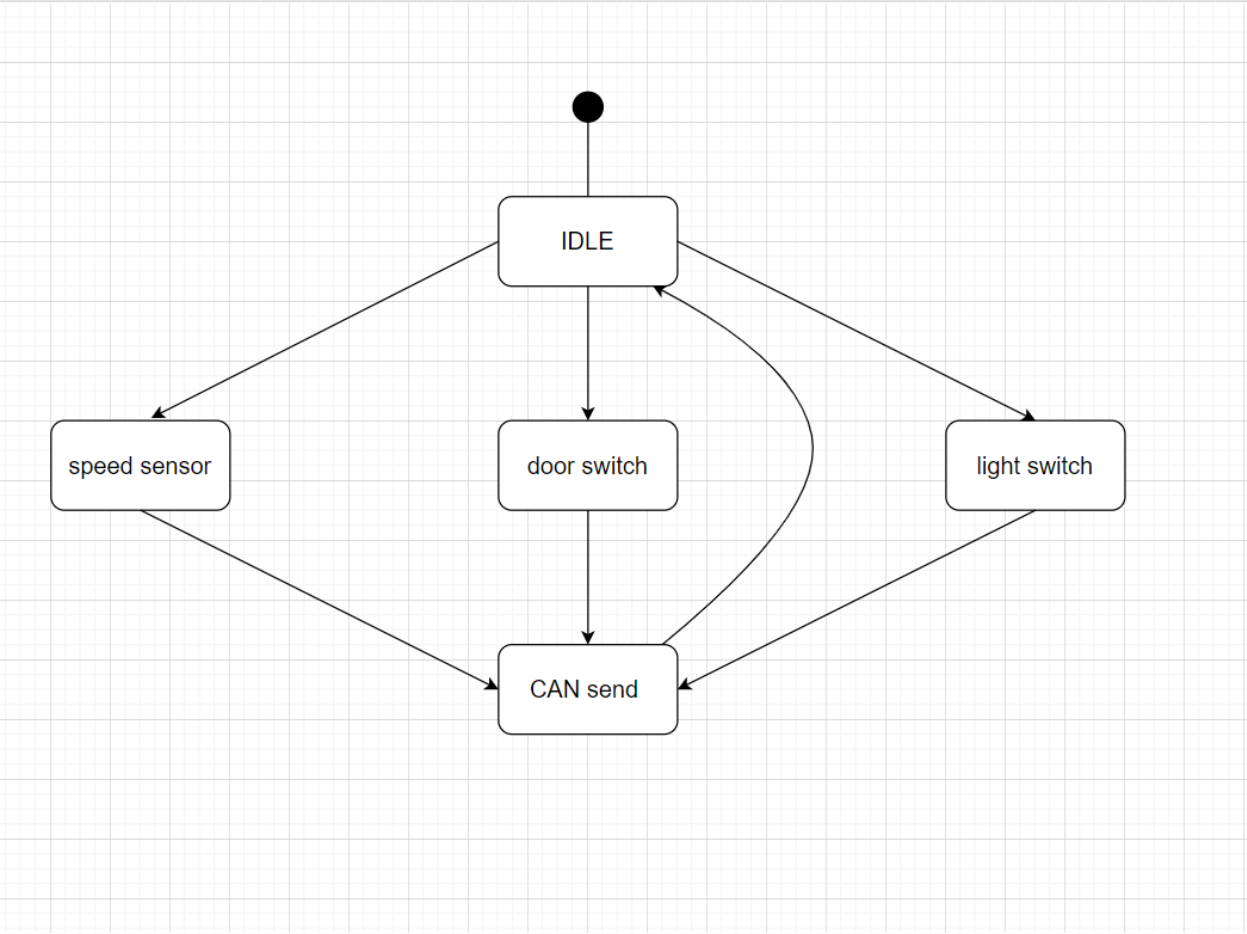
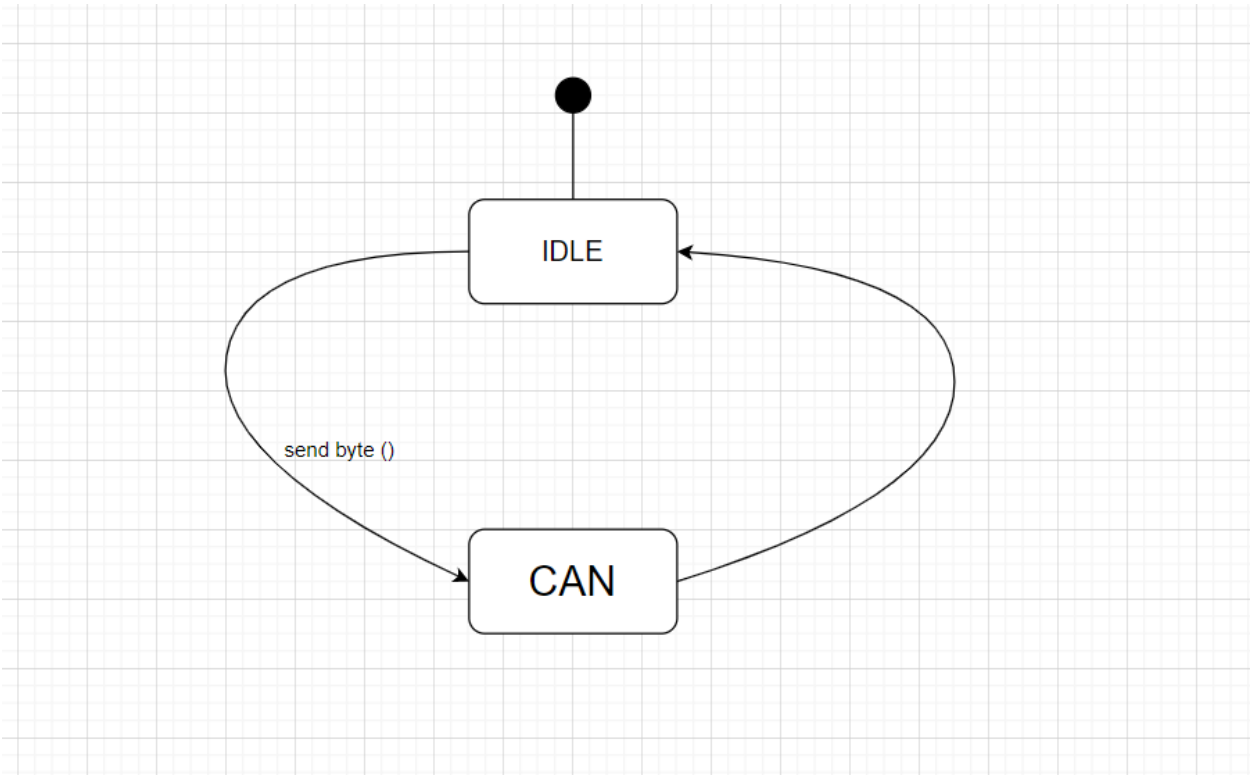
# Automotive Door Control System Design

