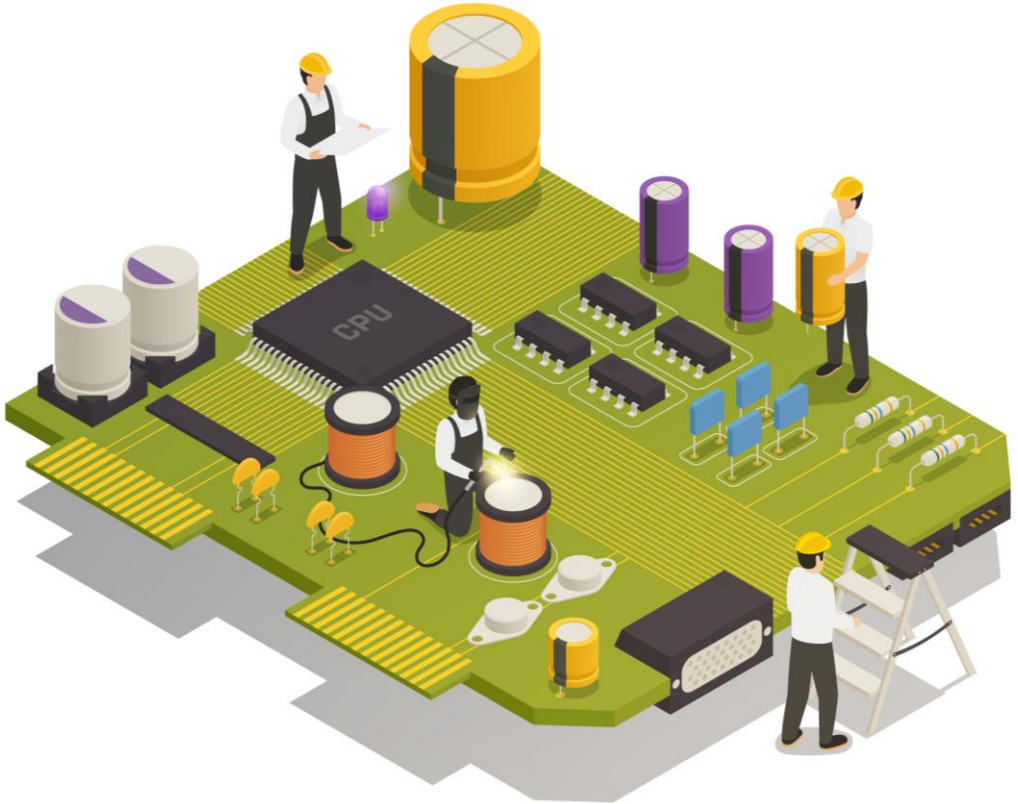
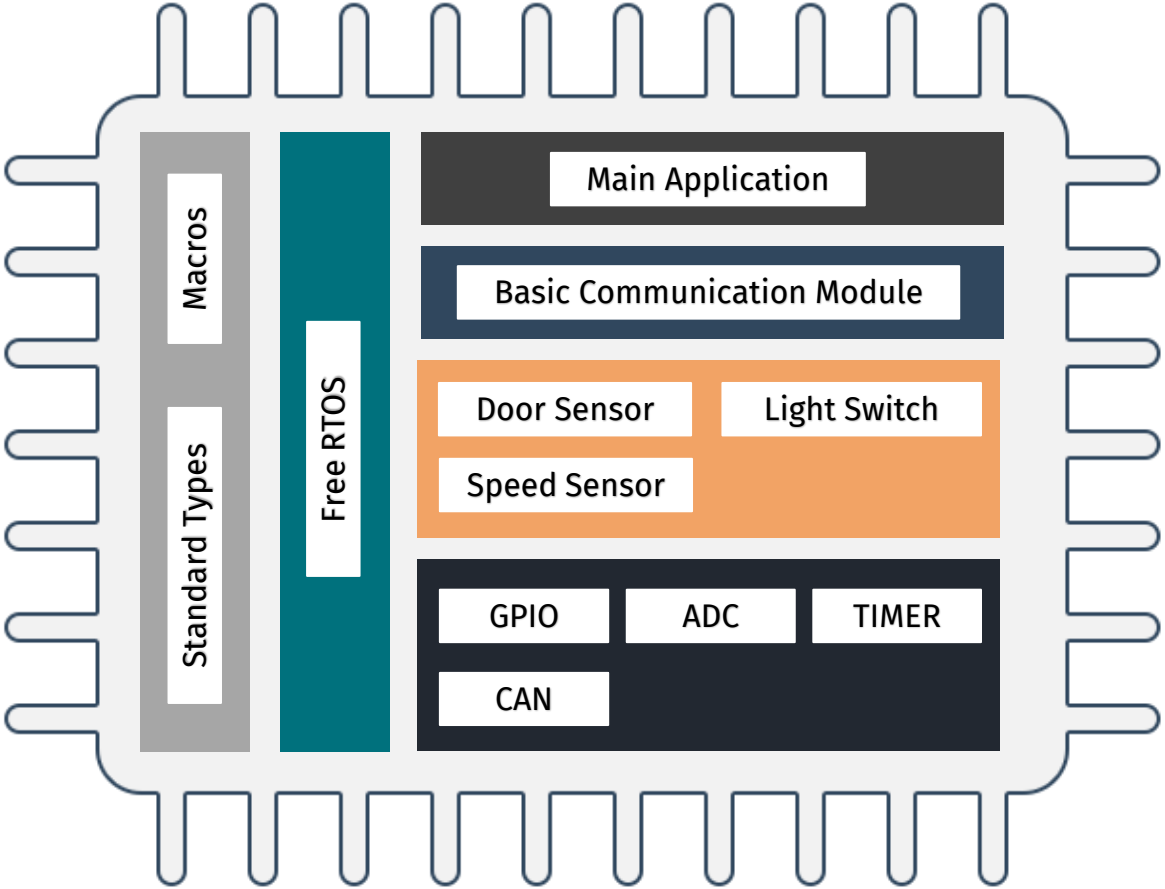
Dynamic Desgin



