

ECO DRIVING – DRIVER ASSISTANCE SYSTEM

PROBLEM STATEMENT :

A method of achieving the same is eco-driving. Eco-driving is a term used to describe the energy-efficient driving of vehicles. By this principle, a driver follows certain principles while driving that help him reduce the total energy consumed.

OBJECTIVES :

The driver assistance system must look out for the following principles.

- The Cruising Speed of the vehicle must be around 90 km/h
- Acceleration shouldn't exceed 1.4705 m/s^2
- If the vehicle is idling (Idling is a working condition in which the engine is idling but does not output power, resulting in fuel consumption) for more than half a minute, recommend that the engine be switched off.
- The number of braking must be kept minimal.
- Detect obstacles ahead and suggest an optimal deceleration
- Track the location of the vehicle

SIMULATION :

TINKERCAD:

We had used Tinkercad for the simulation of obstacle detection, acceleration sensing and idling condition.

ACCELEROMETER AND IR:

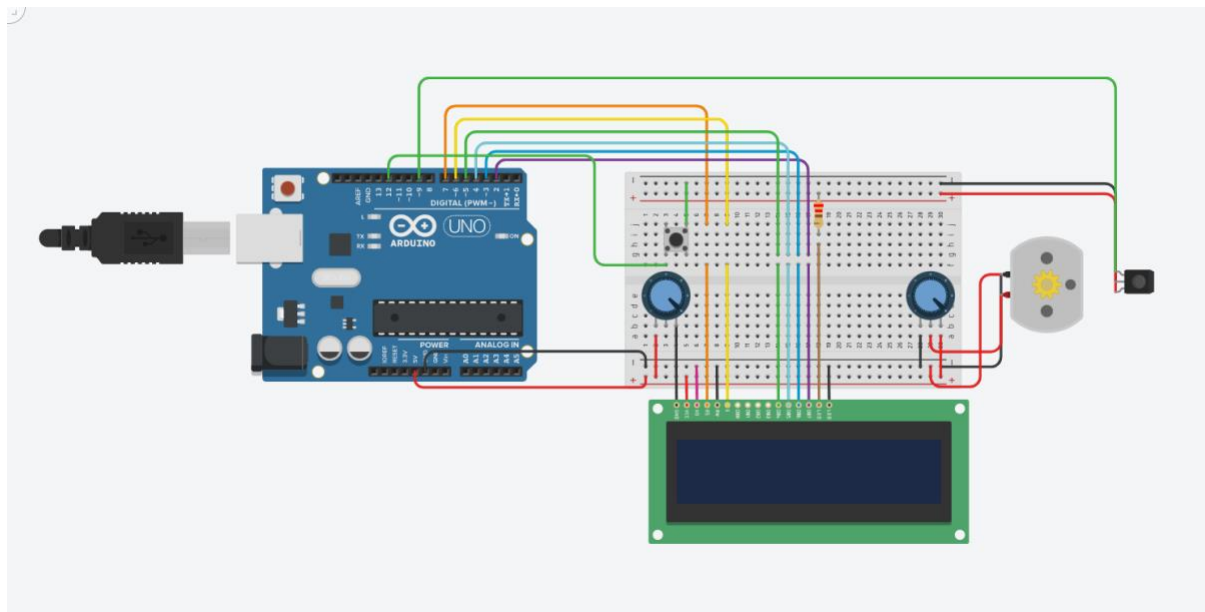
IR sensor is used to detect the obstacles by sending an Infrared Rays. Once the rays were reflected by the obstacles the receiver, it sends a notification that there

is an obstacle ahead and indicates the driver to slow down the vehicle. We would be also using an ultrasonic sensor tilted at an angle to detect if there are any pits ahead.