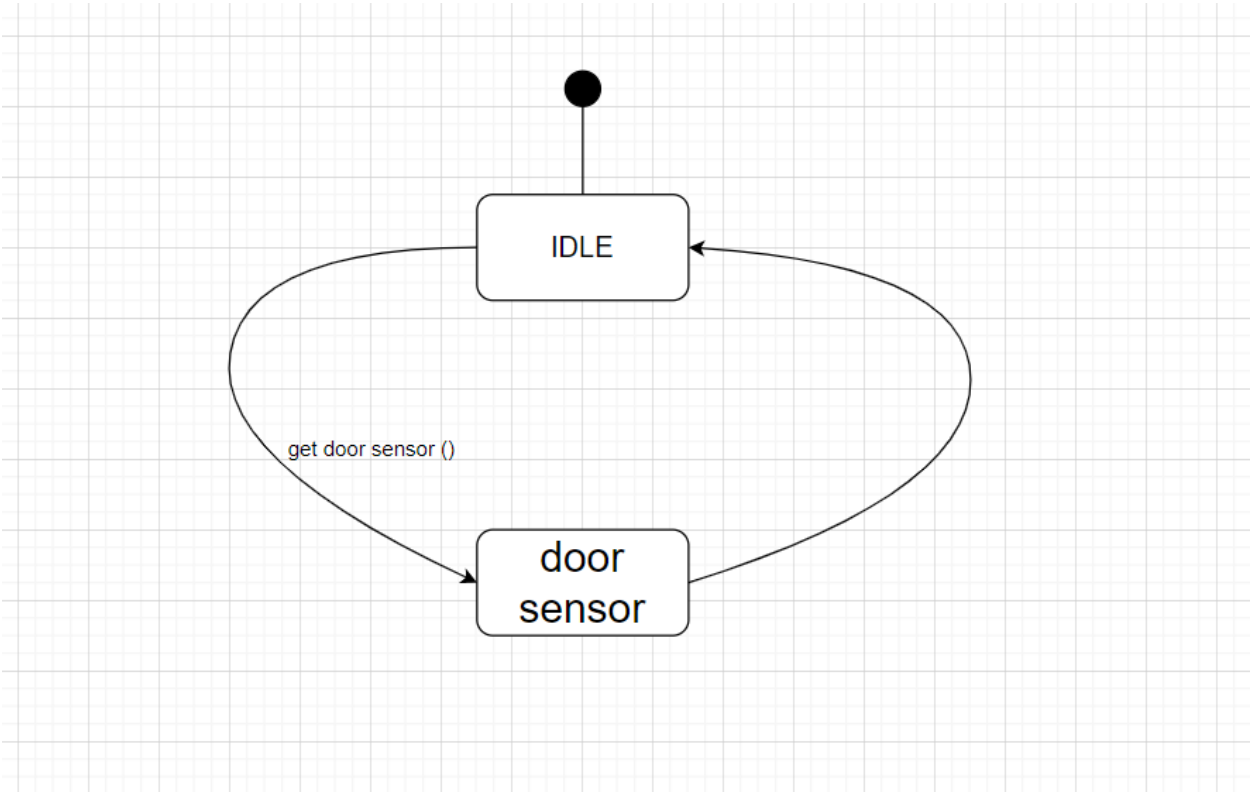
## ECU1

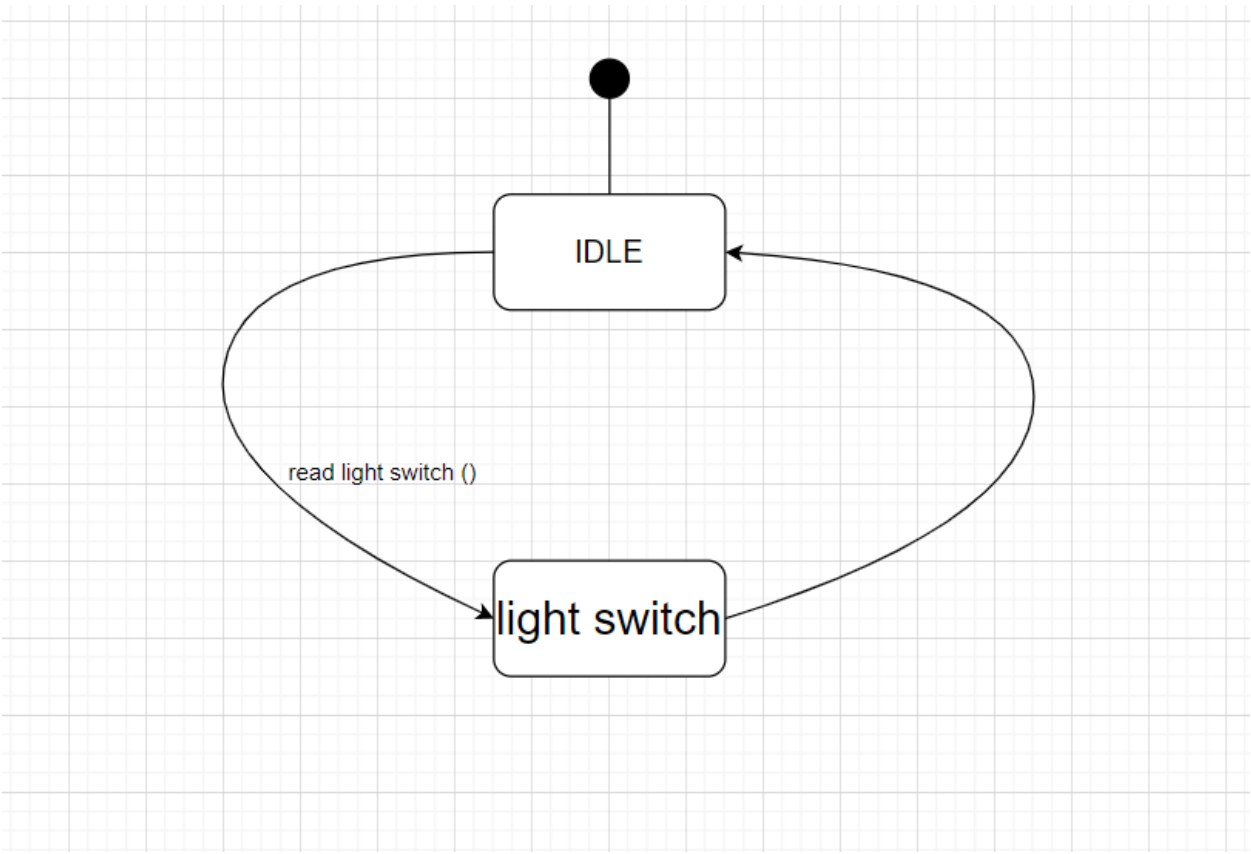
## 1- State Machine Diagram for ECU1 Operation:

