AUTOMOTIVE DOOR CONTROL SYSTEM DYNAMIC DESIGN

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Embedded Systems (Advanced Track)

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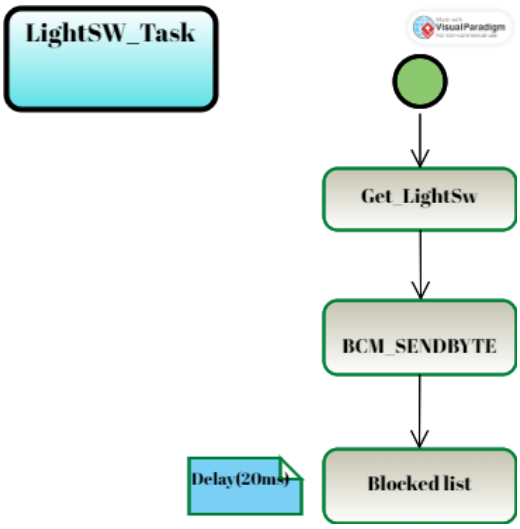
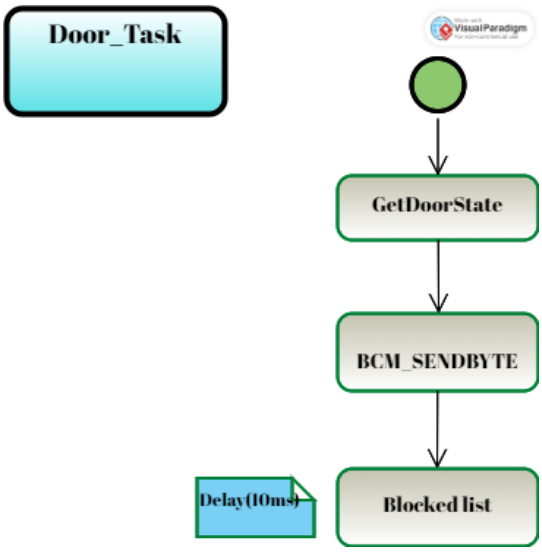
State Machine Diagram for each ECU1 component:

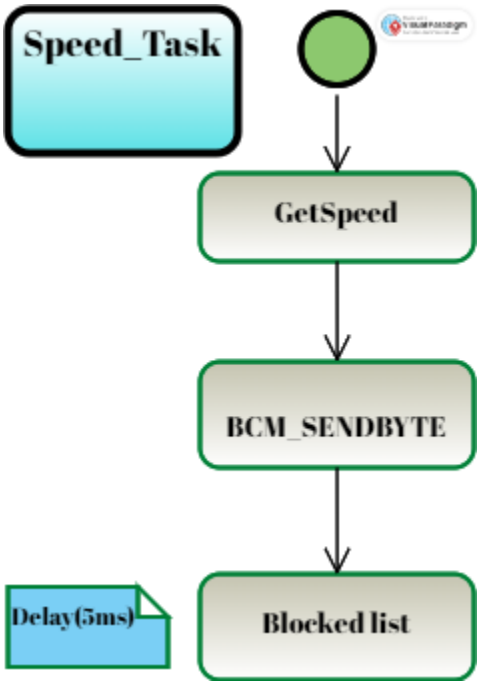
1-Light switch (L)



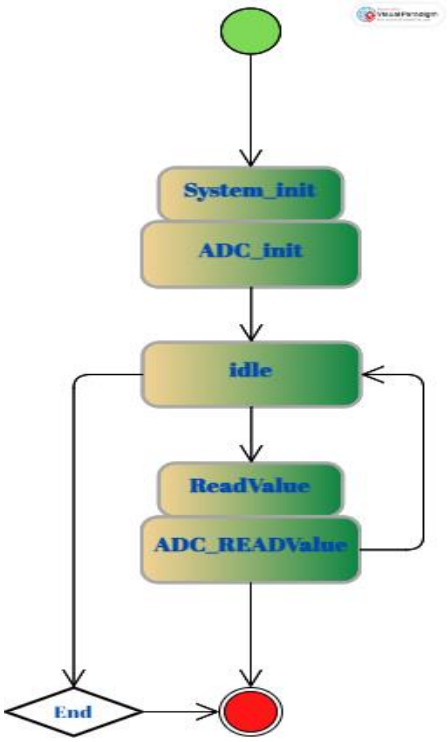
2-Door sensor (D)



