ECU1 Dynamic Design
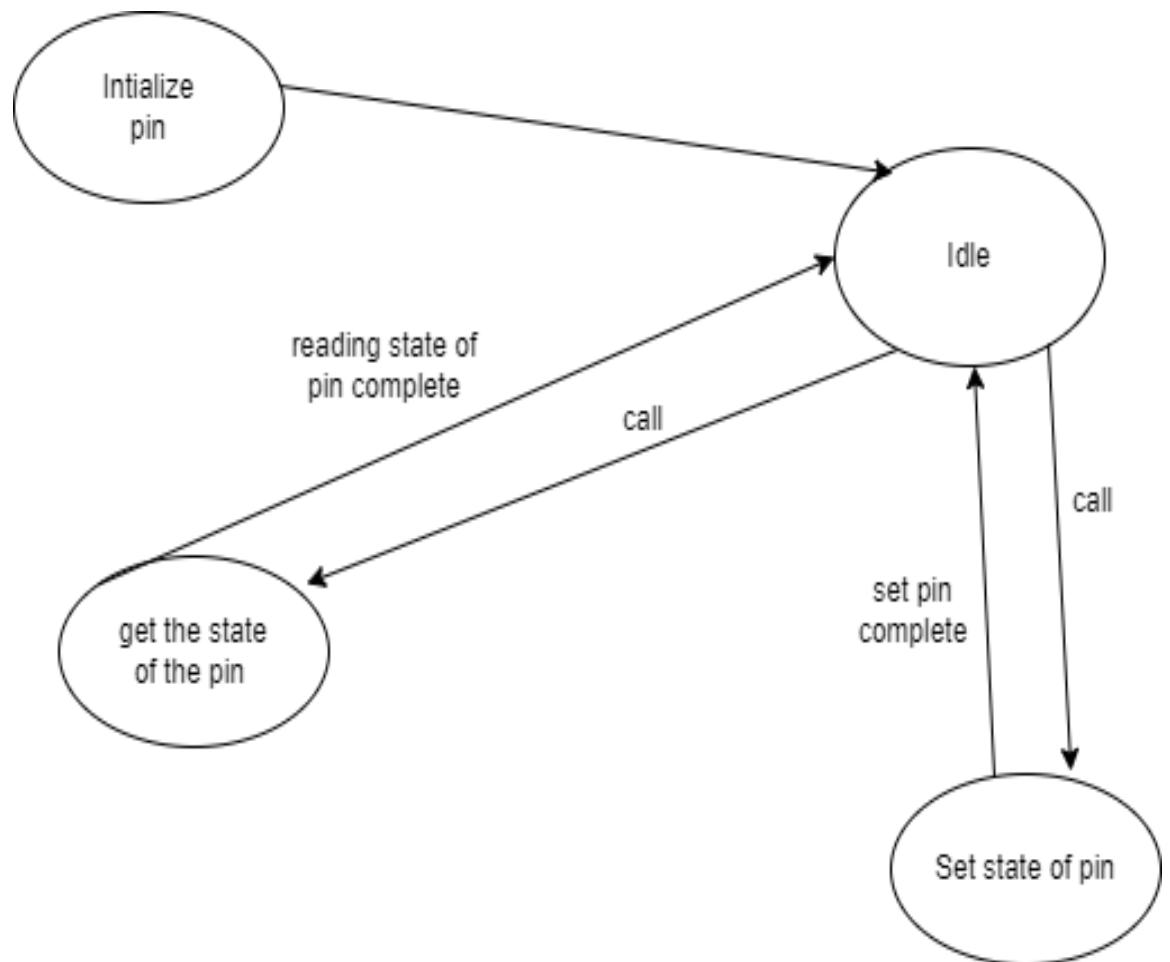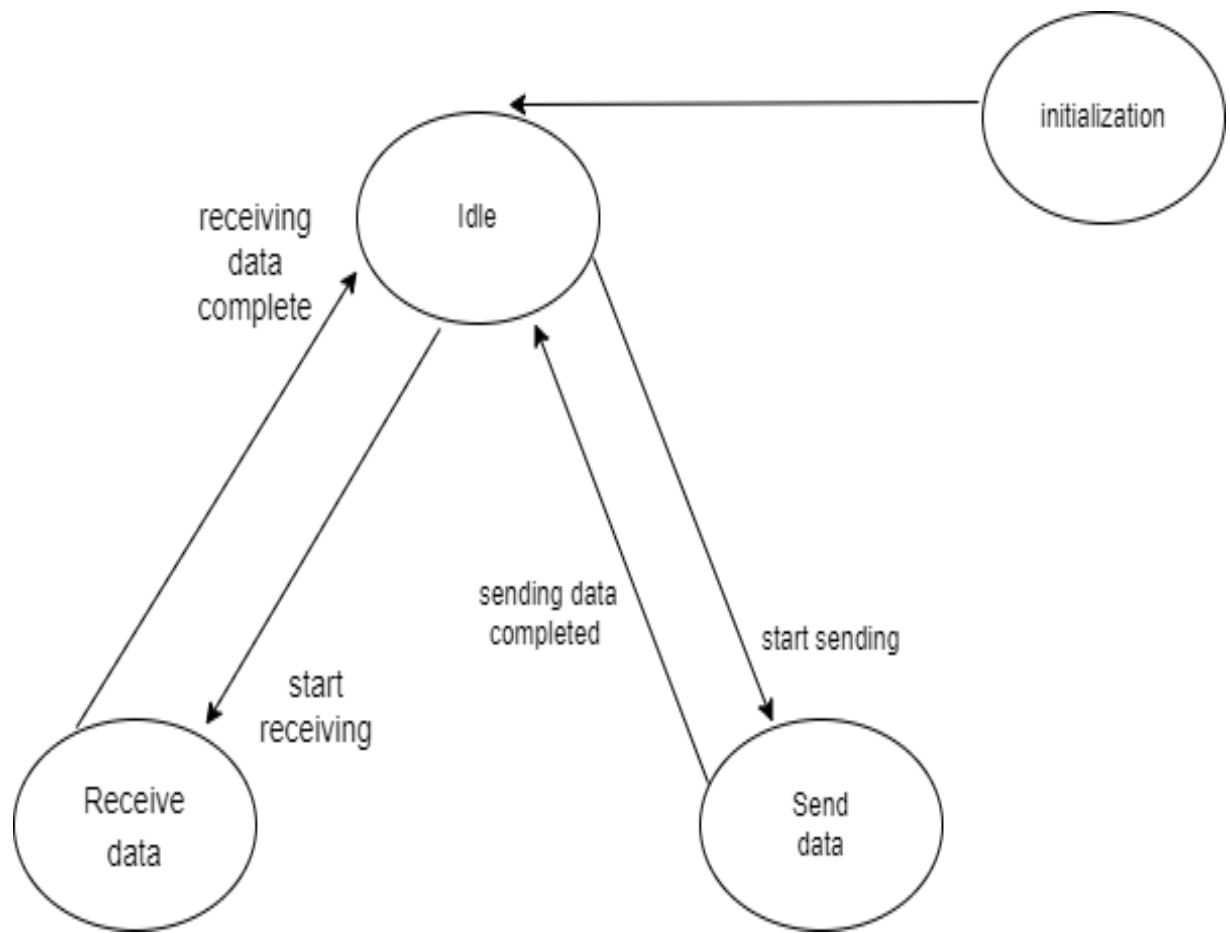