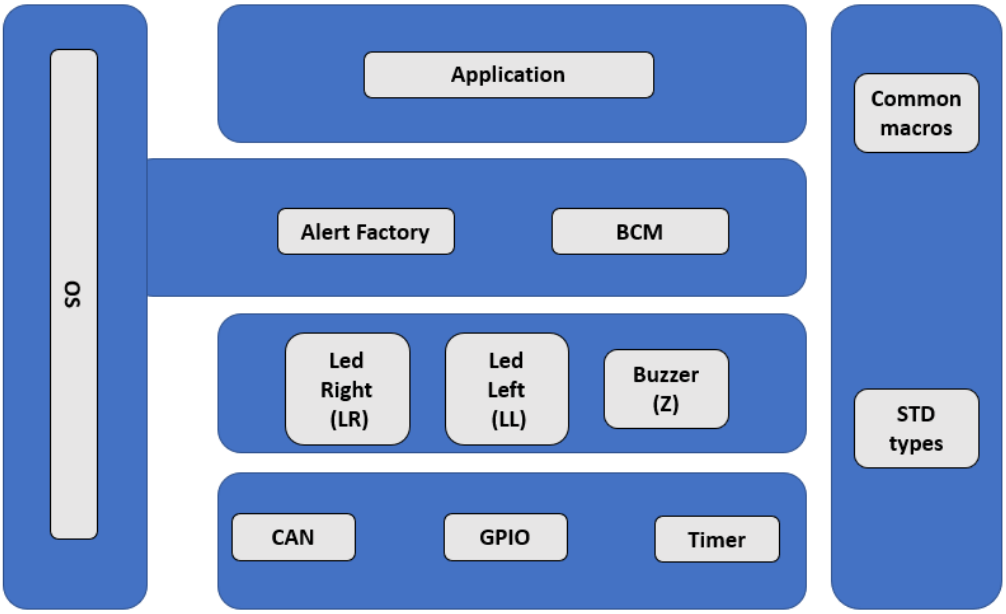

Figure 4: ECU2 Layered Architecture Diagram

ECU2 Components and modules:

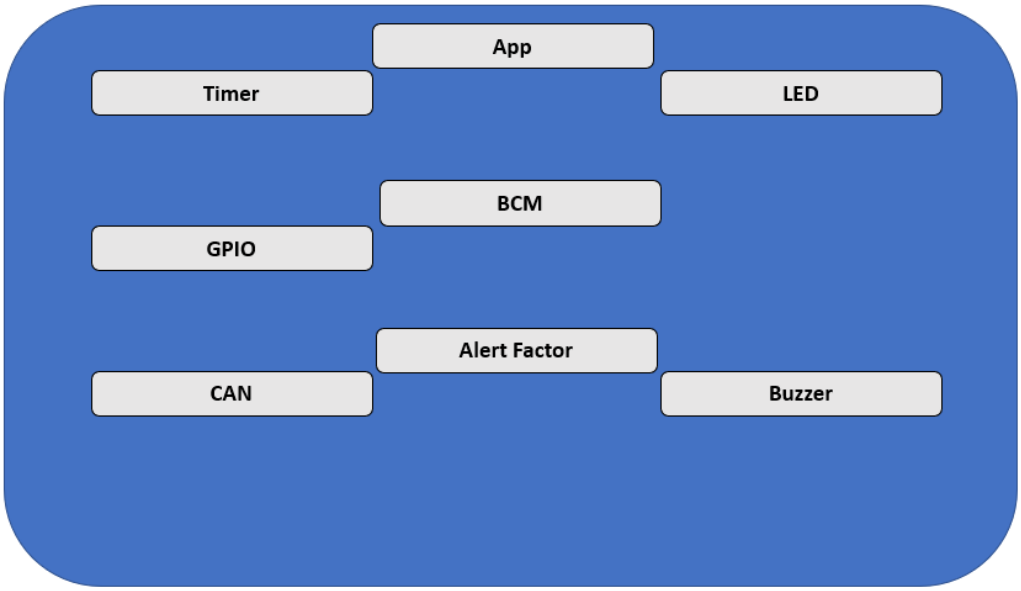

Figure 5: ECU2 Components and modules

APIs and Typedefs:

DIO API: ECU1 & ECU2

Function name	DIO_Init
API type	Initialization
Parameters (inputs)	DIO_Cfg_type
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Initialize the DIO Component

Function name	DIO_ReadChannel
API type	Getter
Parameters (inputs)	channelId
Parameters (outputs)	None
Return	DIOlevel
Description	Read DIO Channel

Function name	DIO_FlipChannel
API type	Setter
Parameters (inputs)	channelId
Parameters (outputs)	None
Return	Void
Description	Toggle DIO Channel

DIO TYPEDEF:

Name	PinLevel	
Type	Enumeration	
Range	Low	0
	High	1
Description	Levels for channel	

Name	PortNum
Type	Enumeration
Range	{PORTA, ..., PORTF} = {0, ..., 5}
Description	Ports numbers

Name	PinNum
Type	Enumeration
Range	{Pino, …, Pin7} = {0, …, 7}
Description	Pins numbers

Name	DIO_Cfg_type
Type	Structure
Elements	PinNum
	PortNum
	PinLevel
Description	Configuration structure for DIO Component

TIMER APIS AND TYPEDEFS: ECU1 & ECU2

Function name	Timer_Init
API type	Initialization
Parameters (inputs)	Timer_ConfigurationType
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Initialize the Timer Component

