EMBEDDED SYSTEMS ADVANCED COURSE

EMBEDDED SOFTWARE

DYNAMIC DESIGN

PROJECT

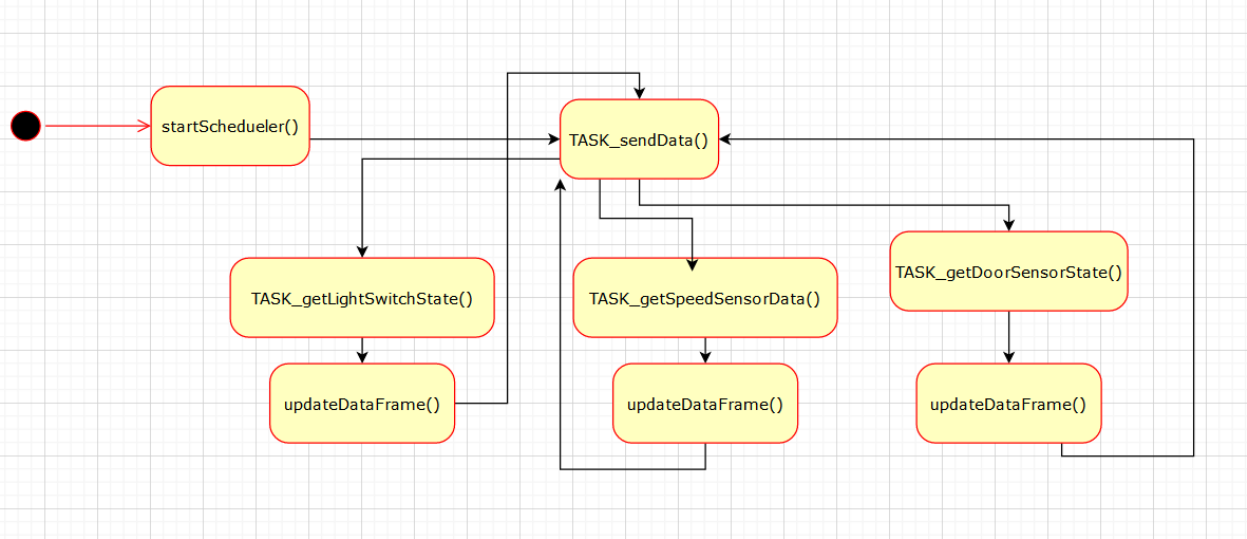
BY

AHMEDSAMEHSAAD99@GMAIL.COM

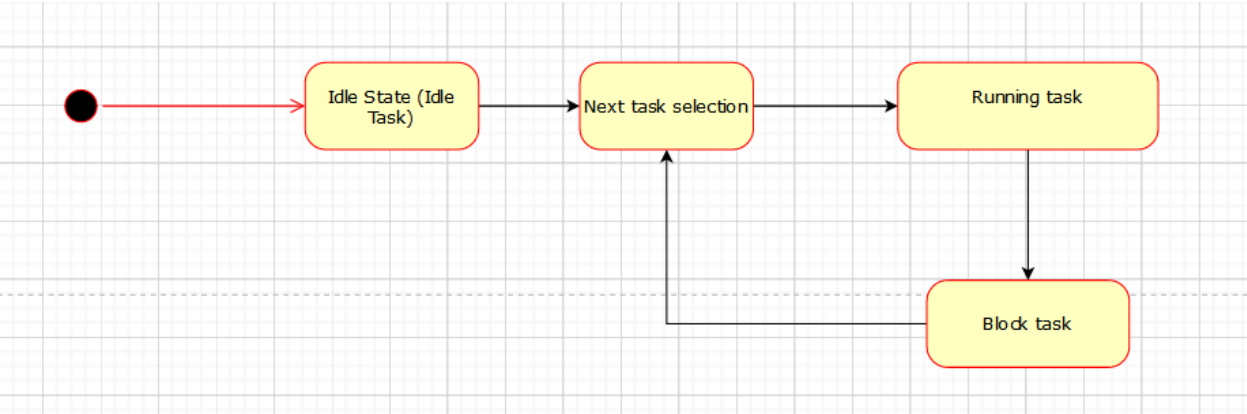
ECU #1 – READING SENSORS / SENDING DATA TO CAN