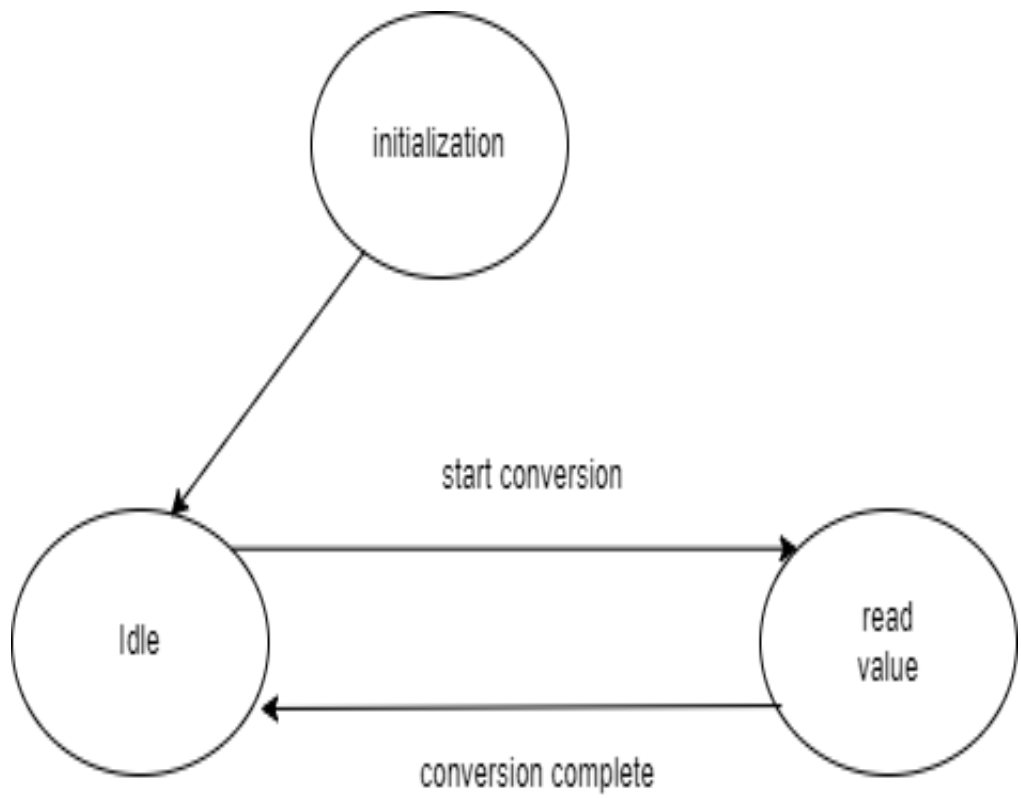
Ammar Hassan Abdelhakim

