

AVR final project



- **Driver mentoring.**
- **Speed limiter.**
- **Break assistance system.**
- **Kilometer counter.**
- **Cross Control System**

A D A S
Advanced
driver-
assistance
systems



The project involves two ECUs:

For security ECU:

- The ECU is connected to a keypad to enter a password for each start.
- Passwords are saved in EEPROM and are equal to '1', '2', '3', '4'. For each start, the system compares the input entered by the keypad after pressing the '=' button.
 - If the password does not match, the red lamp will turn on for 700 ms and then turn off.
 - If the password matches, the green lamp will turn on for 700 ms and then turn off. The servo motor will move to an angle of +90 degrees and then return to 0 degrees after 1 second.
 - The ECU sends the 'A' character through UART if the password is correct.
 - Do not use the delay function to count times for the servo, red lamp, and green lamp. Instead, use Timer0 in overflow mode or CTC mode to count the times for the servo, red lamp, and green lamp.

For Control ECU:

- All subsystems are off until UART receives the 'A' character from the security ECU.
- The ECU is connected with 3 push buttons: the 1st and 3rd buttons for SL and CCS, and the 2nd button for exchanging the gearbox (D, N, P, R). These are the subsystems in the car:

Brake Assistant System (BAS):

- The system is turned off by default because the gearbox is in N by default.
- The system is turned on when the gearbox is in D and returns to off otherwise.
- The system uses the distance measured by the ultrasonic sensor. If the distance is > 10 cm, the BAS LED is turned off. If the distance is > 5 cm, the BAS LED is toggled every 100 ms. Otherwise, the BAS LED is turned on.
- Print "BAS: ON" or "BAS: OFF" on the LCD depending on the mode of BAS.

Speed Limiter System (SL):

- The system is turned off by default because the gearbox is in N by default.
- The system is turned on using the SL push button when the gearbox is in D and returns to off if the gearbox isn't in D or if the SL push button is used.
- The SL LED will turn on if SL is on and turn off otherwise.
- Print "SL: ON" or "SL: OFF" on the LCD depending on the mode of SL.

Cross Control System (CCS):

- The system is turned off by default because the gearbox is in N by default.
- The system is turned on using the CCS push button when the gearbox is in D and returns to off if the gearbox isn't in D, or if the CCS push button or gas potentiometer is exchanged.
- The CCS LED will turn on if the CCS is on and turn off otherwise.
- Print "CCS: ON" or "CCS: OFF" on the LCD depending on the mode of the CCS.

Kilometer Counter:

- Print the kilometer value on the LCD. This value will increment at a high rate if the gas potentiometer is high and vice versa.

Drive Monitoring:

- The system is turned off by default because the gearbox is in N by default.
- The system is turned on when the gearbox is in D and returns to off otherwise.
- The system is monitoring the driver using Timer2 overflow. If the timer counts 5 seconds without any change in the system, the time will be reset with any change in the system. If the timer reaches 5 seconds, you can toggle the buzzer every 100 ms.