Automotive door control system

Contents

I. Overview of system components

A. ECU 1

ECU 1 is a microcontroller responsible for receiving data from three sensors

- The vehicle speed (Analog input with the speed value)
- The light switch (A digital input switch has two states on or off)
- Door state sensor (detect if the door is closed or open)

And resend the data received from the sensors to ECU 2 Via can bus

B. ECU 2

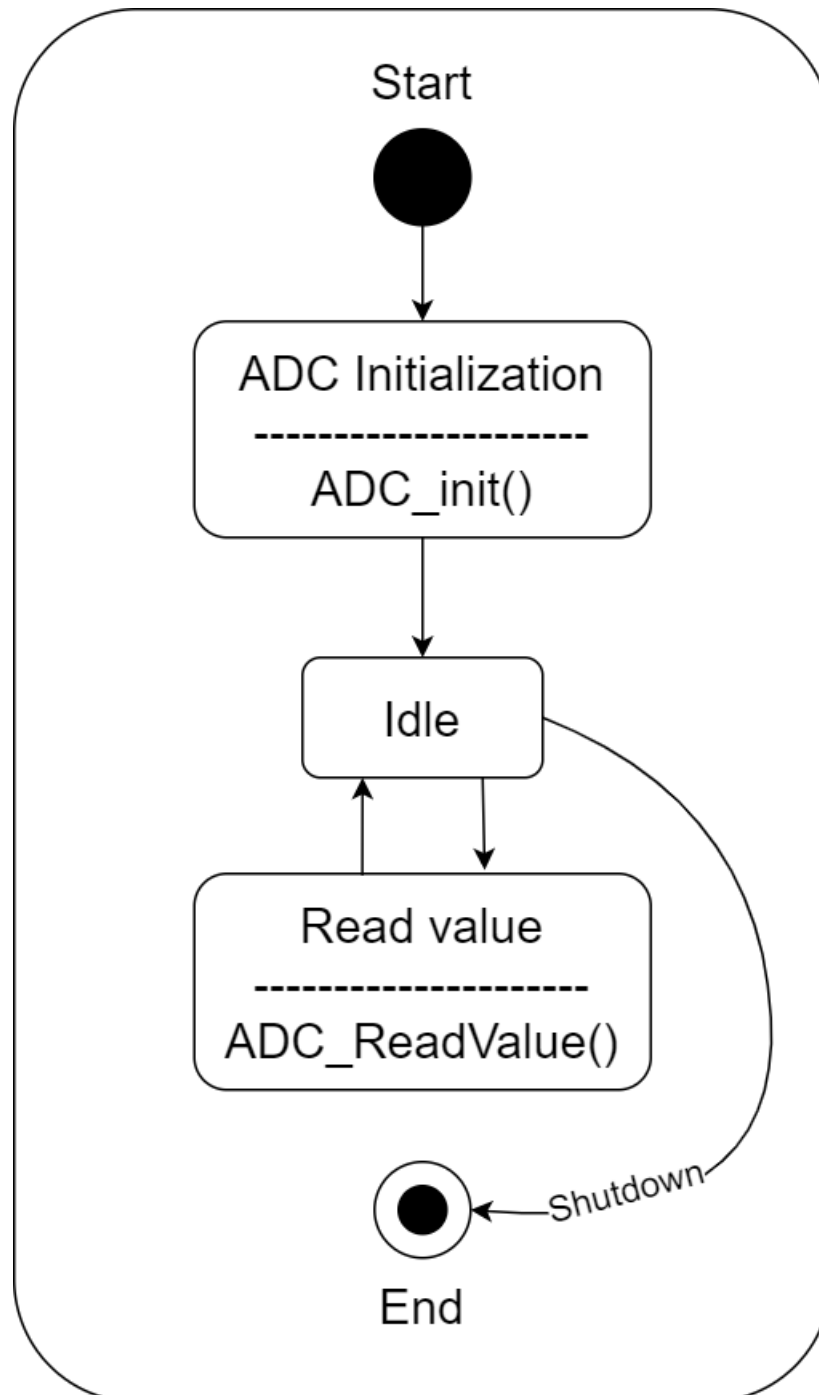ECU 2 is a microcontroller responsible for controlling three devices

- Left lights (by a switch with two states ON/OFF   )
- Right lights (by a switch with two states ON/OFF)
- The buzzer

ECU 2 also take the decision according to the received data from ECU.1
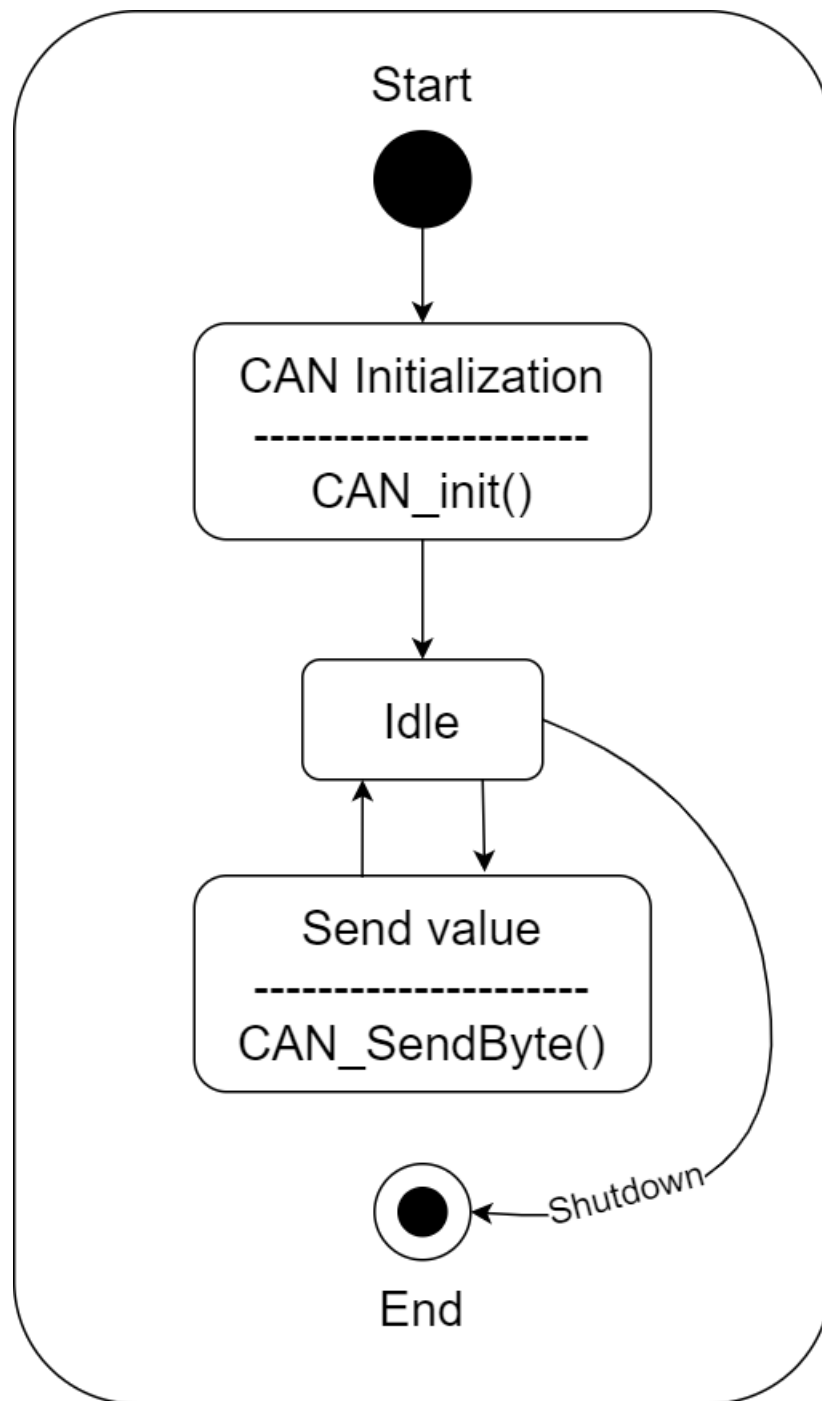
II. State machine diagram