Function name	Timer_Start
API type	-
Parameters (inputs)	TimerID , Period
Parameters (outputs)	None
Return	Void
Description	Start Specific timer with certain period in ms

Function name	Timer_Stop
API type	-
Parameters (inputs)	TimerID
Parameters (outputs)	None
Return	Void
Description	Stop imer

Name	Timer_Configurationtype
Type	Structure
Elements	Timer_Channel
	Timer_Mode
	Timer_PointerToHandler
Description	Configuration structure for Timer Component

CAN APIS AND TYPEDEFS: ECU1 &ECU2

Function name	CAN_Init
API type	Initialization
Parameters (inputs)	CAN_ConfigurationType
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Initialize the CAN Component

Function name	CAN_SEND
API type	Setter
Parameters (inputs)	U8Data, MsgID
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Load character with specific Message ID on CAN Bus

Function name	CAN_Read
API type	Getter
Parameters (inputs)	None
Parameters (outputs)	None
Return	U8Data
Description	Read Message with specific ID from CAN BUS

Name	CAN_Configurationtype
Type	Structure
Elements	CAN_BaudRate
	CAN_RecMsgID
Description	Configuration structure for CAN Component

ADC APIS AND TYPEDEFS: ECU1

Function name	ADC_Init
API type	Initialization
Parameters (inputs)	ADC_ConfigurationType
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Initialize the ADC Component

Function name	ADC_Read
API type	Getter
Parameters (inputs)	ChannelID
Parameters (outputs)	None
Return	U16Data
Description	Read ADC channel value

Name	ADC_Configurationtype
Type	Structure
Elements	ChannelMode
Description	Configuration structure for ADC Component

BASIC COMMUNICATION MODULE (BCM) APIS: ECU1

Function name	BCM_Init
API type	Initialization
Parameters (inputs)	BCM_ConfigurationType
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Initialize the BCM Module by initializing CAN Component

Function name	BCM_Write	
API type	Setter	
Parameters (inputs)	MsgID	Sensor ID {0,1,2}
	MsgData	State of sensor
Parameters (outputs)	None	
Return	E_OK	
	E_NOK	
Description	Send state msg from each sensor to ECU2	

Name	BCM_Configurationtype
Type	Structure
Elements	CAN_Configurationtype
	Transmission rate in ms
Description	Configuration structure for BCM Component

BASIC COMMUNICATION MODULE (BCM) APIS: ECU2

Function name	BCM_Read
API type	Getter
Parameters (inputs)	None
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Read Msg from ECU1 and parse it to RTOS Queue According to message ID

ALARM MANAGER APIS AND TYPEDEFS: ECU2

Function name	AlarmManager_init
API type	Initialization
Parameters (inputs)	AlarmManager_configuration
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Init alarm manager with lights and buzzer configurations

Function name	Lighs_ON
API type	Setter
Parameters (inputs)	None
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Turn Right and left LED on

Function name	Lighs_OFF
API type	Setter
Parameters (inputs)	None
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Turn Right and left LED off

Function name	Alarm_ON
API type	Setter
Parameters (inputs)	None
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Turn Buzzer on

Function name	Alarm_OFF
API type	Setter
Parameters (inputs)	None
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Turn Buzzer off

DOOR SENSOR APIS: ECU1

Function name	Read_Door_Sensor	
API type	Getter	
Parameters (inputs)	None	
Parameters (outputs)	None	
Return	Opened	1
	Closed	0
Description	Read Door sensor state	

Function name	DoorSensor_Init
API type	Initialization
Parameters (inputs)	ChannelID
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Initialize the Door Sensor Component

SPEED SENSOR APIS: ECU1

Function name	Read_Speed_Sensor
API type	Getter
Parameters (inputs)	None
Parameters (outputs)	None
Return	SpeedValue
Description	Read Speed sensor Value

Function name	SpeedSensor_Init	
API type	Initialization	
Parameters (inputs)	ChannelID	
Parameters (outputs)	None	
Return	E_OK	
	E_NOK	
Description	Initialize the Speed Sensor Component	

LIGHTS SWITCH APIS: ECU1

Function name	Read_Lights_Swittcch	
API type	Getter	
Parameters (inputs)	None	
Parameters (outputs)	None	
Return	ON	1
	OFF	0
Description	Read Lights Switch state	

Function name	LightsSwitch_Init
API type	Initialization
Parameters (inputs)	ChannelID
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Initialize the Lights Switch Component

BUZZER APIS: ECU2

Function name	Buzzer_On
API type	Setter
Parameters (inputs)	PinNum , PortNum
Parameters (outputs)	None
Return	Void
Description	Turn Buzzer on

Function name	Buzzer_Off
API type	Setter
Parameters (inputs)	PinNum , PortNum
Parameters (outputs)	None
Return	Void
Description	Turn Buzzer off

Function name	Buzzer_Init
API type	Initialization
Parameters (inputs)	PinNum , PortNum
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Initialize the Buzzer Component

LED APIS: ECU2

Function name	LED_On
API type	Setter
Parameters (inputs)	PinNum , PortNum
Parameters (outputs)	None
Return	Void
Description	Turn LED on

Function name	LED_Off
API type	Setter
Parameters (inputs)	PinNum , PortNum
Parameters (outputs)	None
Return	Void
Description	Turn LED off

Function name	LED_Init
API type	Initialization
Parameters (inputs)	PinNum , PortNum
Parameters (outputs)	None
Return	E_OK
	E_NOK
Description	Initialize the LED Component