C++ LABORATORY

CASE STUDY:

DYNAMIC FINE CALCULATION ON TRAFFIC VIOLATIONS

ABSTRACT

- This Case Study attempts to understand the concepts learnt in the course Object Oriented Programming through C++ by implementing them to a real-time system of Dynamic Fine Prizing for Traffic Violations by drivers.
- The program consists of three different classes inherited through multilevel inheritance namely: driver, vehicle and compute.
    - Driver – Accepting driver details
    - Vehicle-Accepting vehicle details
    - Compute-Fine calculation
- There are two functions in the program namely:
    - Quit() – Used to implement an early exit condition in the program
    - Main() – Used to implement the classes stated above and display the formatted result
- Let us discuss the details and functionality of the above stated attributes in detail in the following sections of this case study.

INTRODUCTION

- Accidents have become numerous in the recent times due to various factors. In an attempt to make, the fine system for traffic rules violation more concrete and dynamic, we have created a program that fines the guilty based on his/her history of violations committed. Which in turn may lead to more cautious driving of automobiles reducing the frequency of accident occurrence relatively.
- The objective of the program is to take relevant data from the user and give a violation ticket as an output, which contains the total fine to be paid by the guilty for the violations committed.
- Various OOPs concepts have been implemented in the program such as :
    - Classes
    - Objects
    - Encapsulation
    - Inheritance
- In addition to these concepts constructors, loops, conditional statements are also in use to implement this real-time system.
- Through Dynamic Analysis, we are successful in eliminating most of the bugs in the program while keeping the lines of code to a minimum.

IMPLEMENTATION

VARIABLE DESCRIPTION TABLE

Variable Name	Data Type	Description
name	char	Used to store name of the driver
lc_id	char	Used to store the license number of the driver
v	Int	Array to store the history of violations made by the driver
t	int	Array to store the present violations made by the driver
age	int	Used to store the age of the driver
n	int	Used to store the number of present violations committed
flag	Int	Control variable to check the frequency of violations
rc_no	char	Array to store the registration number of the vehicle
ins	char	Check variable used to store response about insurance of vehicle
lpc	int	Used to store number of months since last pollution check
p	double	Used to store the percentage of increase in fine
fine	double	Array to store individual fine rate per violation
tfine	double	Used to store total fine to be paid by the driver
tf	compute	Class object used to access various class attributes

- Class driver is used to accept all the driver details such as name , license number, age along with the history of violations and current violations using the accept() method.
- An early exit condition can be triggered if the age of the driver is less than 18 years through the call of quit() function based on the value of variable x.
- Class vehicle is used to accept all vehicle details such as registration number, insurance policy and pollution check details. Class vehicle inherits class driver publically.
- Class compute is used to calculate the dynamic fee prices according to the history of violations and present violations committed as well as calculate the total fine to be paid but the driver.
- The compute() default constructor is used to assign default values to fines for various types of violations.
- The violation() member function computes the values of fines depending on the type of violation through the parameter x where for driver violations logic is:
  - If frequency is (f<=3) times – (f*4)% of fine will be added to the original fine amount.
  - If frequency is (3<f<=6) times – (f*8)% of fine will be added to the original fine amount.
  - If frequency is (6<f<=10)times – (f*12)% of fine will be added to the original fine amount.

  And for vehicle violations logic is:
  - If the vehicle has no insurance policy that is (ins='n'||ins='N') and (0<f<=10)times – f% of fine will be added to the original fine amount.
  - If the vehicle's pollution check is past the due time of 6 months that is (lpc>6) and (0<f<=10) – f% of fine will be added to original fine amount.
- NOTE :-
  - If frequency exceeds 10 times in any case then the flag variable is triggered to 1 and appropriate action needs to be taken on the driver since the maximum frequency has been exceeded.
- Class compute inherits the properties of class vehicle publically leading to a multilevel inheritance where objects of class compute can use any class attributes from vehicle or driver.
- In the main() method we create an object of class compute (tf) which calls the default constructor compute() assigning default values to fine[] array.
- By using object tf we call functions accept() and get() of driver and vehicle classes respectively to accept data from the console.
- Depending on the input by the user we call the violation() function to compute the new fine values for each type of violation committed.
- Depending on the value of the flag variable, the program generates the output violation ticket.