- **Components State Machine**
  - **DIO State Machine**

- **CAN State Machine**

- **ADC State Machine**

- **Speed Control State Machine**

call

Idle → get speed value
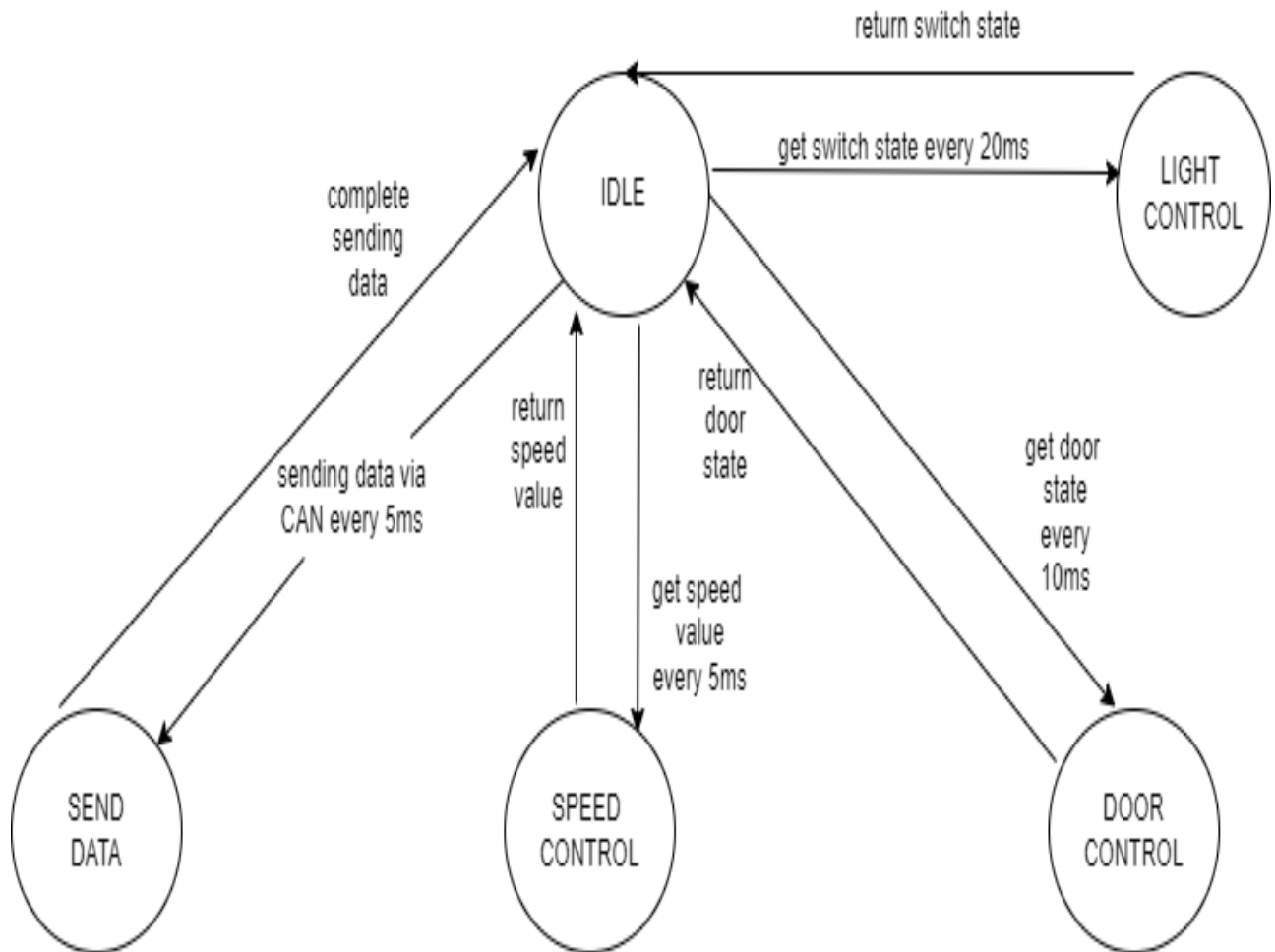
return speed value
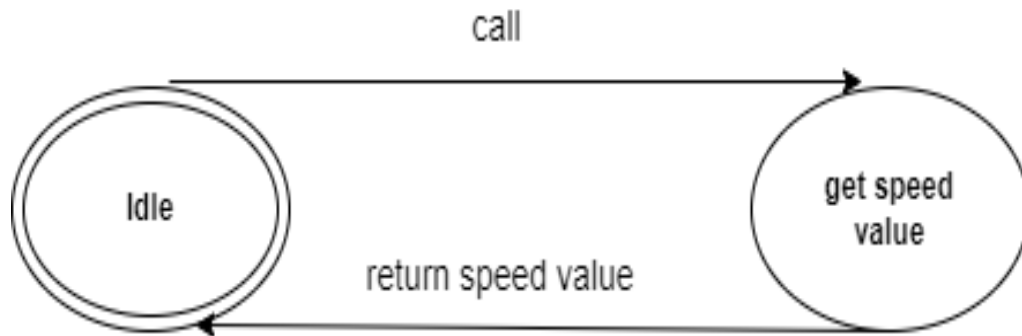
- **Door Control State Machine**