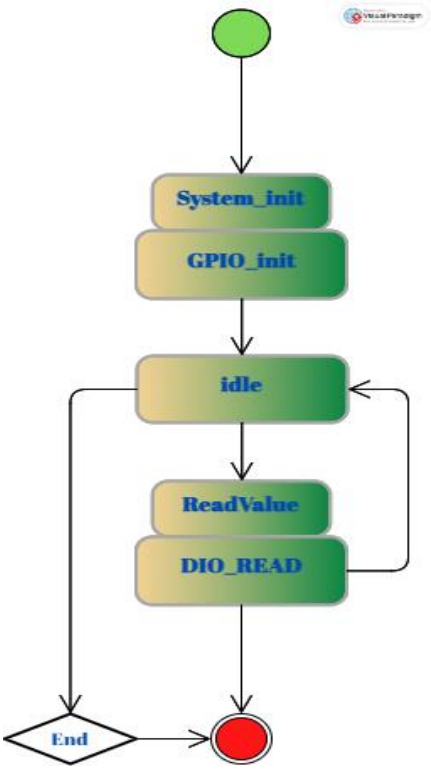
3-Speed sensor(S)



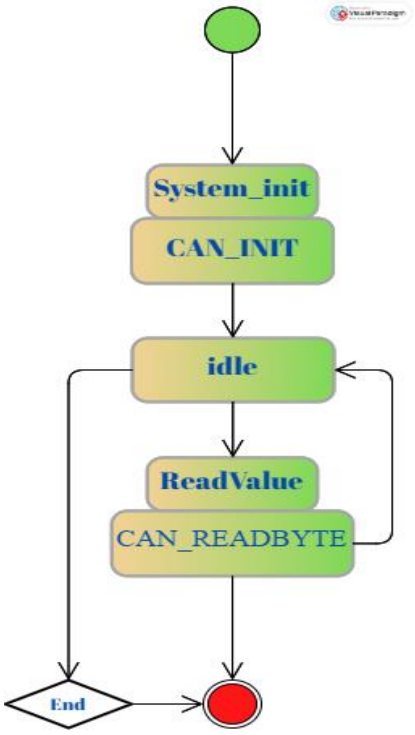
5- ADC Module



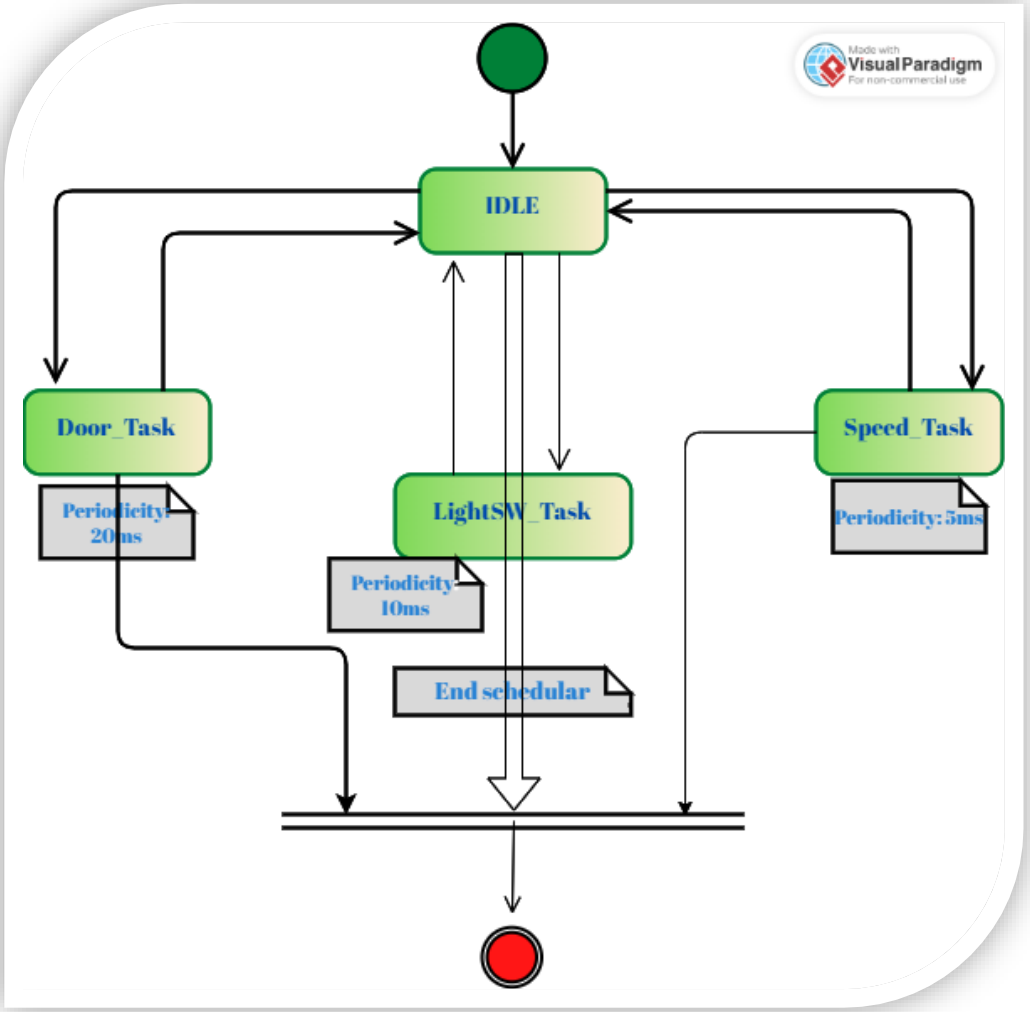
6-GPIO Module



7-CAN MODULE



State Machine Diagram for the ECU1 operation

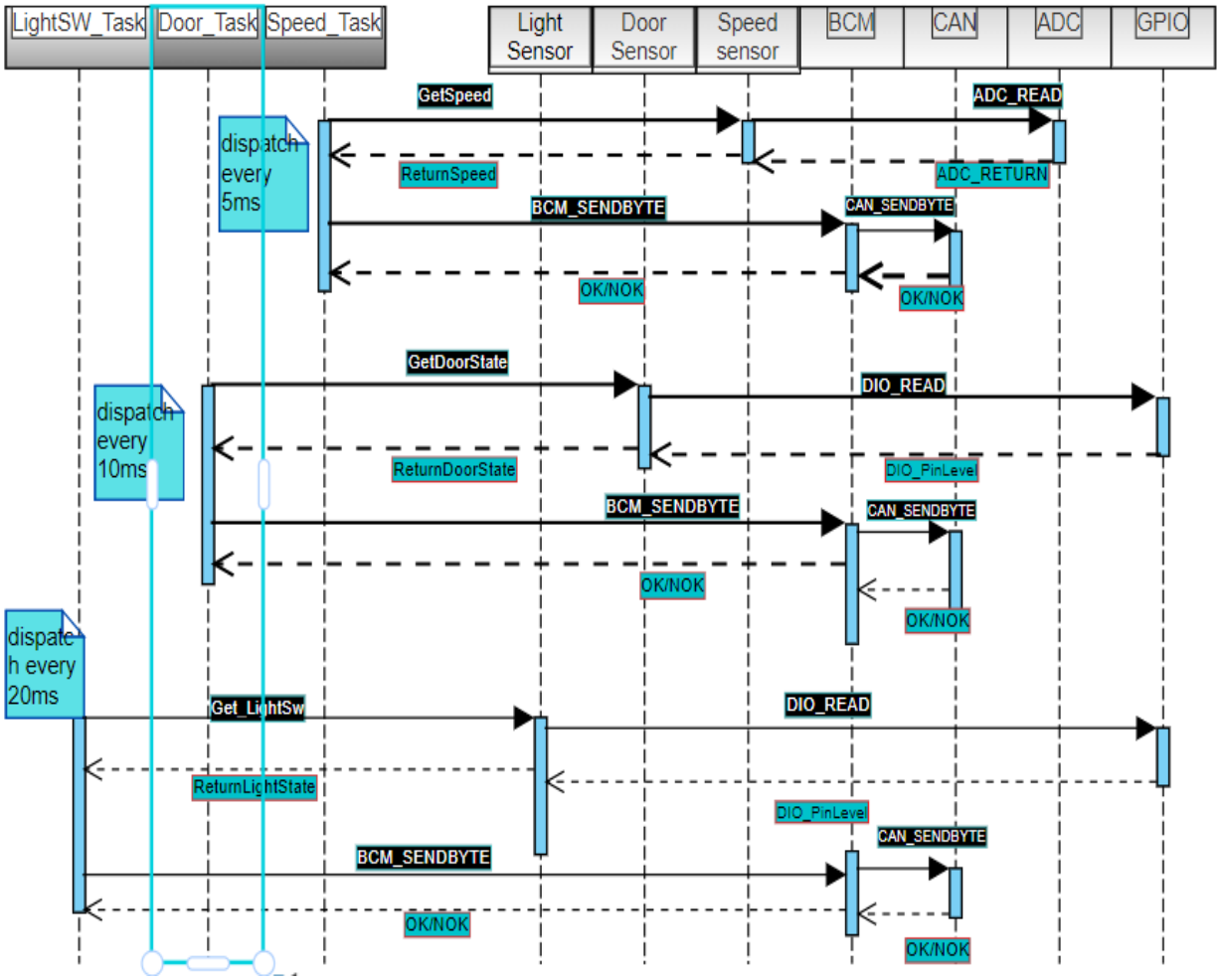