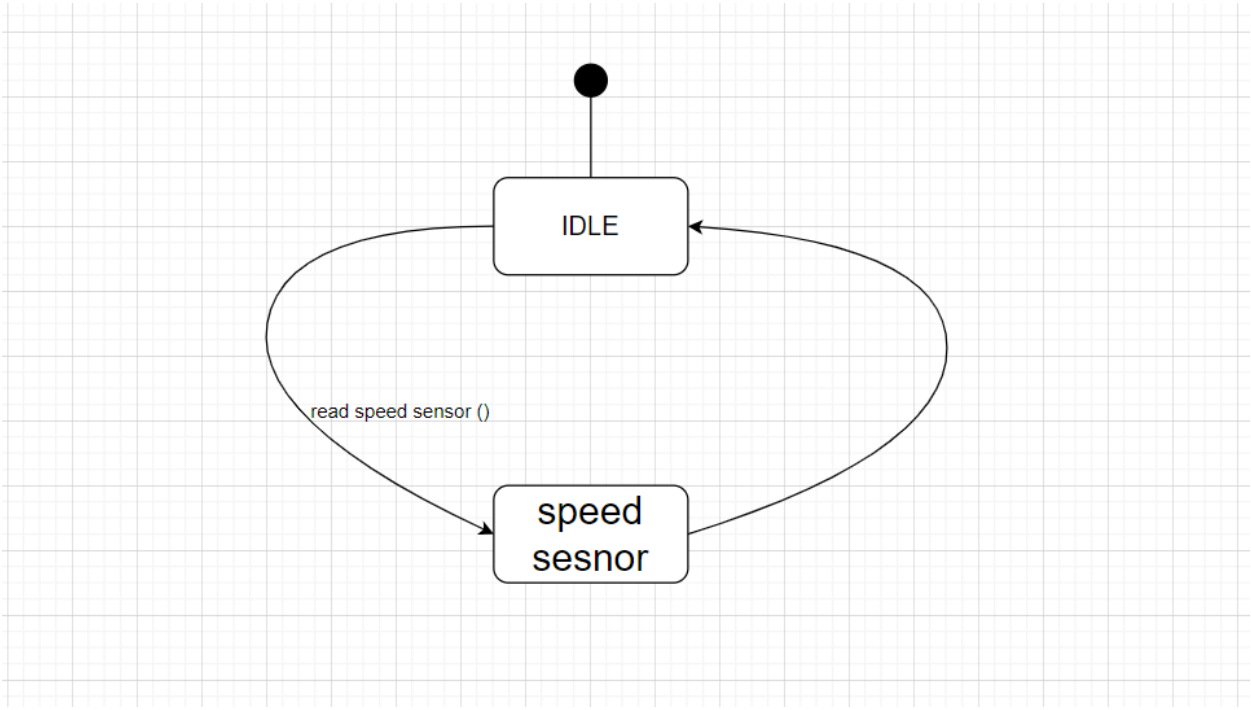



## 2- State Machine Diagram for ECU1 Components:

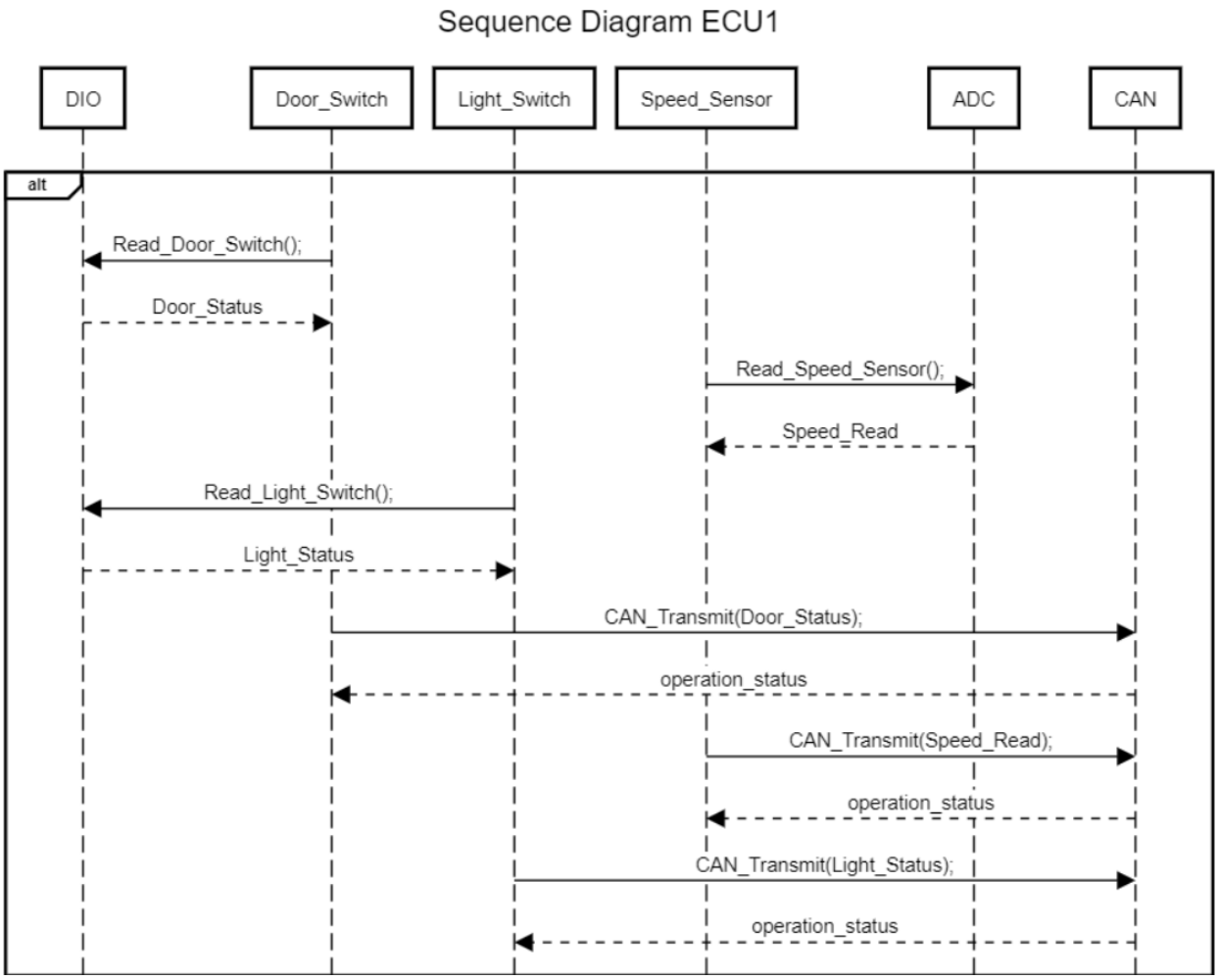

IDLE
send byte ()
CAN


IDLE
get door sensor ()
door
sensor


IDLE
read light switch ()
light switch


IDLE
read speed sensor ()
speed
sesnor