- **ECU #1: component state diagram**

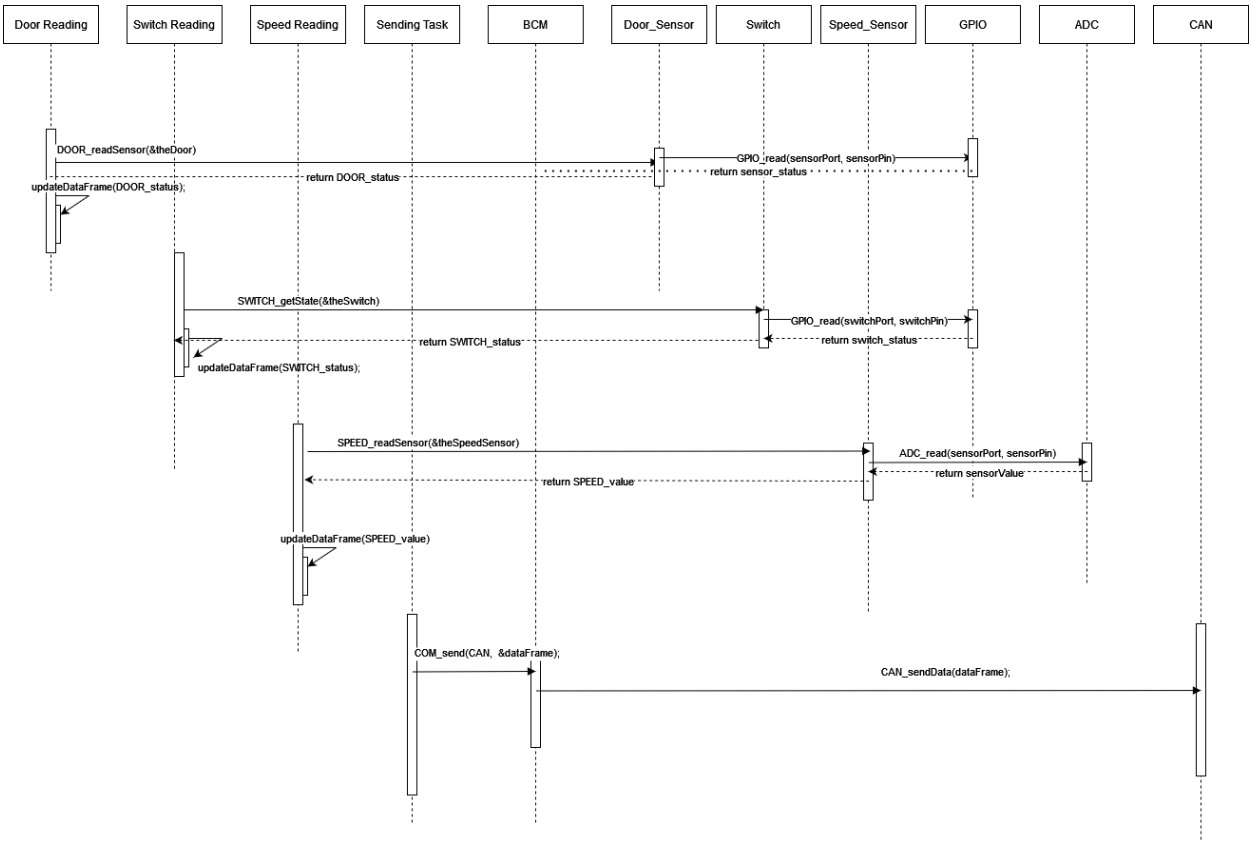
Using RTOS and assuming that all tasks have the same execution time:



- **ECU #1: operation state diagram (based on RTOS)**

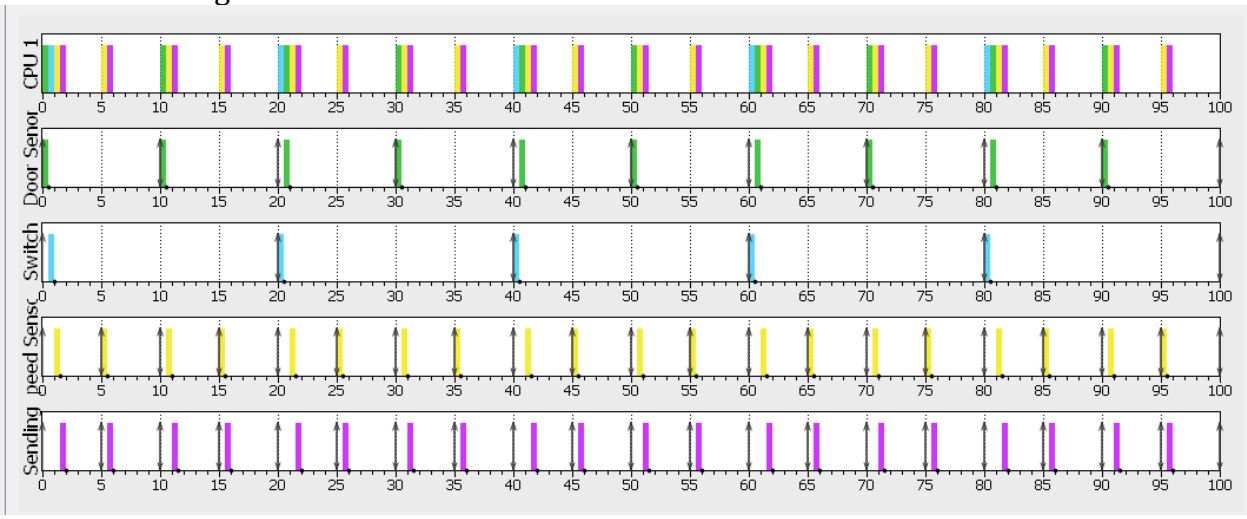


- **ECU #1: Sequence Diagram**



To calculate the CPU load, using Simso offline simulator:

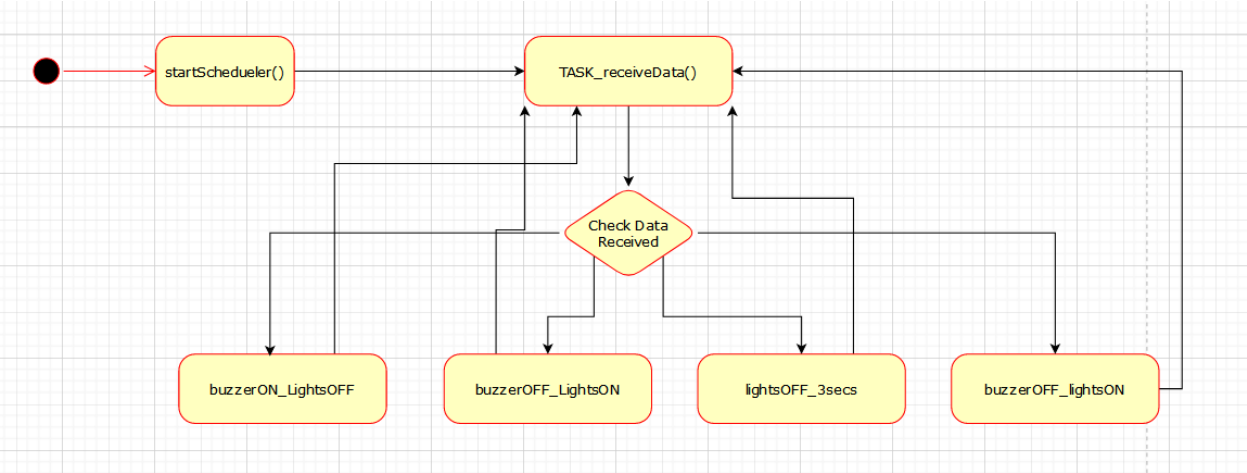
- Assuming that all tasks have the same execution time which is **500 us**



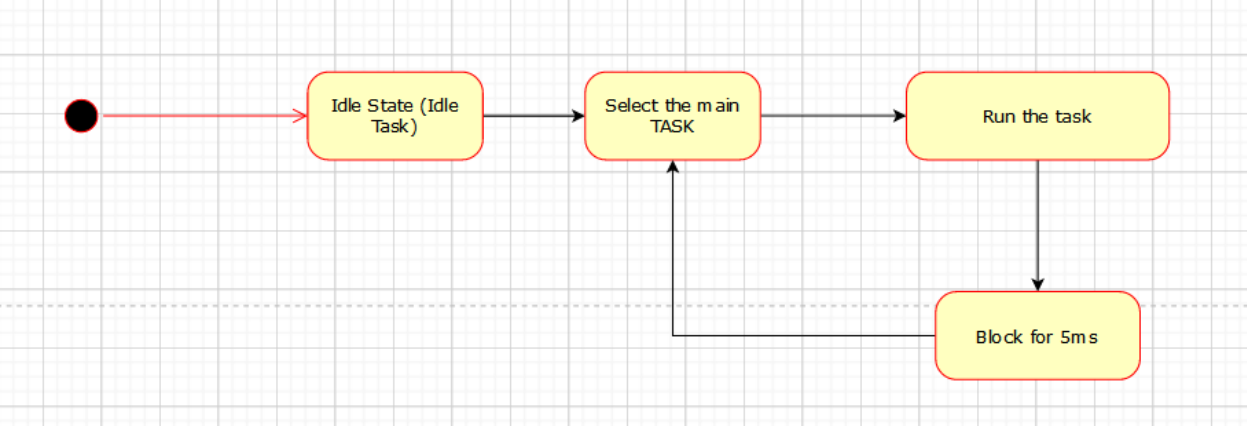
CPU 1	0.2750	0.2750	0.0000
Average	0.2750	0.2750	0.0000