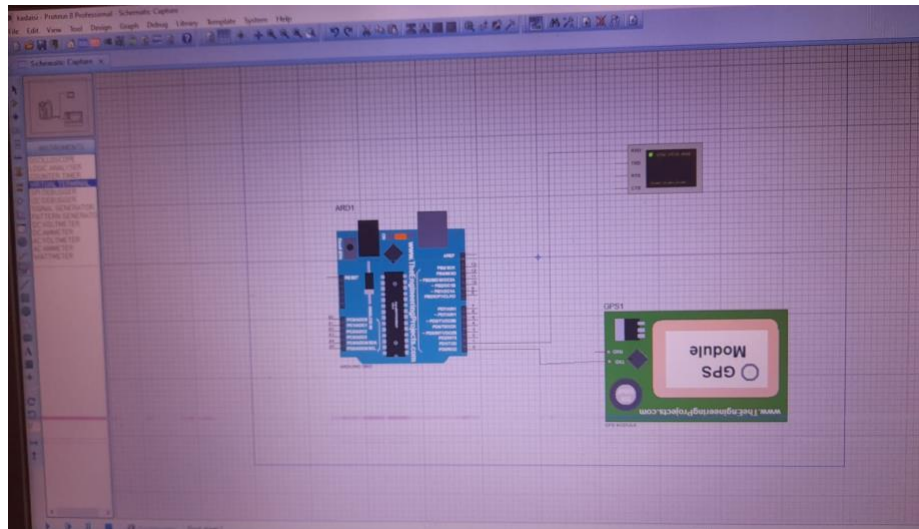
With the help of accelerometer sensor we can continuously detect the acceleration of the vehicle. If the acceleration goes beyond 1.4705 m/s^2 we have programmed to indicate that “You’re accelerating more”. If it decelerates at a rapid rate means he is breaking hard which consumes high fuel. Hence we have programmed to indicate that “You’re breaking hard”.

TACHOMETER:

Tachometer displays the Rotations Per Minute(RPM). GPS Module displays latitude and longitude, if the GPS Module remains same but the RPM is above 600 means the vehicle is idling. Hence we have programmed that if the vehicle is idling for more than half a minute it will indicate the driver to turn off the vehicle.



PROTEUS :



COMPONENTS USED:

- Arduino UNO
- Virtual terminal
- GPS module

EXPLANATION:

We used GPS module available in the proteus software to give random input values.(latitude and longitude). The code dumped in arduino calculates the speed using the coordinates given as input.

$$d = 2R \cdot \sin^{-1} \left(\sqrt{[\sin^2 \left(\frac{\theta_2 - \theta_1}{2} \right) + \cos \theta_1 \cdot \cos \theta_2 \cdot \sin^2 \left(\frac{\varphi_2 - \varphi_1}{2} \right)]} \right).$$

where:

- θ_1, φ_1 – First point latitude and longitude coordinates;
- θ_2, φ_2 – Second point latitude and longitude coordinates;
- R – Earth's radius (R = 6371 km); and
- d – Distance between them along Earth's surface.

We use a virtual terminal to display the output in proteus. Using speed we can interpret both about acceleration and deceleration(brake). Hence we can meet up 4 objectives with no sensors.

SOFTWARE :

For this problem we have used Thingspeak IOT cloud server for storing the data from sensor modules.

GPS module sends Latitude & Longitude coordinate, Speed (calculated from latitude and longitude), Acceleration (calculated from speed) to the NIT channel of Thingspeak.

Tachometer sensor sends RPM data to the LAT channel of Thingspeak.

IR sensor module sends Obstacle (ahead or not) data to the same Lat channel.

Similarly, Ultra sonic sensor sends Pits data to server.

From the server data is interpreted and user is given suggestion based on the data.

CRUISE SPEED:

- Speed data is analysed and if it is between 85 kmph to 90 kmph ,USER is notified “FUEL CONSUMPTION IS ECONOMICAL”
- If the consecutive speed data are equal then, USER is notified “YOU ARE MAINTAINING A CONSTANT SPEED”
- If the speed exceeds 90kmph, then USER is notified “OVERSPEED ,SLOW DOWN !!!”

GPS:

- Latitude and Longitude data is displayed to the USER.

TACHOMETER:

- RPM data is displayed to the USER.

IDLING:

- If GPS data gives same info for 10 - 15 seconds but, tachometer gives RPM reading(greater than 0) then, USER is notified “ SWITCH OFF YOUR ENGINE”.

ACCELERATION:

- If acceleration data is greater than 1.4705 then, USER is notified “YOU ARE OVER ACCELERATING”
- Previous and current acceleration data compared and break count is updated