## 3- Sequence Diagram for ECU1:




## 4- CPU Load for ECU1:

**Assume that:**

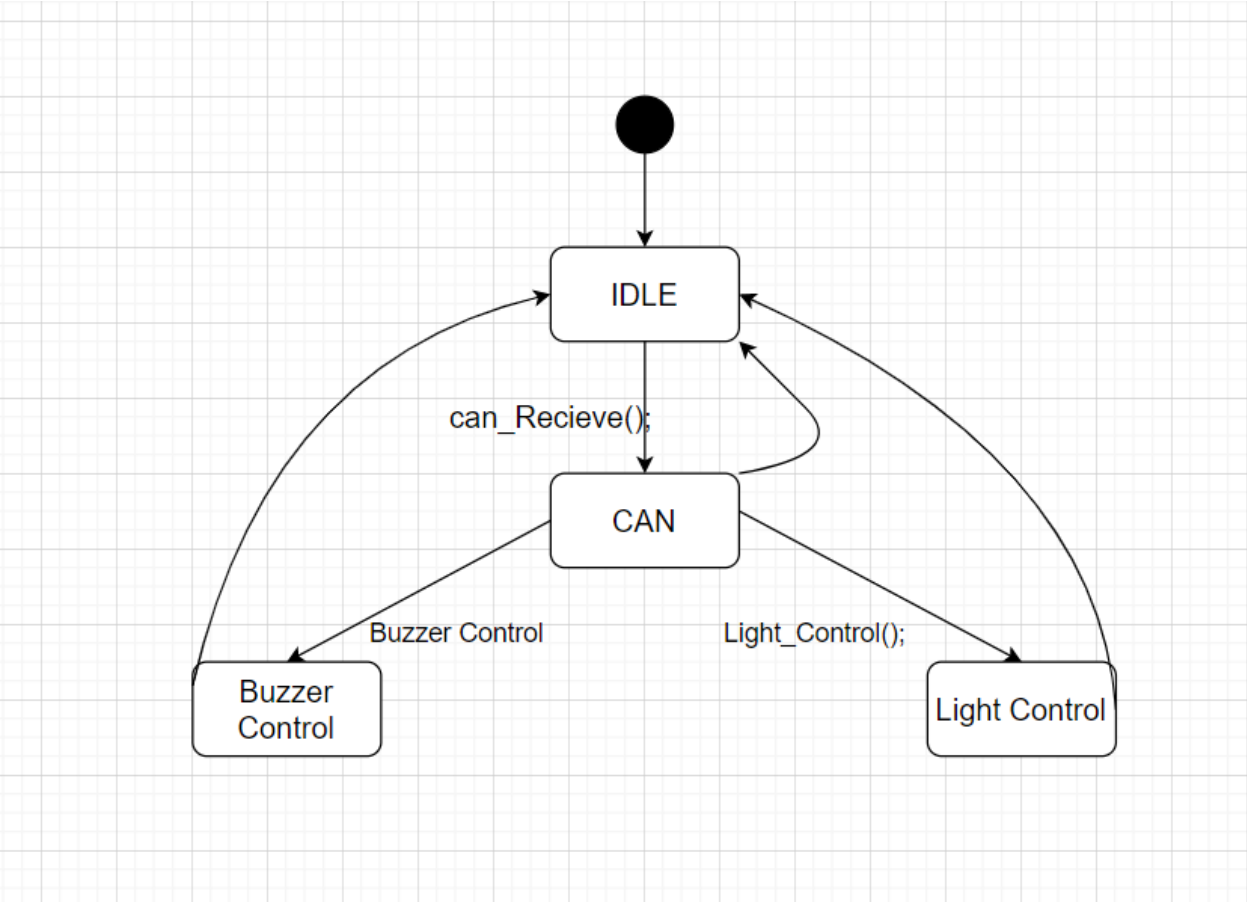
- Light switch task execution time = 8 us and P: 20 ms
- Door sensor task execution time = 11us and P: 10 ms
- Speed sensor task execution time = 11us and P: 5 ms
- CAN send execution time = 1 ms