- **ECU #2: component state diagram**

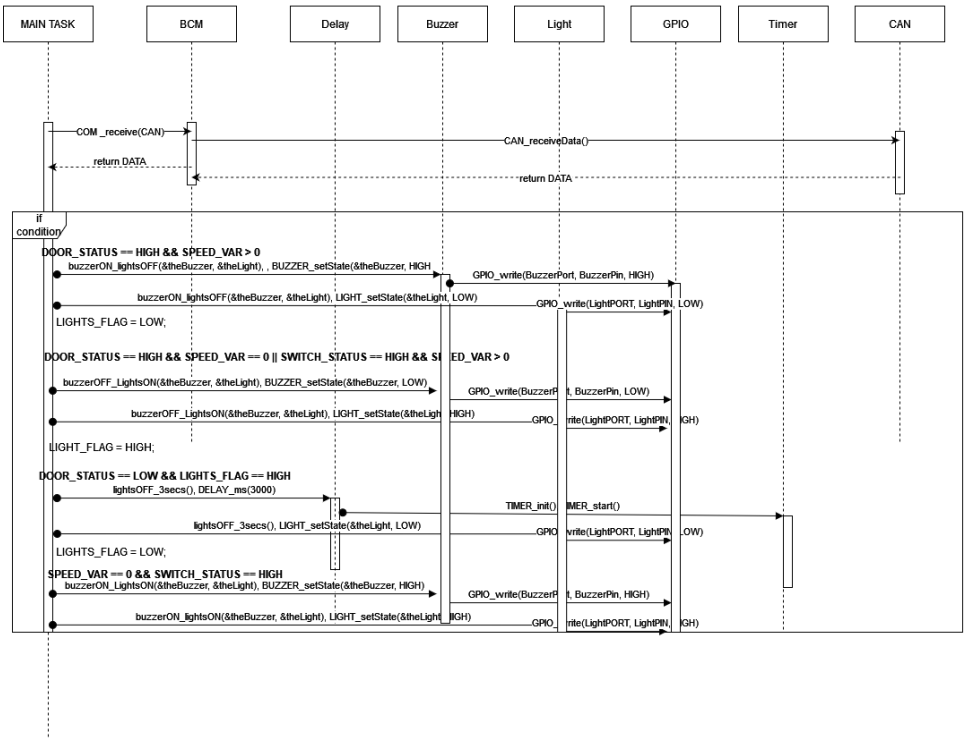
Using RTOS with 1 main task, and 4 functions



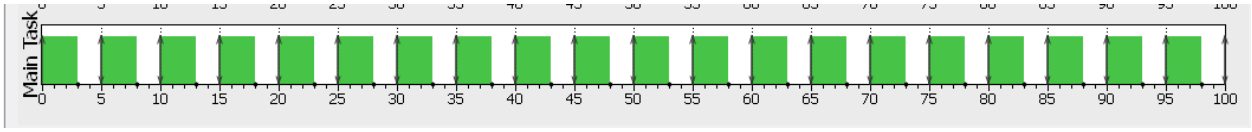
- **ECU #2: operation state diagram**



- **ECU #2: Sequence Diagram**



To calculate the CPU load, using Simso offline simulator:
Assuming the Main Task has 2ms of execution time



	Total load	Payload	System load
CPU 1	0.6000	0.6000	0.0000
Average	0.6000	0.6000	0.0000

To calculate the bus load analytically:

- Assumptions made:
  - CAN data field is 64bits → 111 total frame bits
  - CAN rate of 125 kbps → 0.00000781 second to send 1 bit
- 200 messsages / second (1000/ 5)
- 22200 bits are sent by second (200 * 111)
- Overall time: 22200 * 0.00000781 = 0.1734375 sec
- Then the overall bus load in 1 second = **17.34375%**