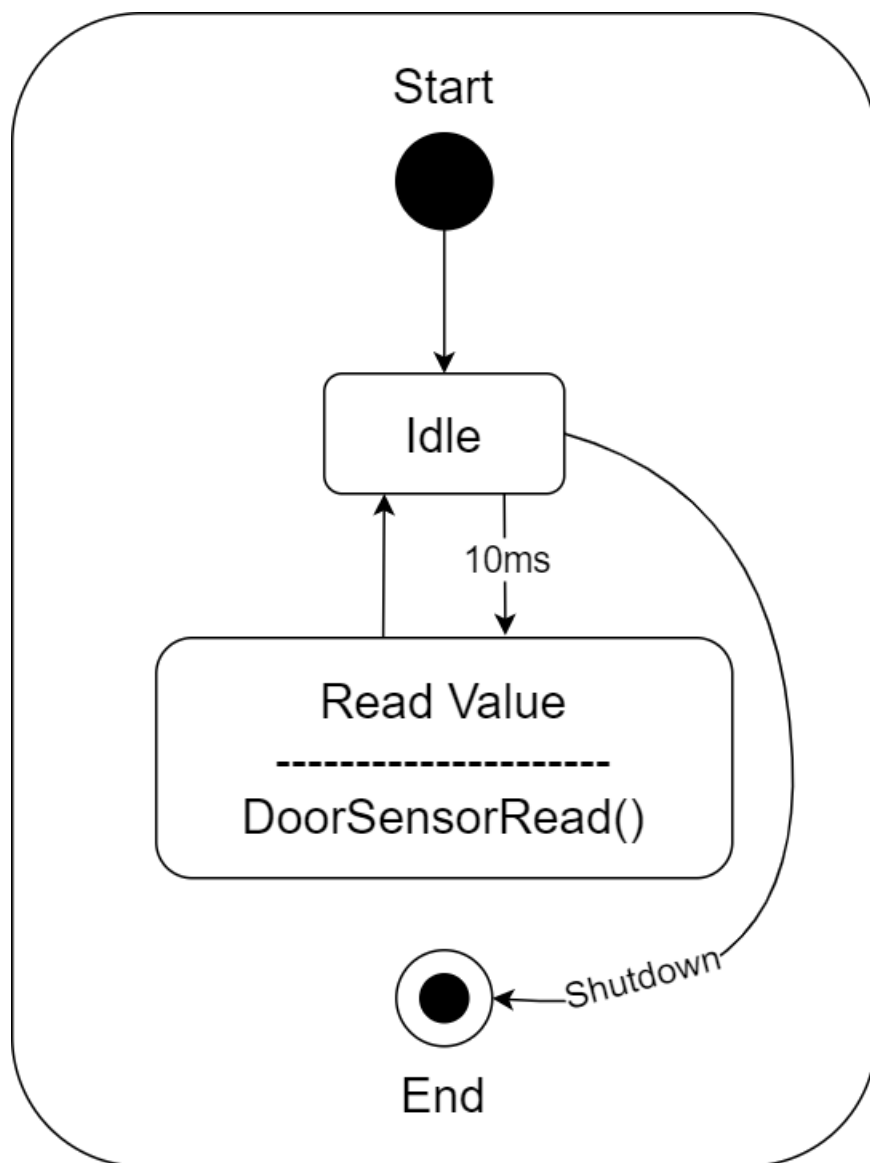## A. ECU 1 state machine diagram for each component

ADC

CAN Send

Door Switch

Start

Idle

10ms

Read Value

DoorSensorRead()