► **Hype Period = LCM ( T1,T2,T3,T4) = 20 ms**

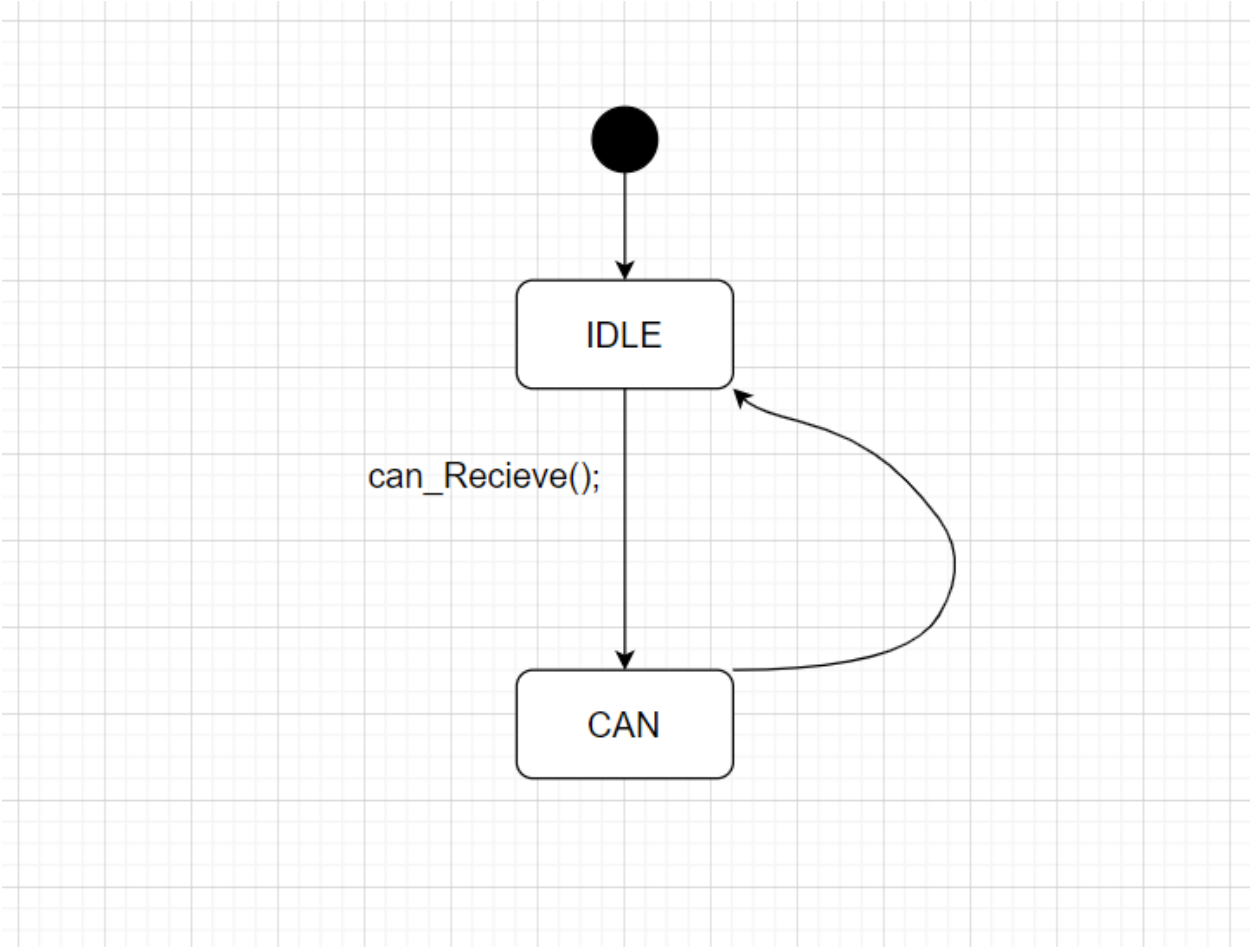
► **CPU Load =** $\frac{(8*1+11*2+11*4)*10^{-3}+1*7}{20}$ **= 35.37%**