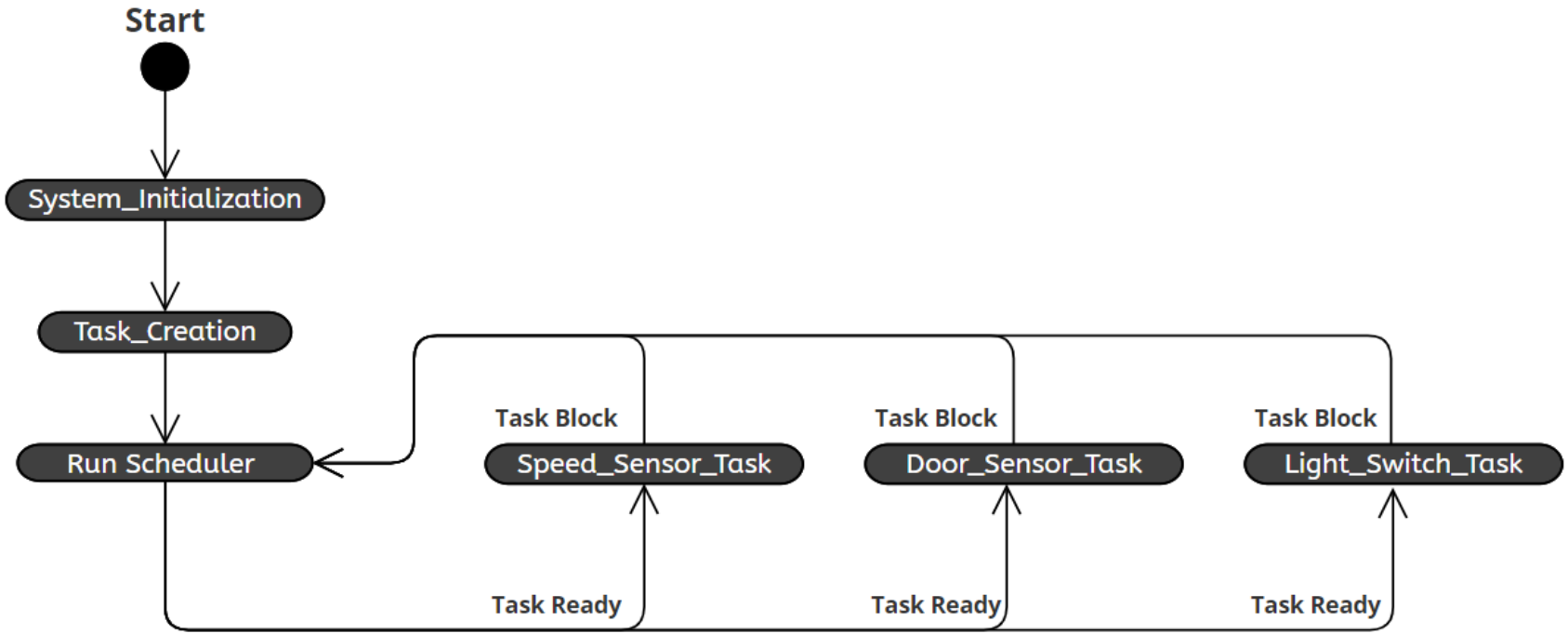
Made By : **Khaled El-Sayed**

First Microcontroller

- Application
- Service
- HAL
- MCAL
- Operating System
- Library



State Machine Diagram

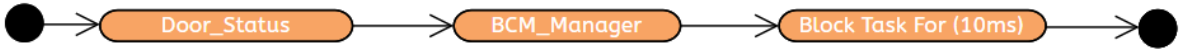