door closed → door open

- **Light Control State Machine**

pressed

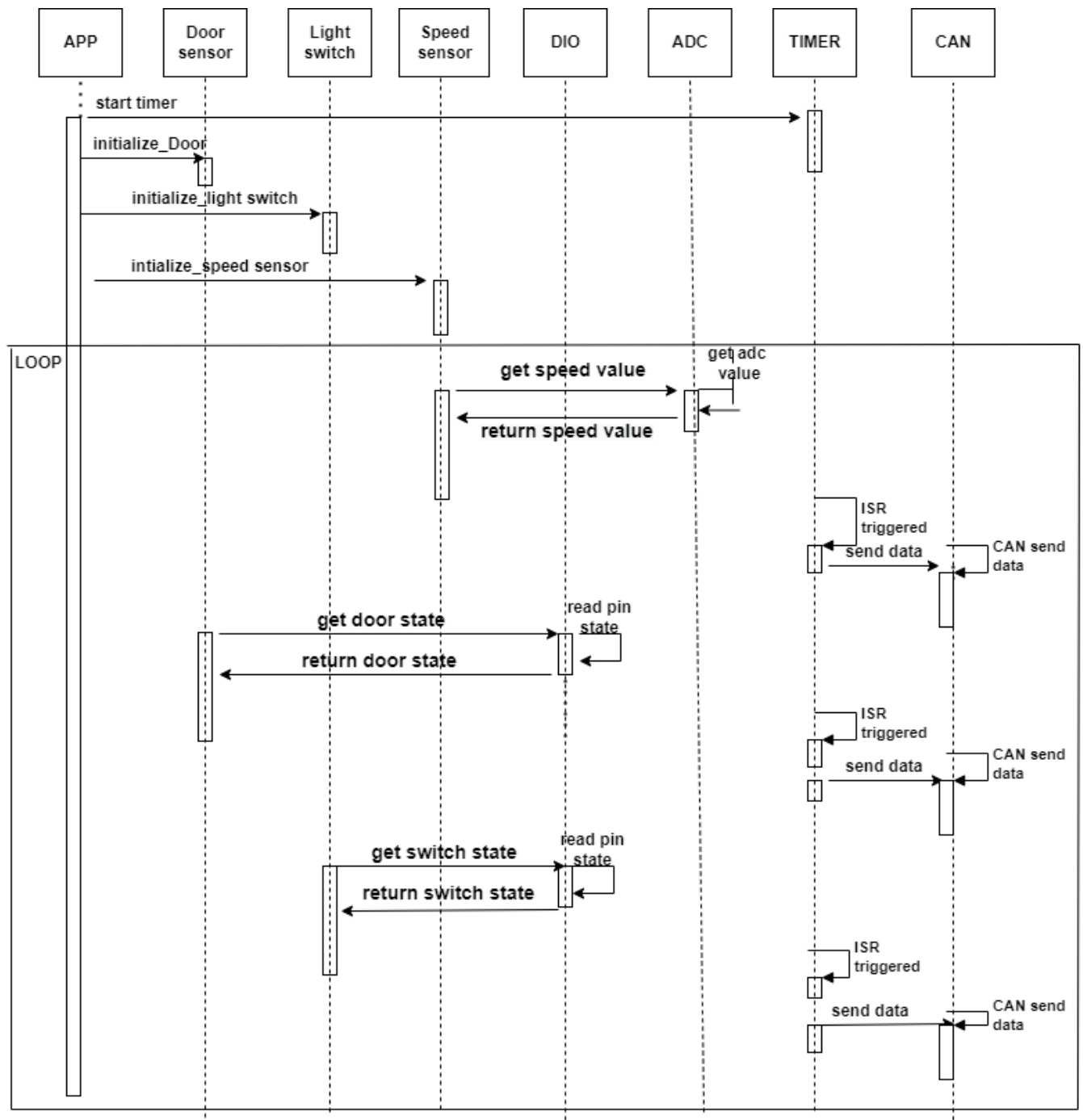switch OFF → switch ON

not pressed
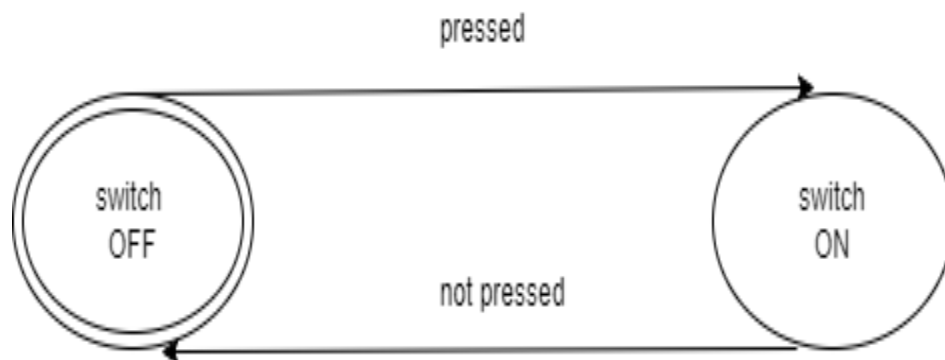
- **ECU1 State Machine**

ECU1 STATE MACHINE

ECU1 Sequence Diagram

- **ECU1 CPU LOAD**

  - **Assuming execution time for each task is 1ms**

$$cpu_{load} = \frac{\sum task\_execution\_time}{hyperperiod}$$

$$hyperperiod = LCM(tasks'periods) = 20\ ms$$

Task	Execution_time	Number of exec
Speed sensor	1ms	4
Door sensor	1ms	2
Switch sensor	1ms	1

$$cpu_{load} = \frac{1 \times 4 + 1 \times 2 + 1}{20} = 35\%$$

- **BUS LOAD**

  Assume the followings:

    CAN frame number of bits = 125

    CAN speed = 1MBit/s

  Then

    Bit time = 1 us

    Frame time = 1us x 125 = 125 us

    Total frames in 1 sec = 1 / 5ms + 1 / 10ms + 1 / 20ms

    = 200 + 100 + 50 = 350 frames

    Total busy time in bus in 1 sec = Total frames in 1 sec x

    Frame time

    =350 x 125us=43.750ms

    Bus load = (43.750 / 1000) x 100 = 4.375%