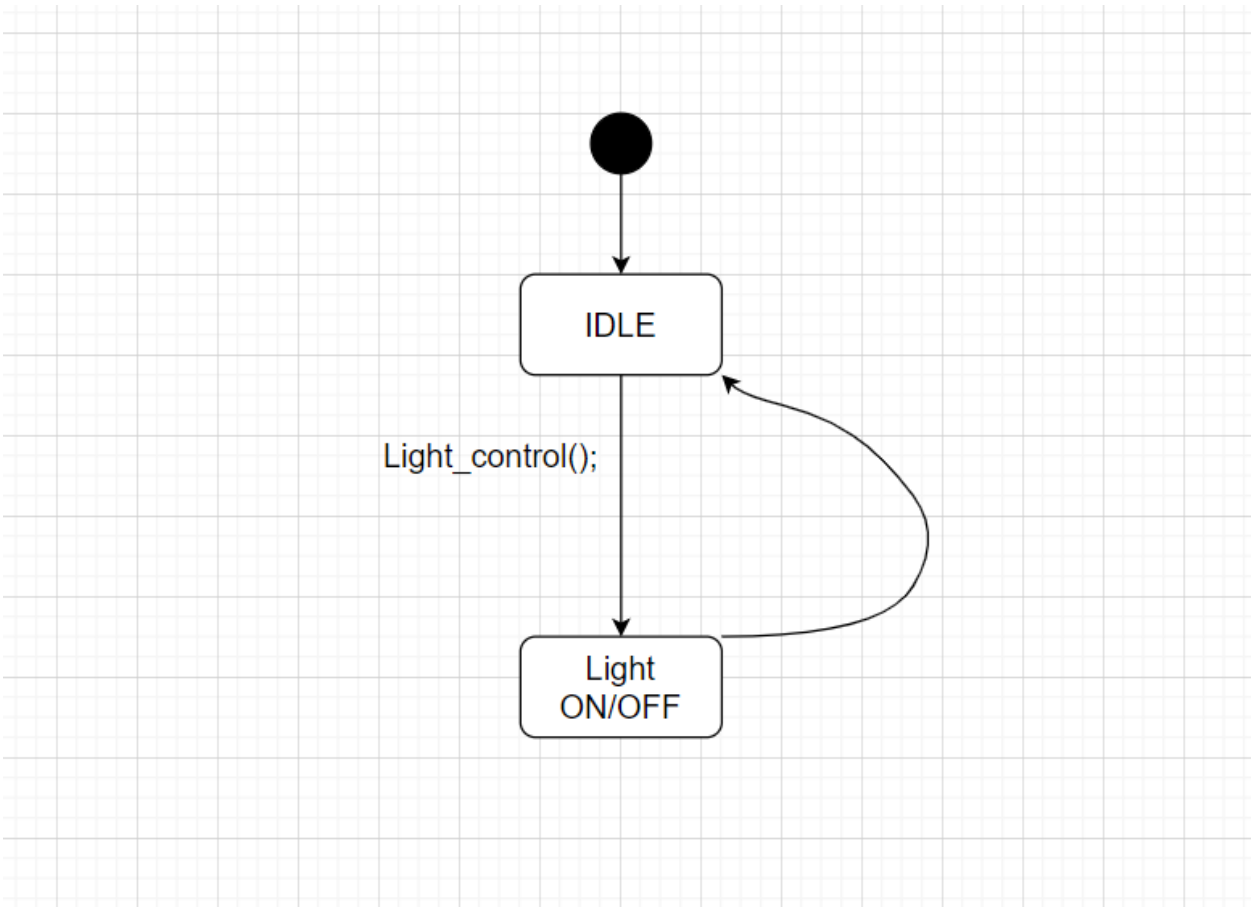
## ECU2