State Machine Diagram

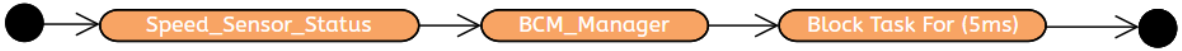
ECU 1 : System_Initialization(void);

ECU 1 : Light_Switch_Task(void);

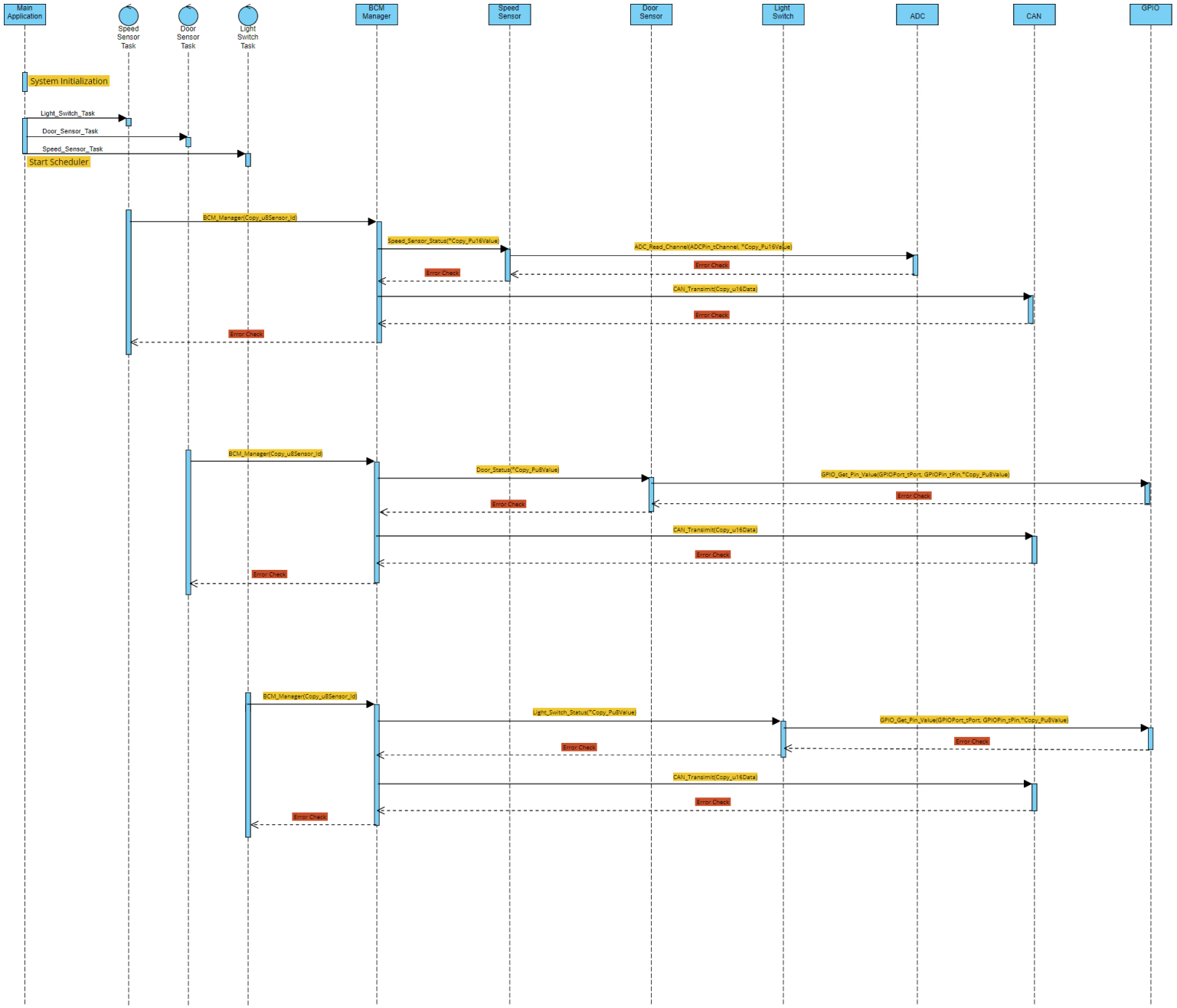
ECU 1 : Door_Sensor_Task(void);