Shutdown

End
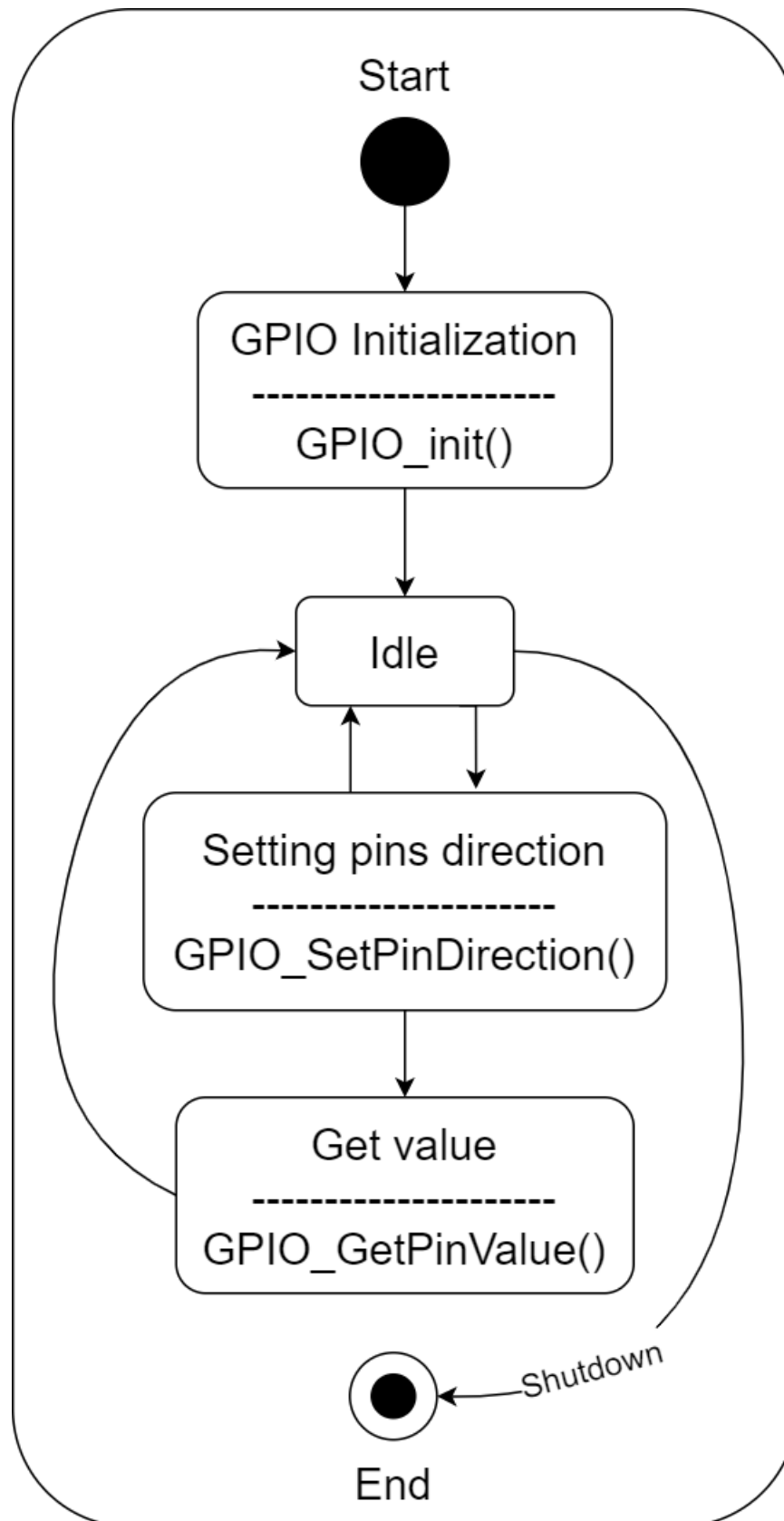
GPIO

Speed sensor
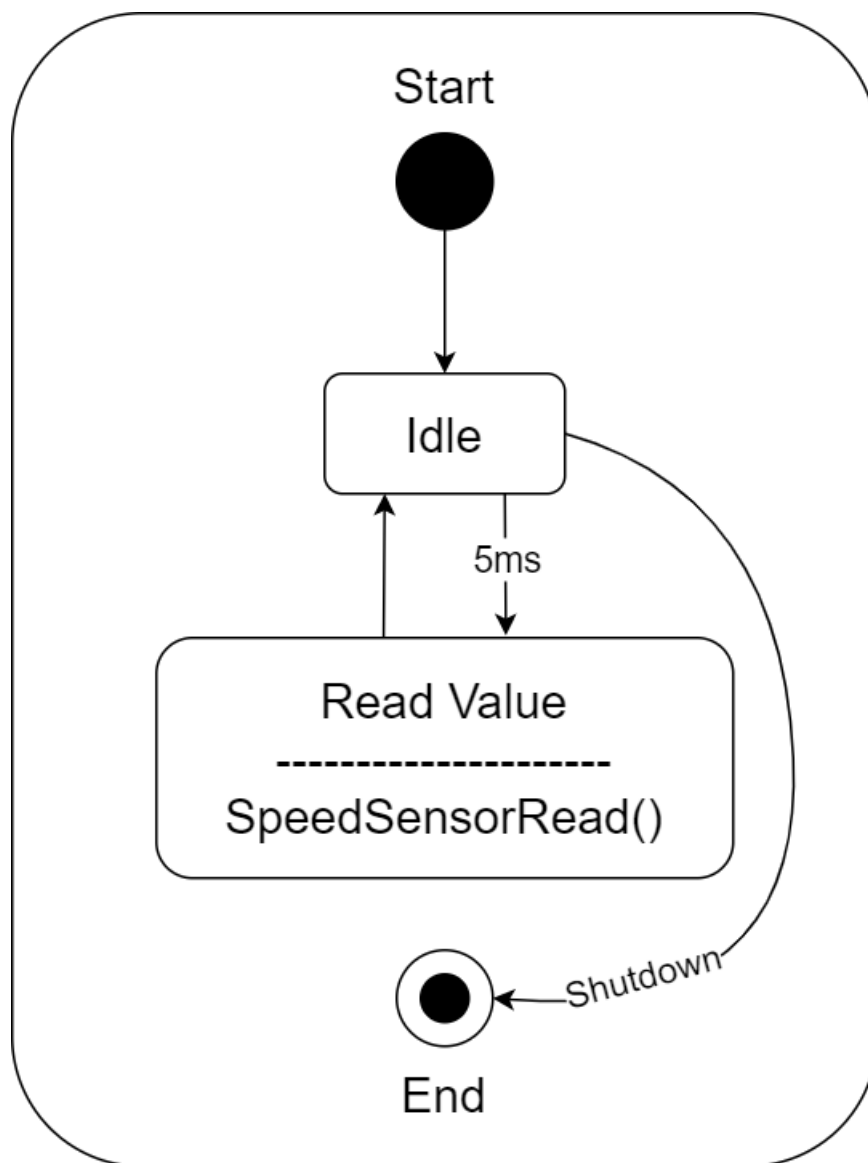
B. ECU 2 state machine diagram for each component

CAN

GPIO

Start

GPIO Initialization

GPIO_init()

Idle

Setting pins direction

GPIO_SetPinDirection()

Get value

GPIO_GetPinValue()

Shutdown

End

Buzzer

Start

Idle

ON

OFF

BuzzerON()

BuzzerOFF()