- **ECU1 CPU LOAD**

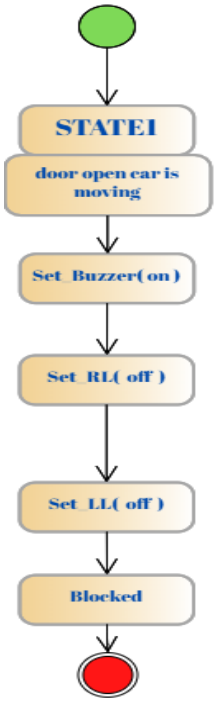
Three tasks (LightSW_Task 1 /Door_Task 2 /Speed_Task 3)
Where E ==> execution time, P ==> Periodicity
Assume E1 → 3ms, Assume E2 → 2 ms, Assume E3 → 1.5 ms
Assume P1 → 20ms, us Assume P2 → 10 us, Assume P3 → 5 us
Hyperperiod = 20 ms.

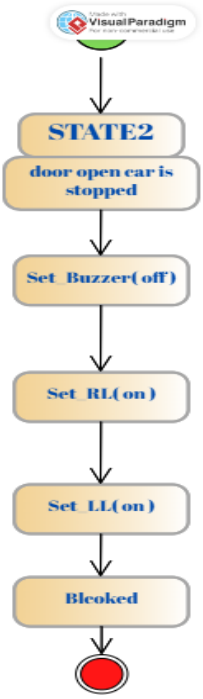
SO CPU1 Load = (3*1) + (2*2)+ (1.5*4) = 13/20*100 = 65%

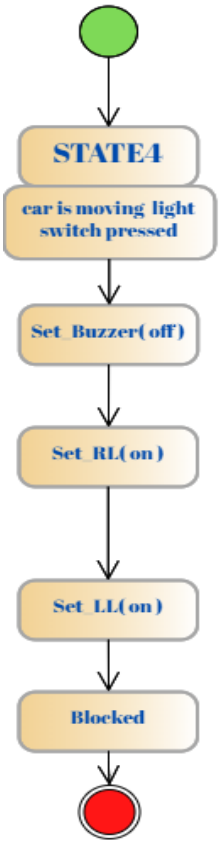
Sequence Diagram for the ECU1

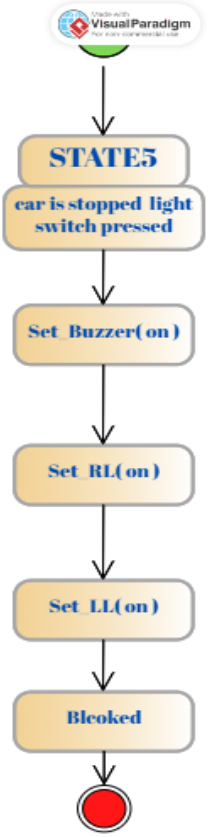


State Machine Diagram for each ECU2 component:

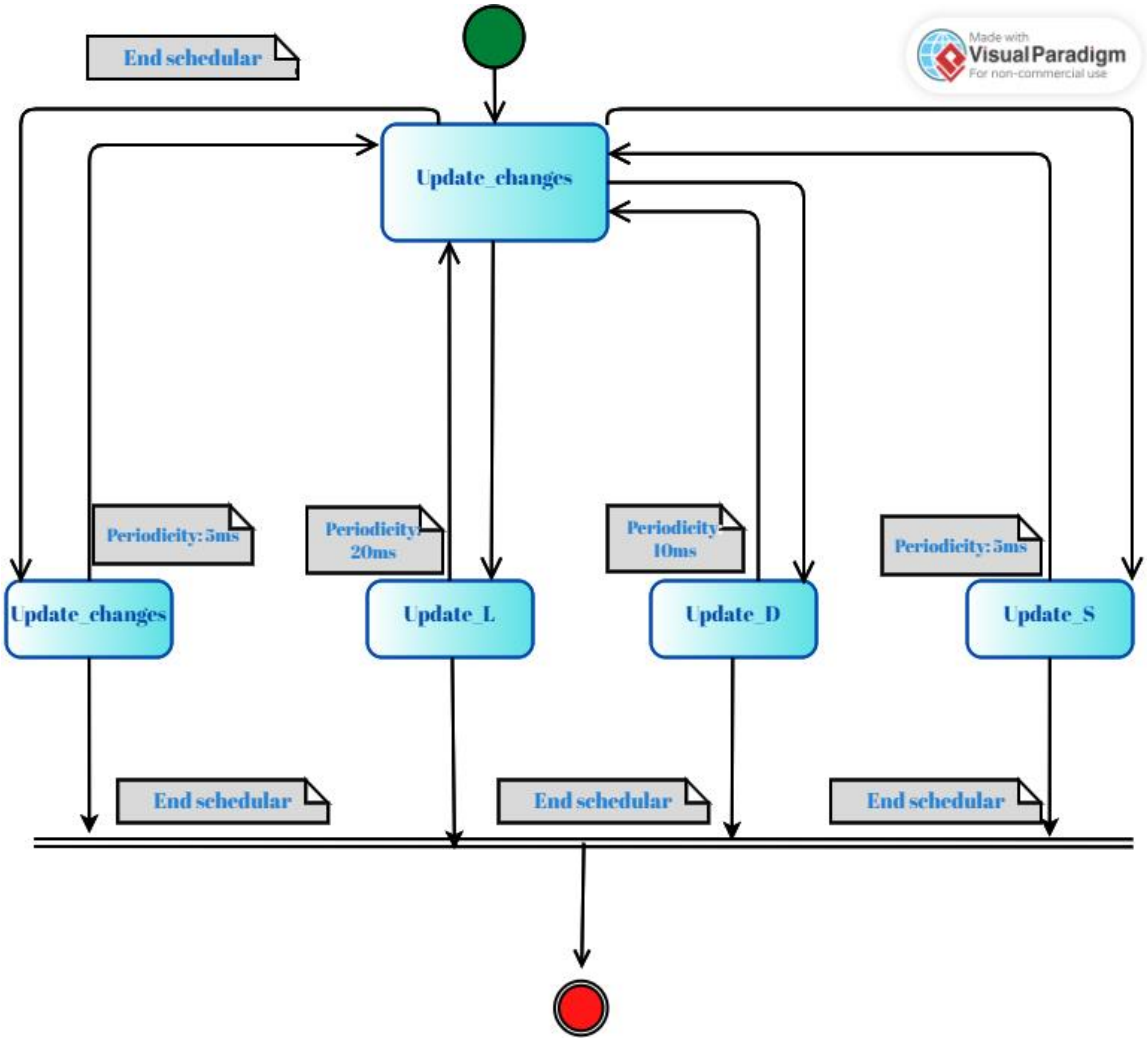








State Machine Diagram for the ECU2 operation



- **ECU2 CPU LOAD**

Four tasks (Update_changes / Update_L / Upadate_D / Update_S)
Where E ==> execution time, P ==> Periodicity
Assume E1 → 2ms, Assume E2 → 1.8ms, Assume E3 → 1.5 ms
, Assume E4 → 1.3 ms
Assume P1 → 5ms, us Assume P2 → 20 us, Assume P3 → 10 us
, Assume P4 → 5us
Hyperperiod = 20 ms.

SO CPU2 Load = (2*4) + (1.8*1) + (1.5*2) + (1.3*4) = 18/20*100 = 90%

Sequence Diagram for the ECU2