ECU 1 : Speed_Sensor_Task(void);



Sequence Diagram


Main Application
Speed Sensor Task
Door Sensor Task
Light Switch Task
BCM Manager
Speed Sensor
Door Sensor
Light Switch
ADC
CAN
GPIO
System Initialization
Light_Switch_Task
Door_Sensor_Task
Speed_Sensor_Task
Start Scheduler
BCM_Manager(Copy_u8Sensor_Id)
Speed_Sensor_Status(*Copy_Pu16Value)
ADC_Read_Channel(ADCPin_tChannel, *Copy_Pu16Value)
Error Check
CAN_Transimit(Copy_u16Data)
BCM_Manager(Copy_u8Sensor_Id)
Door_Status(*Copy_Pu8Value)
GPIO_Get_Pin_Value(GPIOPort_tPort, GPIOPin_tPin,*Copy_Pu8Value)
CAN_Transimit(Copy_u16Data)
BCM_Manager(Copy_u8Sensor_Id)
Light_Switch_Status(*Copy_Pu8Value)
GPIO_Get_Pin_Value(GPIOPort_tPort, GPIOPin_tPin,*Copy_Pu8Value)
CAN_Transimit(Copy_u16Data)

CPU Load

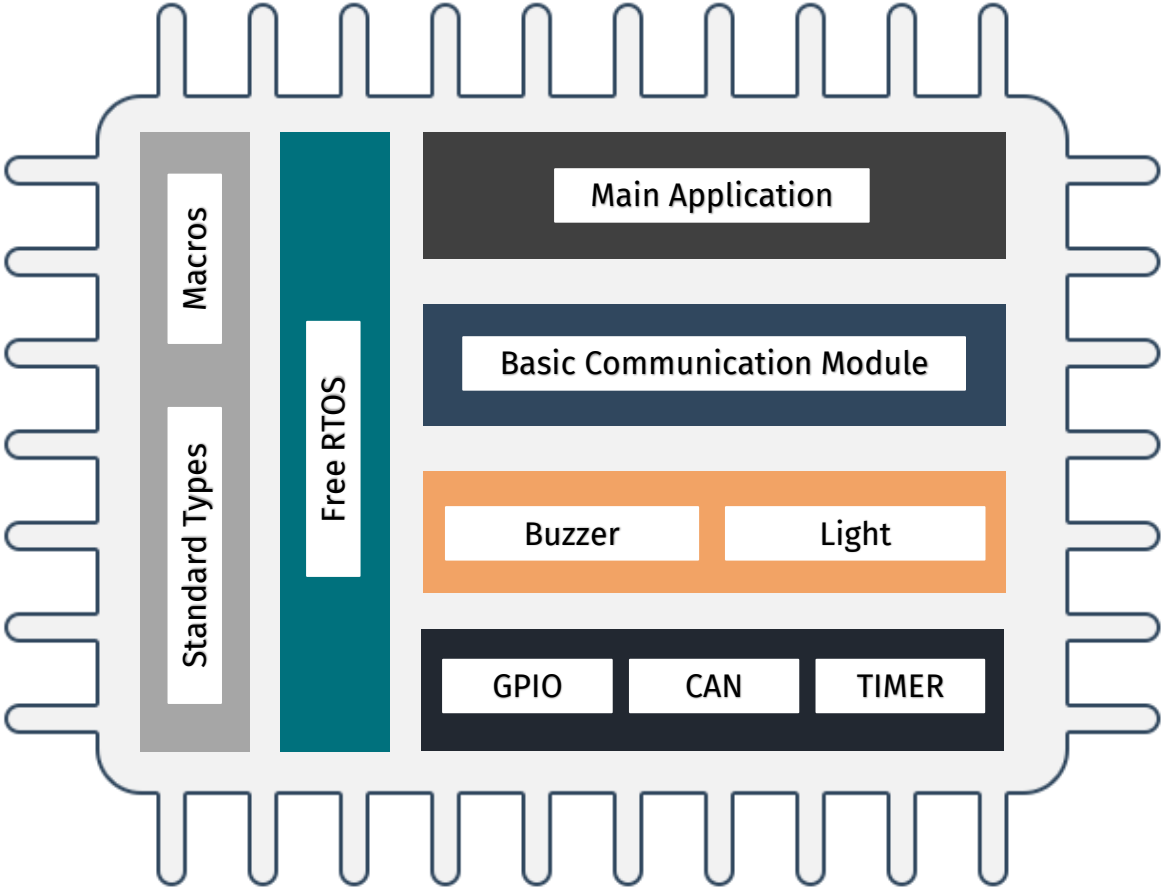
Task Name	Periodicity	Execution Time
Light_Switch_Task()	20 ms	1 ms
Door_Sensor_Task()	10 ms	1 ms
Speed_Sensor_Task()	5 ms	1 ms