Shutdown

End
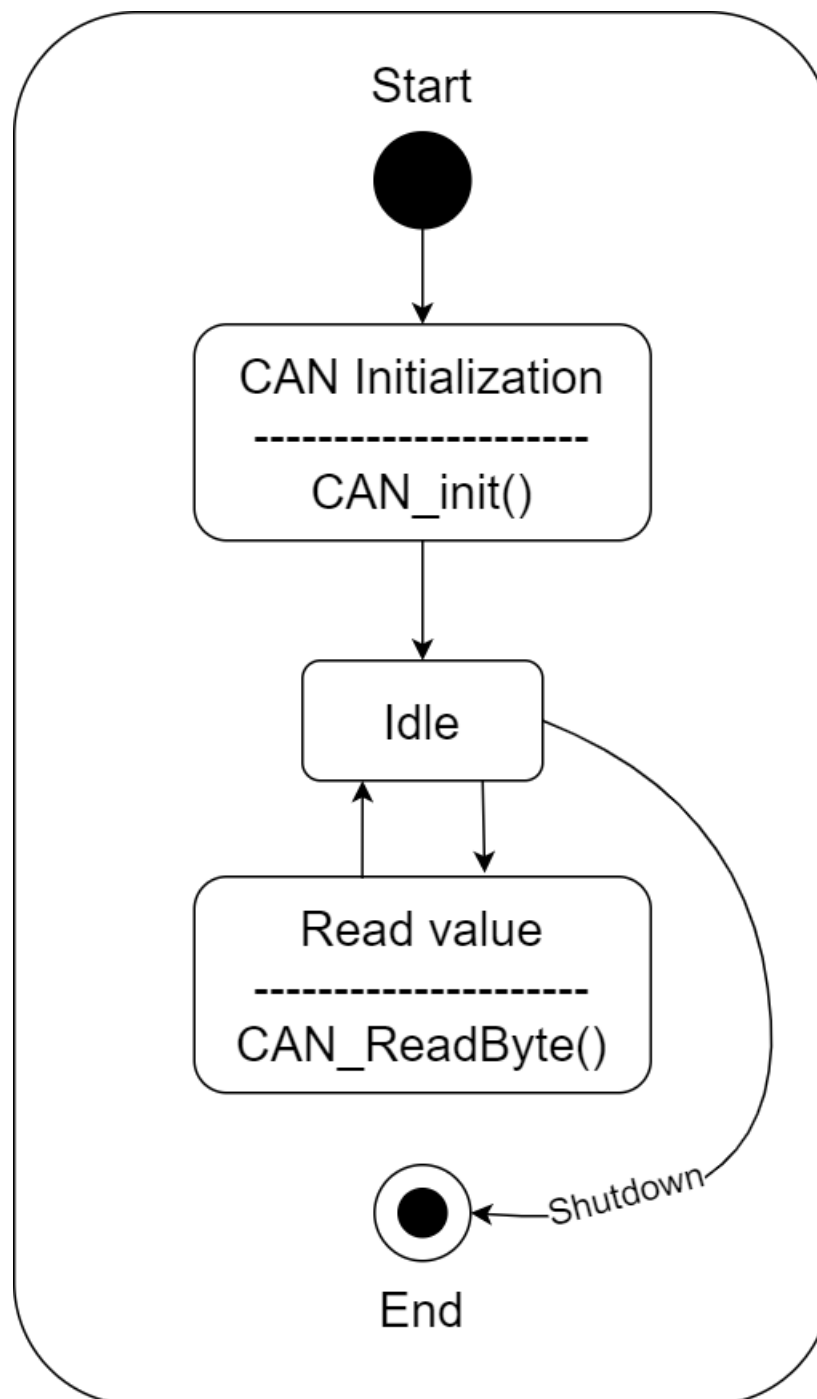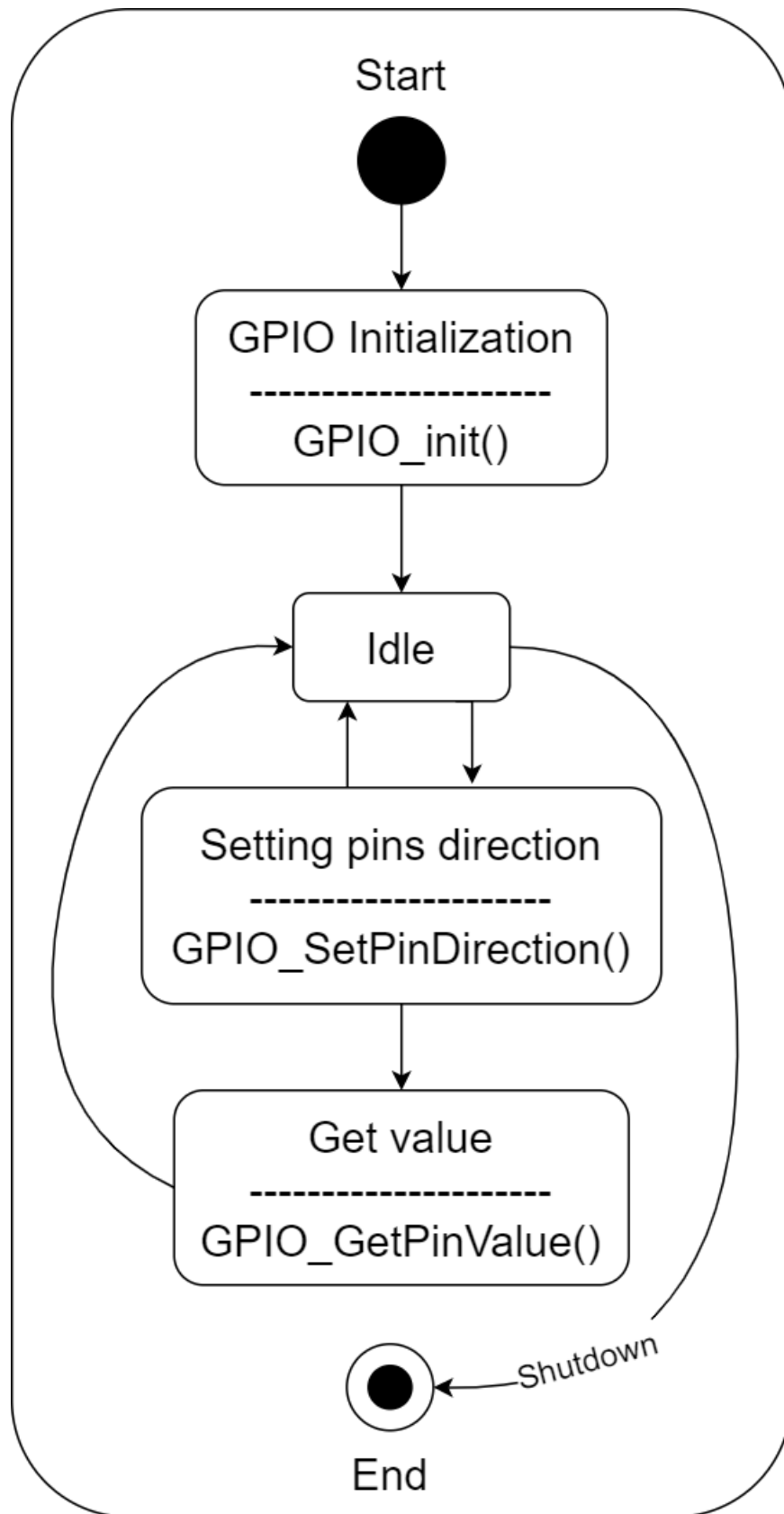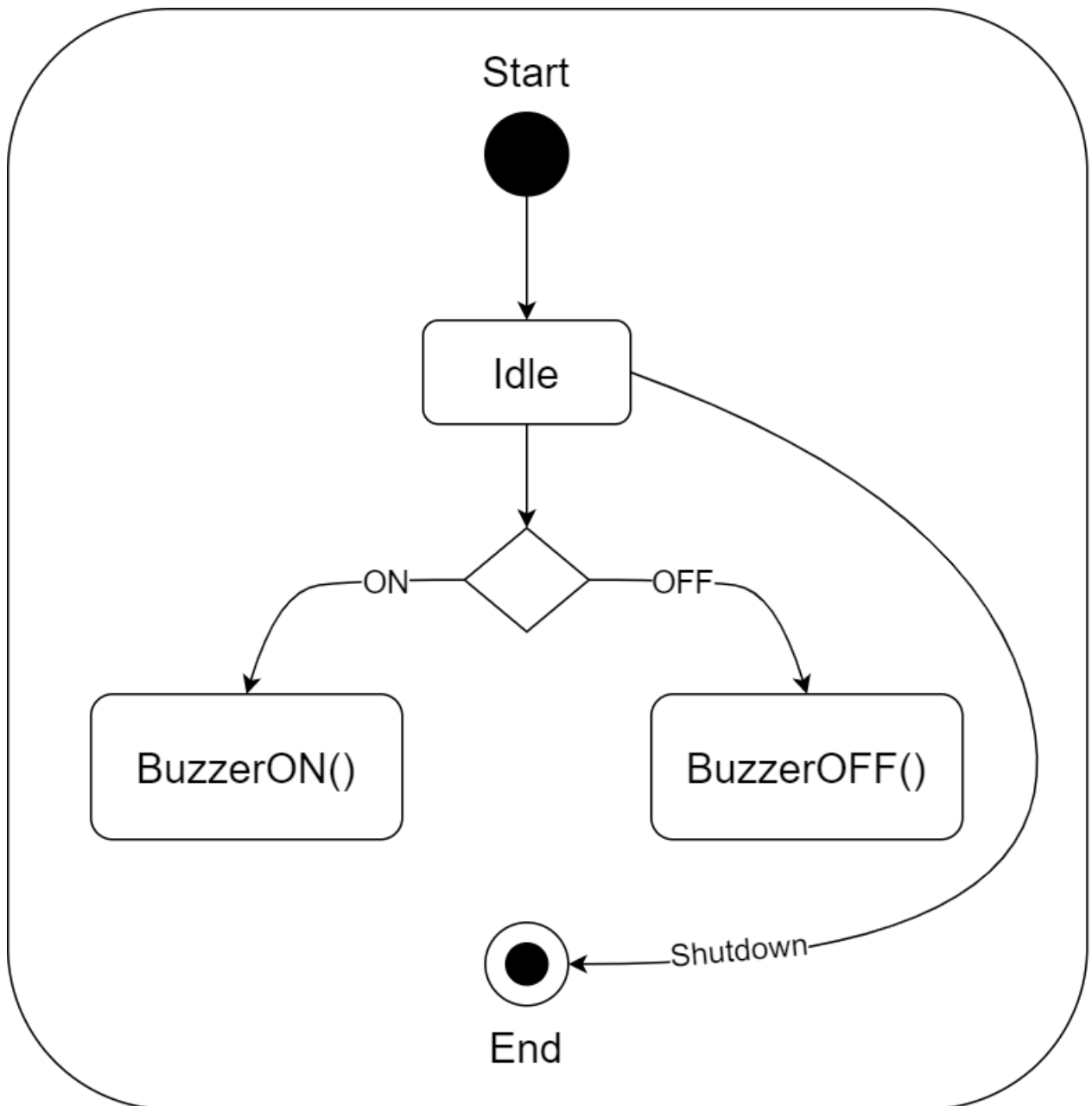
Left light