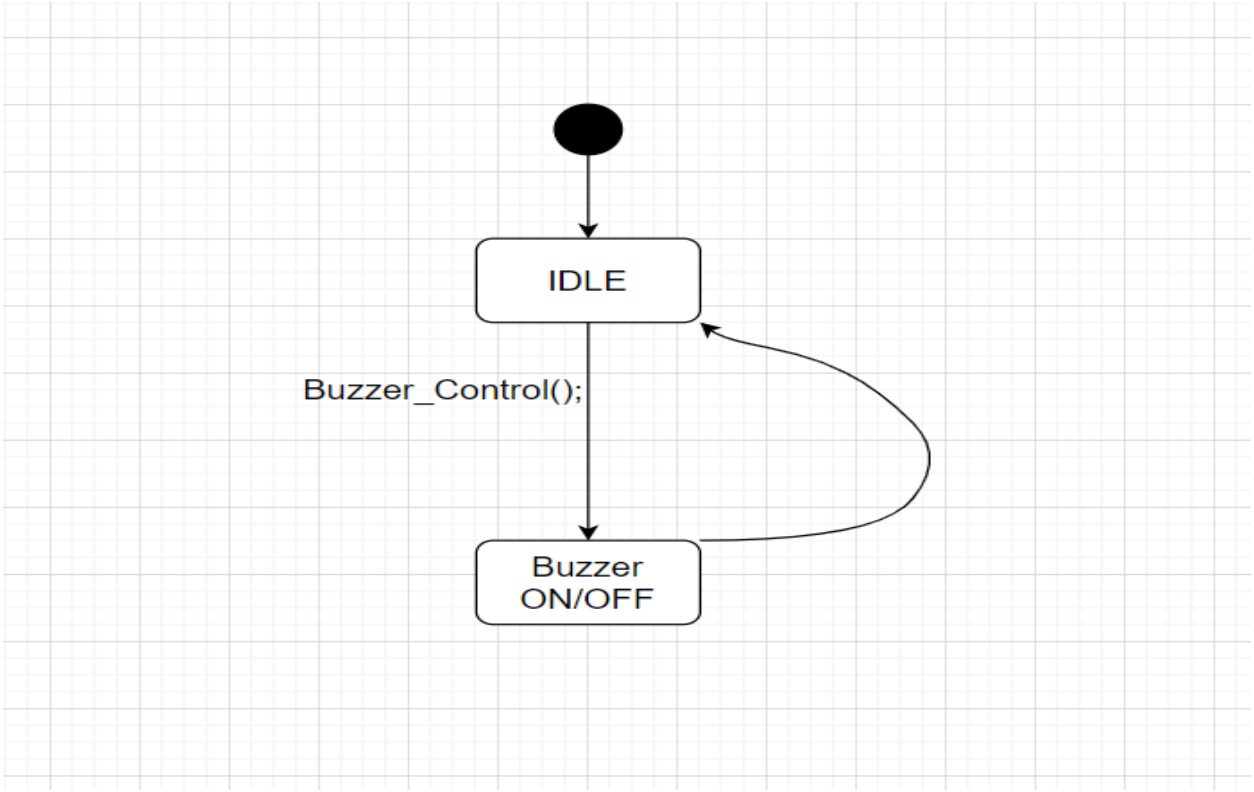
## 1- State Machine Diagram for ECU2 Operation:


IDLE
can_Recieve();
CAN
Buzzer Control
Light_Control();
Buzzer Control
Light Control

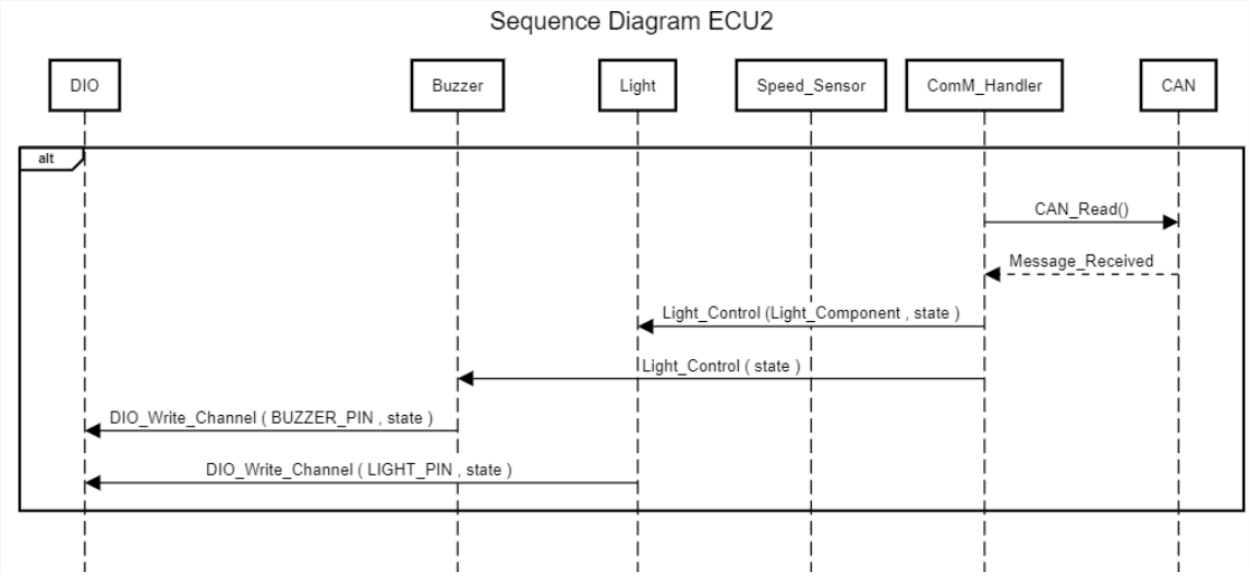
## 2- State Machine Diagram for ECU2 Components:




IDLE
Light_control();
Light
ON/OFF


IDLE
Buzzer_Control();
Buzzer
ON/OFF

## 3- Sequence Diagram for ECU2:




## 4- CPU Load for ECU2:

**Assume that:**

- Light control task execution time = 8 us and P: 5 ms
- Buzzer control task execution time = 11us and P: 5 ms
- CAN receive execution time = 1 ms

**► Hype Period = LCM ( T1,T2) = 5 ms**

**► CPU Load = $\frac{(8*4+11*4)*10^{-3}+1*7}{20}$ = 35.38%**

❖ **Bus Load :**

- **Assume than Can Send/Receive takes 1 ms**
- **Number of messages in one hyper period = 4 + 2 + 1 = 7 messages**
- **Hyper period = 20 ms**

► **Bus Load** = $\frac{\textbf{Number of messages in one hyper period}}{\textit{Hyper Period}}$

$= \frac{7}{20} * 100 = 35\%$