Assuming That Execution Time Of All Tasks = 1 ms

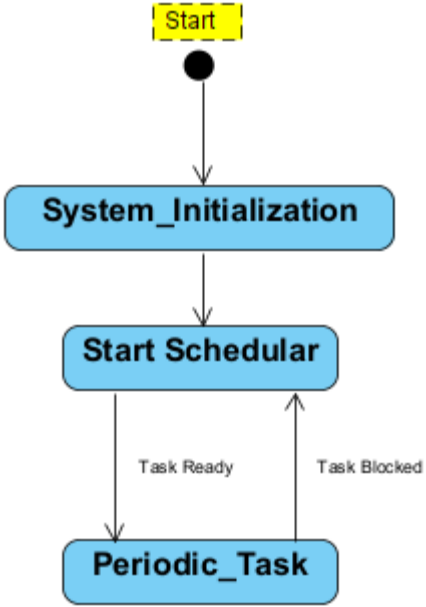
∴ Hyper Period = 20 ms
∴ CPU Load = (Busy Time / Hyper Period) * 100 = ((1 + 2 + 4) / (20)) * 100 = 35 %

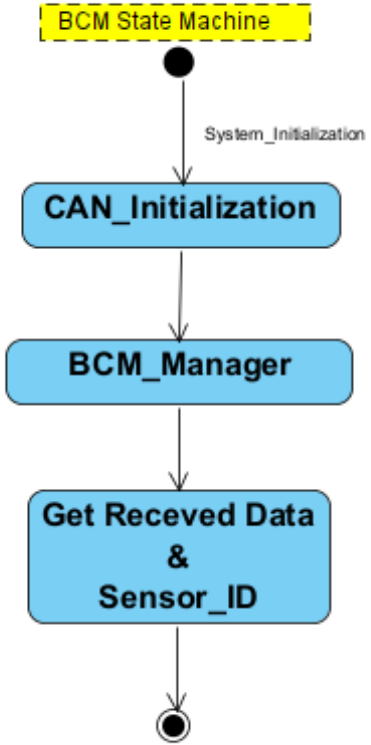
Second Microcontroller

- Application
- Service
- HAL
- MCAL
- Operating System
- Library

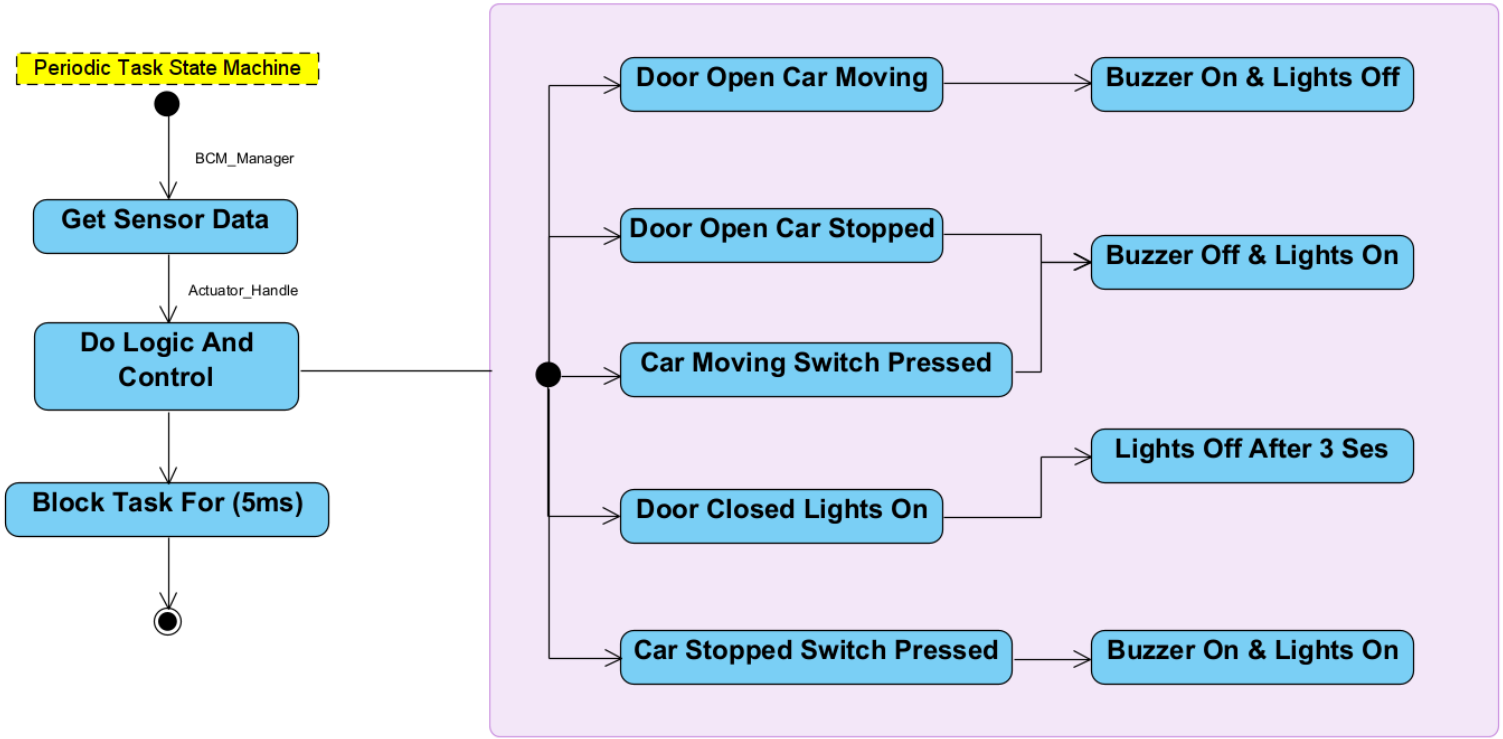


State Machine Diagram

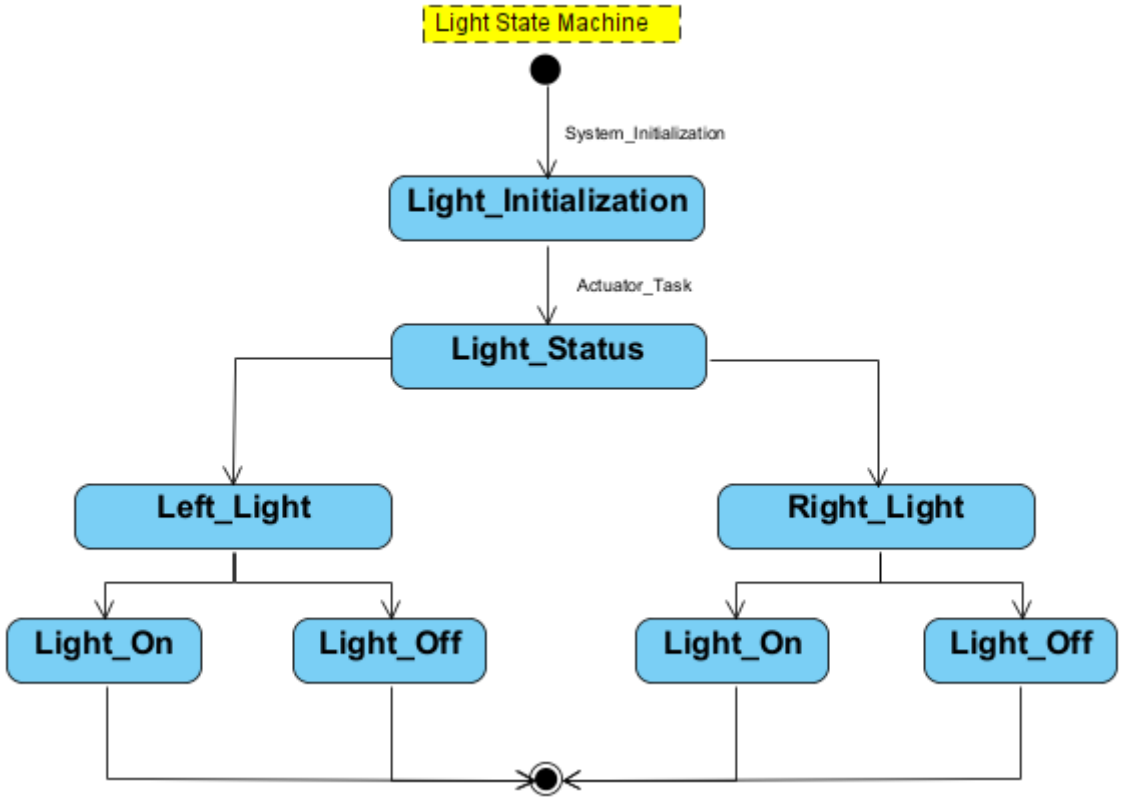




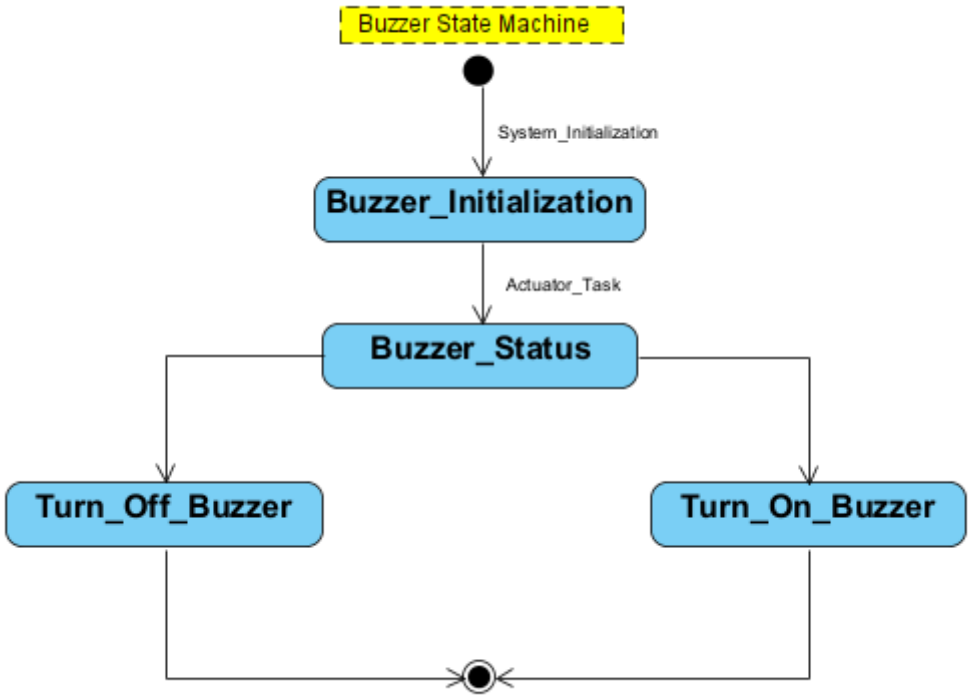
State Machine Diagram