Right light

C. ECU 1 state machine diagram for each Operation

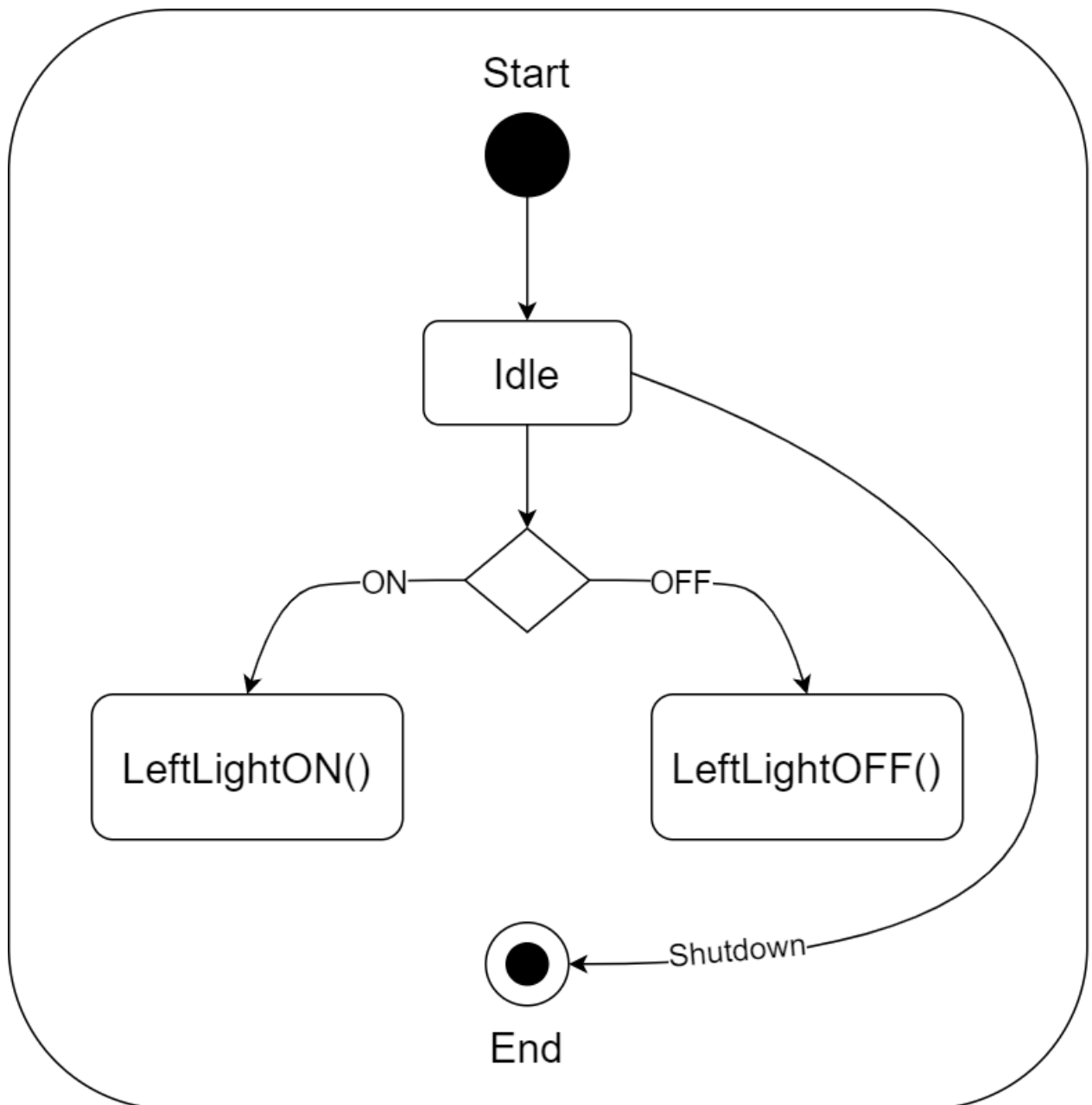