

Algorithm-

Step 1:

Initialize ncurses

Disable line buffering

Disable echoing of typed keys

Enable non-blocking keyboard input

Enable arrow key

Hide cursor

Step 2:

Initialize the Car State

Set starting position (x, y)

Set speed to zero

Set heading direction

Set gear to neutral

Fuel tank limit

Constant limits:

Maximum speed -100

Acceleration

Brake power

Drag

Fuel burn rate

Step 3:

Main Simulation Loop (Runs Forever)

The loop repeats continuously until the user exits.

Step 4:

Read Keyboard Input

If key is:

UP arrow → increase throttle(speed will increase)

DOWN arrow → increase brake(speed will decrease)

LEFT arrow → steer left

RIGHT arrow → steer right

If no key is pressed(means released), controls slowly return to zero.

Step 5 :

Steering Controls

1. In (3D)

X axis → left / right

Y axis → up / down (constant, not used unless jumping)

Z axis → forward / backward

The car always moves in the X-Z plane.

ii). Car Direction (Heading Angle)

The car has a heading angle

Heading represents where the front of the car is pointing

Heading rotates around the Y axis

Heading value range is:

-180 degrees ← left

0 degrees ← straight

+180 degrees ← right

The car cannot rotate beyond -180 or +180

If it reaches the limit, rotation stops

i) Steering Input Behavior

LEFT key is pressed

Heading angle decreases

Car turns left

X and Z position will both change

RIGHT key is pressed

Heading angle increases

Car turns right

X and Z position will both change

iv). Steering Auto-Center

When no steering key is pressed:

Steering returns to 0 degrees

If heading is negative:

It slowly moves toward 0

If heading is positive:

It slowly moves toward 0

Left turn → release key → car in straight direction

Right turn → release key → car in straight direction

Step 6:

Gear Logic :

i)Neutral gear

Car does not move(Car is stopped)

Speed will remain at 0

Engine is in idle state-Fuel consumption is very low

ii)Forward Gear:(1to5) -Upshifting the gears

Neutral - Gear 1

Throttle is pressed and speed >0

Shifts to gear 1(automatically)

Continues accelerating until reaches upto 15

Gear 1- Gear 2

Throttle is pressed and speed > 15

Shifts to gear 2(automatically)

Continues accelerating until reaches upto 35

Gear 2- Gear 3

Throttle is pressed and speed > 35

Shifts to gear 3(automatically)

Continues accelerating until reaches upto 50

Gear 3- Gear 4

Throttle is pressed and speed >50

Shifts to gear 4(automatically)

Continues accelerating until reaches upto 75

Gear 4- Gear 5

Throttle is pressed and speed > 75

Shifts to gear 5(automatically)

Continues accelerating until reaches upto 100

Gear Downshift :

If speed does down less than 75 - Gear 5-Gear 4

if speed does down less than 50 - Gear 4-Gear 3

if speed does down less than 35 - Gear 3-Gear 2

if speed does down less than 15 - Gear 2-Gear 1

if speed == 0 then car when will again come in neutral

iii)Reverse gear

Stop the car and speed will become zero

When the speed < 0

It will automatically comes in reverse

Speed Limit - 0 to -15

Step - 7 :

Throttle and fuel Consumption :

Throttle range(0 to1)

i) Check Fuel

If fuel = 0:

Engine stops

Speed = 0

Throttle has no effect

ii) Determine Throttle

Throttle value ranges 0.0 to 1.0

Actual acceleration = max_acceleration × throttle

Higher throttle → faster acceleration → higher fuel consumption

iii). Update Fuel Based on Throttle

If throttle > 0:

Fuel decreases proportional to throttle:

fuel_used = fuel_burn × throttle × time_step

If throttle = 0 (idle or neutral):
Fuel decreases at very low idle rate

iv). Apply Acceleration Only if Fuel > 0
Speed increases according to:
Throttle value
Gear direction (forward/reverse)
Time step
If fuel = 0 → speed = 0
Car will stop

Step 8:

Position Update
Update X and Z positions based on:
Speed
Heading
Time step
Gear direction (forward or reverse)

Step 9 :

Speed and Drag Effects
drag will reduce speed gradually
speed to 0 and max limits

Step 10:

Display / UI Update
car state: position, speed, heading, gear, fuel

Step 12 –

Main loop repeats forever
Exit if user presses (like q)