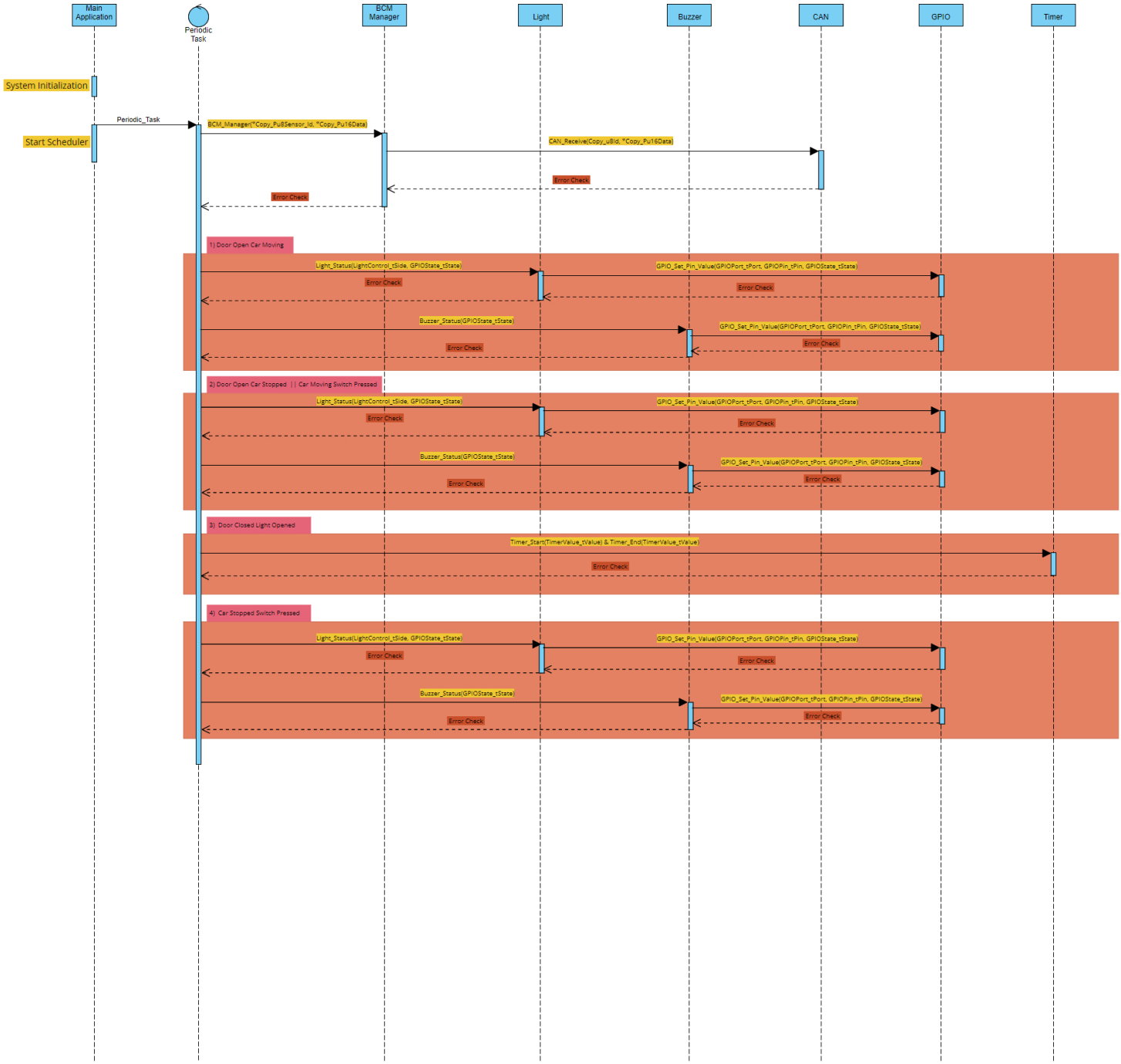
State Machine Diagram



State Machine Diagram



Sequence Diagram


Main Application
Periodic Task
BCM Manager
Light
Buzzer
CAN
GPIO
Timer
System Initialization
Start Scheduler
Periodic_Task
BCM_Manager(*Copy_Pu8Sensor_Id, *Copy_Pu16Data)
CAN_Receive(Copy_u8Id, *Copy_Pu16Data)
Error Check
Error Check
1) Door Open Car Moving
Light_Status(LightControl_tSide, GPIOState_tState)
GPIO_Set_Pin_Value(GPIOPort_tPort, GPIOPin_tPin, GPIOState_tState)
Error Check
Error Check
Buzzer_Status(GPIOState_tState)