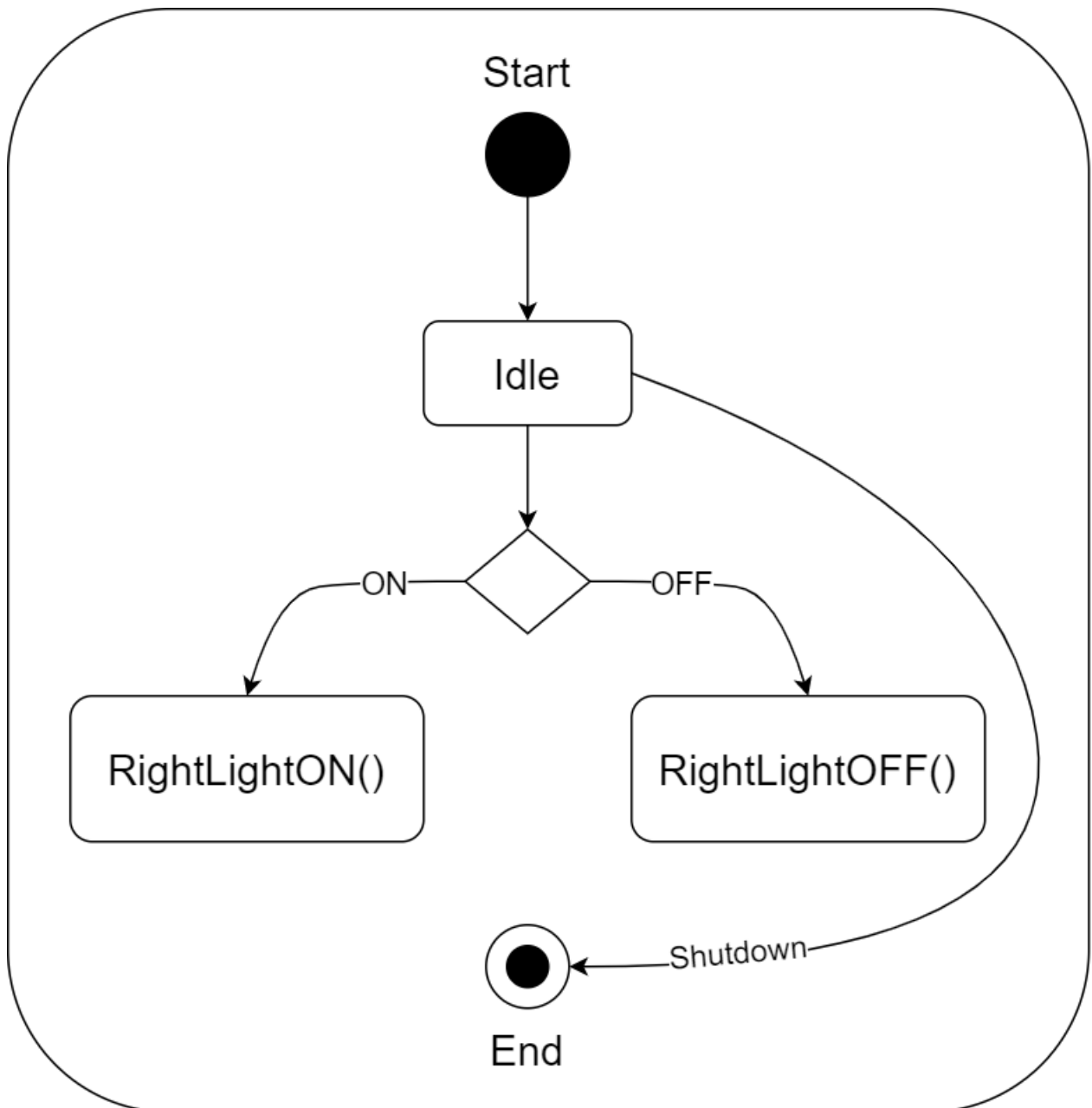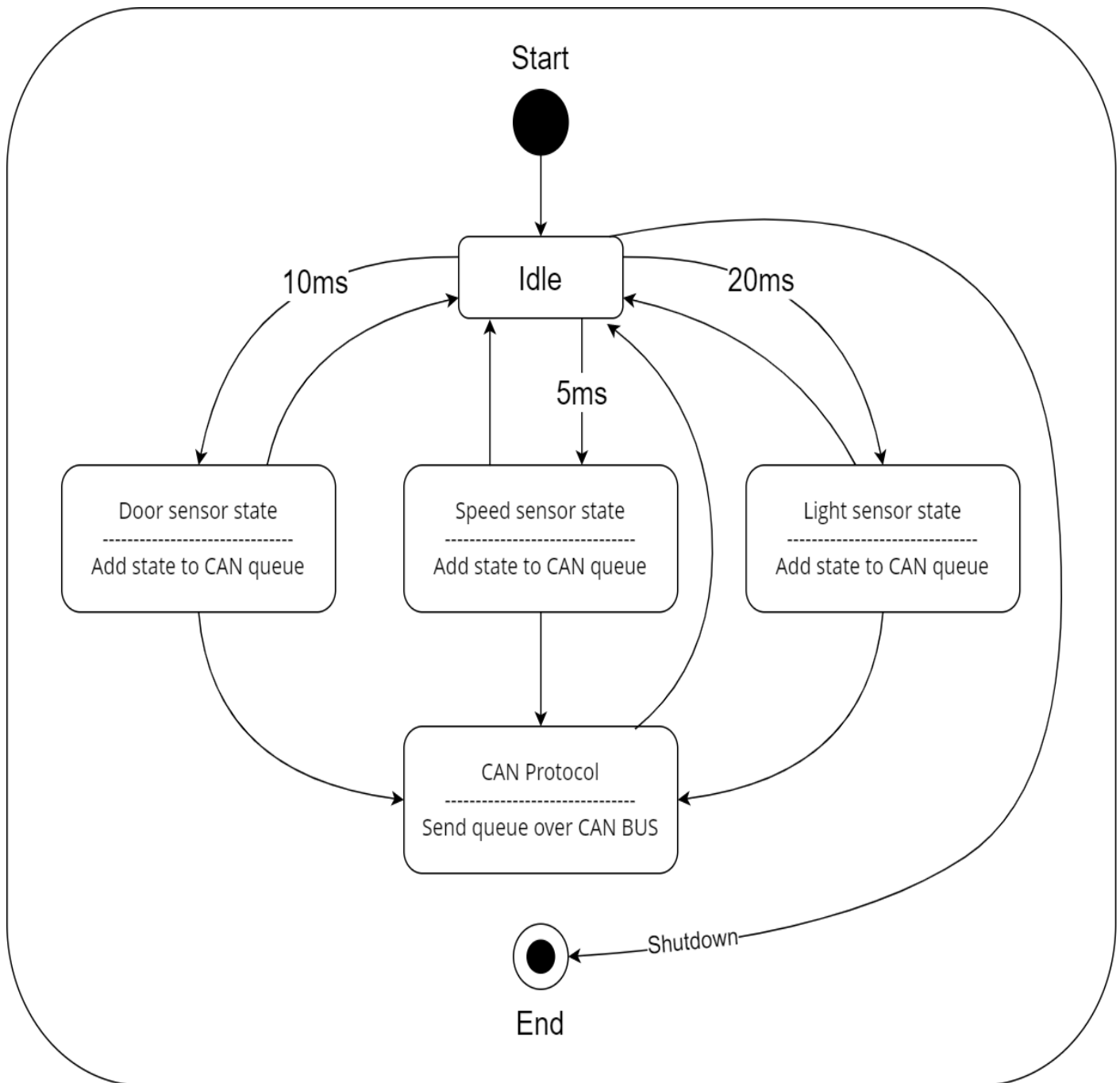## D. ECU 2 state machine diagram for each Operation

Start

Idle

CAN Recive

Make a variables

Check Condition

If the door is opened while the car is moving

Buzzer ON, Lights OFF

If the door is opened while the car is stopped

Buzzer OFF, Lights ON

If the car is moving and the light switch is pressed

Buzzer OFF, Lights ON

If the car is stopped and the light switch is pressed

Buzzer ON, Lights ON

If the door is opened while the lights were on

Lights are OFF after 3 seconds

Shutdown
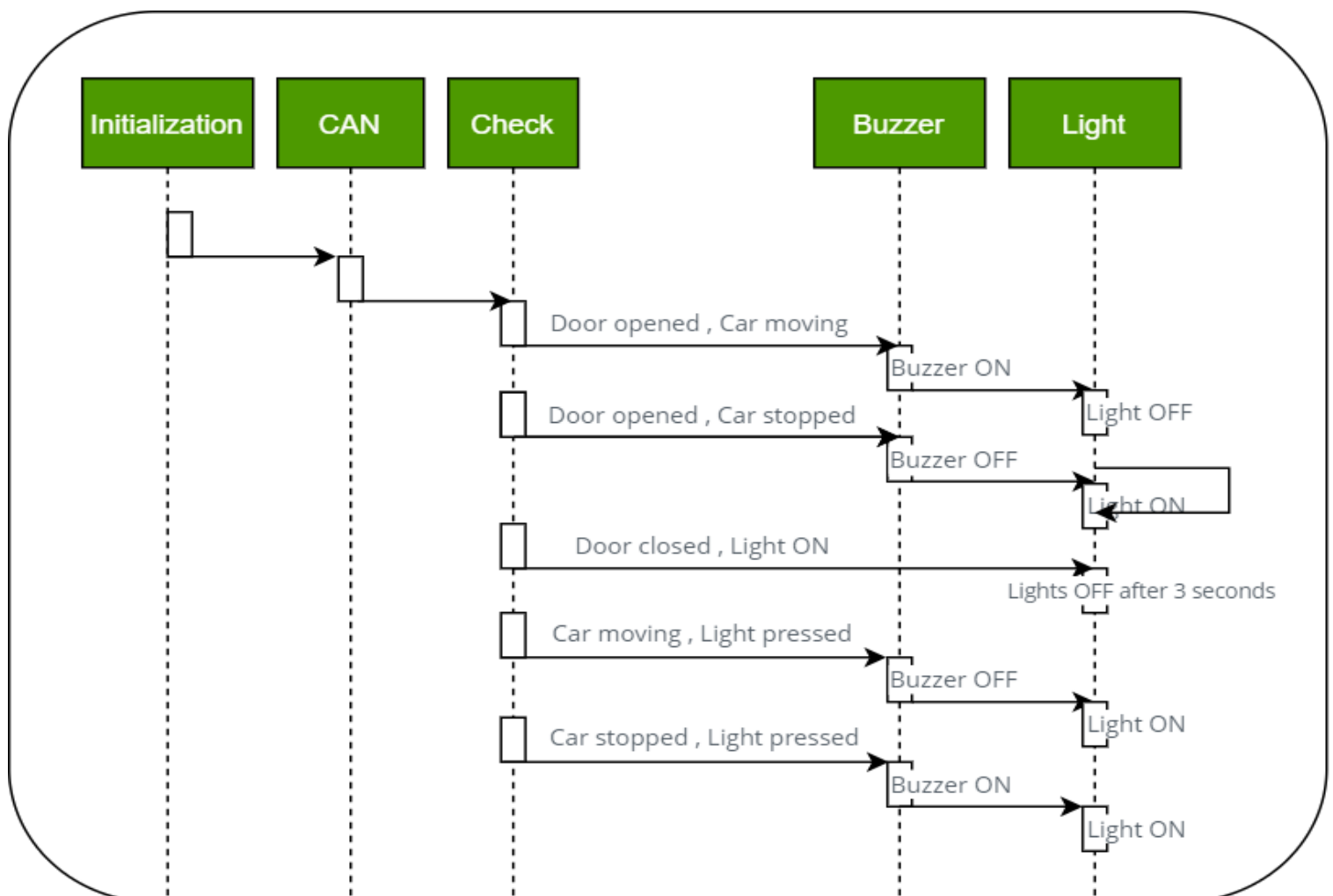
End

III. sequence diagram

A. ECU 1 Sequence diagram
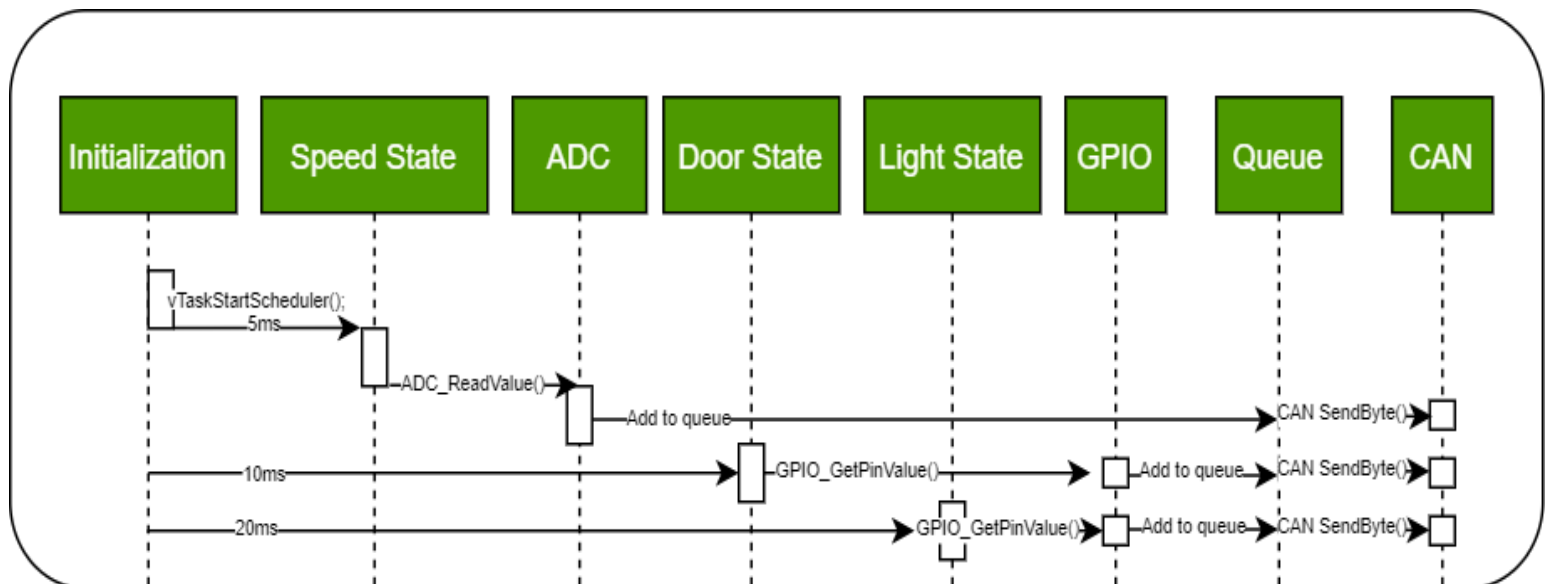
B. ECU 2 Sequence diagram

IV. SimSo simulation and estimated CPU load

Simulating the estimated task execution time on each ECU as follows

A. ECU 1 Tasks

id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by
1	CAN	Periodic ▾	☐ No	0	5	-	5	1	▾
2	Speed	Periodic ▾	☐ No	0	5	-	5	1	▾
3	Door	Periodic ▾	☐ No	0	10	-	10	0.2	▾
4	Light	Periodic ▾	☐ No	0	20	-	20	0.2	▾

Edit data fields...