GPIO_Set_Pin_Value(GPIOPort_tPort, GPIOPin_tPin, GPIOState_tState)
Error Check
Error Check
2) Door Open Car Stopped || Car Moving Switch Pressed
Light_Status(LightControl_tSide, GPIOState_tState)
GPIO_Set_Pin_Value(GPIOPort_tPort, GPIOPin_tPin, GPIOState_tState)
Error Check
Error Check
Buzzer_Status(GPIOState_tState)
GPIO_Set_Pin_Value(GPIOPort_tPort, GPIOPin_tPin, GPIOState_tState)
Error Check
Error Check
3) Door Closed Light Opened
Timer_Start(TimerValue_tValue) & Timer_End(TimerValue_tValue)
Error Check
4) Car Stopped Switch Pressed
Light_Status(LightControl_tSide, GPIOState_tState)
GPIO_Set_Pin_Value(GPIOPort_tPort, GPIOPin_tPin, GPIOState_tState)
Error Check
Error Check
Buzzer_Status(GPIOState_tState)
GPIO_Set_Pin_Value(GPIOPort_tPort, GPIOPin_tPin, GPIOState_tState)
Error Check
Error Check

CPU Load

Task Name	Periodicity	Execution Time
Periodic_Task()	5 ms	1 ms

Assuming That Execution Time Of All Tasks = 1 ms

∴ Hyper Period = 5 ms
∴ CPU Load = (Busy Time / Hyper Period) * 100 = ((1) / (5)) * 100 = 20 %