🗑 Remove selected task(s)   Add task   Generate Task Set

B. ECU 2 Tasks

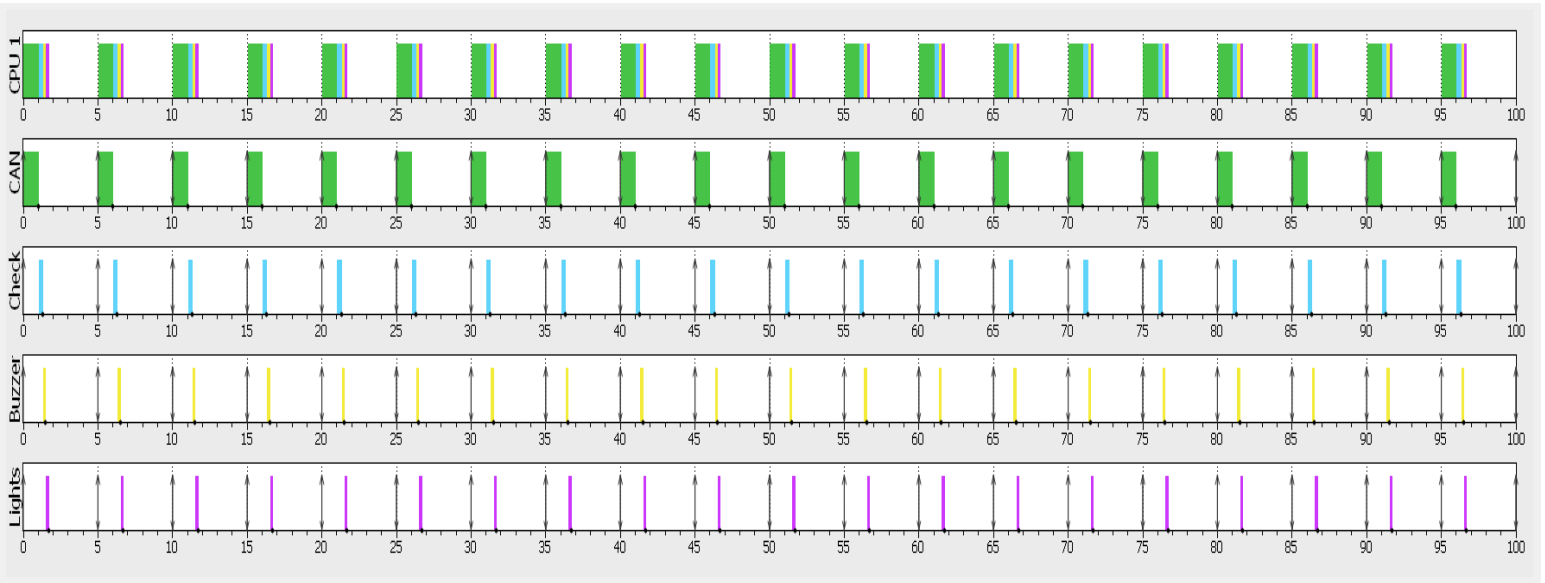| id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by
1	CAN	Periodic ▾	☐ No	0	5	-	5	1	▾
2	Check	Periodic ▾	☐ No	0	5	-	5	0.3	▾
3	Buzzer	Periodic ▾	☐ No	0	5	-	5	0.2	▾
4	Lights	Periodic ▾	☐ No	0	5	-	5	0.2	▾

Edit data fields...

🗑 Remove selected task(s)   Add task   Generate Task Set

C. ECU 1 Gantt chart
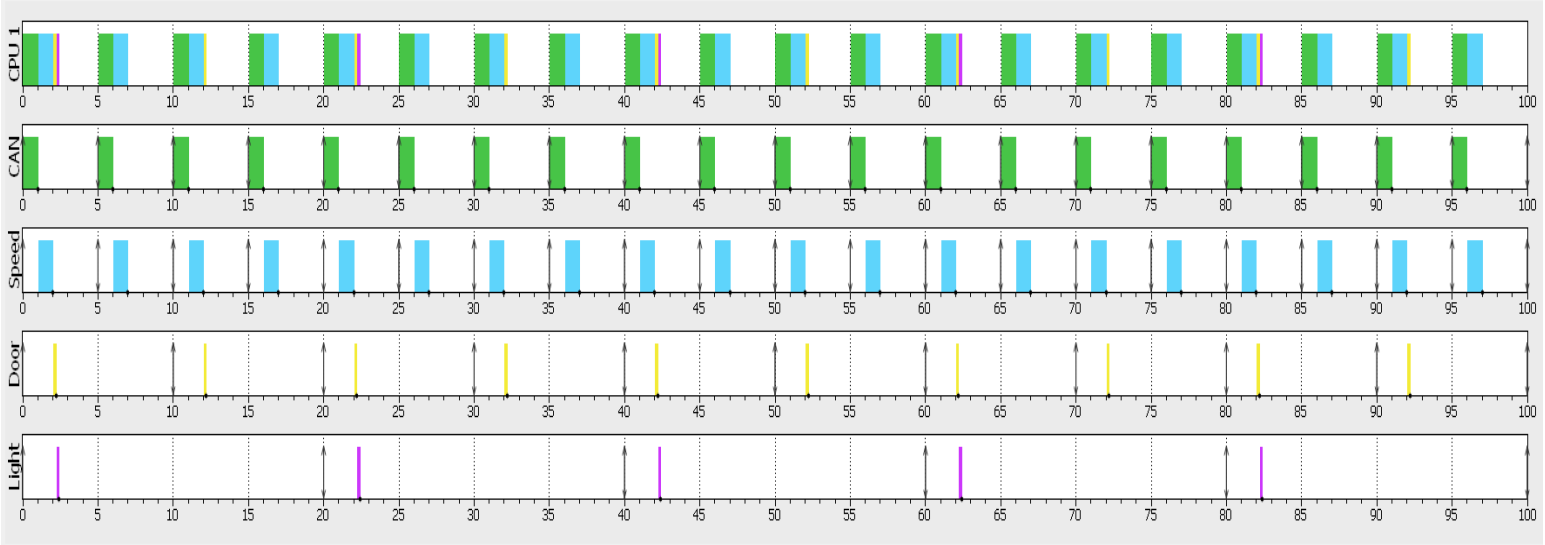
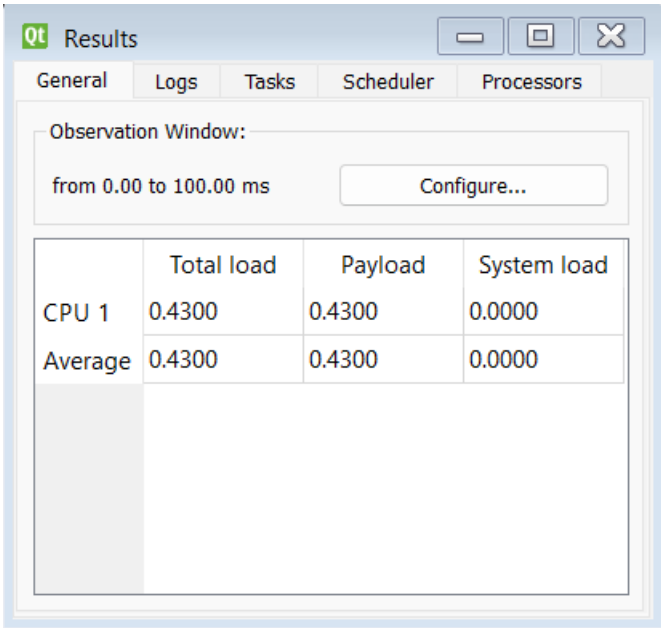## D. ECU 2Gantt chart

E. ECU 1 CPU load

F. ECU 2 CPU load