RESULT

There are Three Cases of INPUTS and OUTPUTS for the Program. Where:

- AGE LIMIT VIOLATION :-

  Here the age of driver is 12 due to which the early exit condition is triggered through quit().

```
        >>>>>>>>>>TRAFFIC RULES VIOLATION CHECK<<<<<<<<<<

Enter Lisence Number :  LLRTS108021602019
Enter Name of Driver :  Kevin Anderson
Enter age of Driver  :  12

        >>>>>>>>>>VIOLATION TICKET<<<<<<<<<<

**********WARNING : UNDERAGE DRIVER**********
NOTICE :
   1.SIEZE VEHICLE
   2.CONTACT PARENTS/GUARDIANS
--------------------------------
Process exited after 32.34 seconds with return value 1
Press any key to continue . . .
```

- FREQUENCY OF VIOLATIONS UNDER 10 TIMES :-

```
        >>>>>>>>>>TRAFFIC RULES VIOLATION CHECK<<<<<<<<<<

Enter Lisence Number :  LLRTS108021902019
Enter Name of Driver :  James Harden
Enter age of Driver  :  32


        **********VIOLATION HISTORY**********

1.Violated Safety Rules (Helmet/Seat Belt)      :       0
2.Travelled Without License                     :       1
3.Violated Road Rules (Signal Jump/Wrong Route) :       2
4.Unsafe Driving (Speeding/Rash Driving)        :       3
5.Drink and Drive                               :       4
6.Travelled Without/Expired Insurance           :       5
7.Pollution Check Violation                     :       6


        **********VIOLATIONS INDEX**********

1.No Safety (Helmet/Seat Belt)
2.No License
3.Road Rules (Signal Skip/Wrong Route)
4.Speeding/Rash Driving
5.Drunk and Drive

Enter number of violations committed :  5

Enter the indexes of the violations as mentioned above :
1
2
3
4
5


        **********VEHICLE DETAILS**********

Enter Registation Number of the vehicle    :    Ap28CD1233
Vehicle under active Insurace Policy (Y/N) :    n
Months since last pollution check          :    9
```

```
        >>>>>>>>>>VIOLATION TICKET<<<<<<<<<<

NAME OF THE DRIVER          :   James Harden
LICENSE NUMBER              :   LLRTS108021902019
VEHICLE REGISTRATION NUMBER :   Ap28CD1233

------------------------------------------------------------
 VIOLATION                                              FINE
------------------------------------------------------------
 Safety (Helmet/Seat Belt)                              1000/-
 No License                                             5400/-
 Road Rules(Signal Skip/Wrong Route)                    1120/-
 Speeding/Rash Driving                                  3960/-
 Drunk and Drive                                       14000/-
 Polluion Check Violation                               2120/-
 Uninsured Vehicle                                      4200/-
------------------------------------------------------------
 TOTAL AMOUNT                                          31800/-
------------------------------------------------------------




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Process exited after 109.4 seconds with return value 0
Press any key to continue . . .
```

- FREQUENCY OF VIOLATIONS OVER 10 TIMES :-
  Frequency of 1 and 2 violations is more than 10 and have been committed again by the driver.

```
        >>>>>>>>>>TRAFFIC RULES VIOLATION CHECK<<<<<<<<<<

Enter Lisence Number :  LLRTS108020602019
Enter Name of Driver :  Kyrie Irving
Enter age of Driver  :  27


        **********VIOLATION HISTORY**********

1.Violated Safety Rules (Helmet/Seat Belt)      :       10
2.Travelled Without License                     :       12
3.Violated Road Rules (Signal Jump/Wrong Route) :       3
4.Unsafe Driving (Speeding/Rash Driving)        :       5
5.Drink and Drive                               :       6
6.Travelled Without/Expired Insurance           :       3
7.Pollution Check Violation                     :       2


        **********VIOLATIONS INDEX**********

1.No Safety (Helmet/Seat Belt)
2.No License
3.Road Rules (Signal Skip/Wrong Route)
4.Speeding/Rash Driving
5.Drunk and Drive

Enter number of violations committed :  5

Enter the indexes of the violations as mentioned above :
3
4
5
2
1


        **********VEHICLE DETAILS**********

Enter Registation Number of the vehicle    :    TS20CD1234
Vehicle under active Insurace Policy (Y/N) :    Y
Months since last pollution check          :    4
```

```
        >>>>>>>>>>VIOLATION TICKET<<<<<<<<<<

NAME OF THE DRIVER          :   Kyrie Irving
LICENSE NUMBER              :   LLRTS108020602019
VEHICLE REGISTRATION NUMBER :   TS20CD1234

**********WARNING : PENALITY LIMIT EXCEEDED**********

NOTICE :
   1.CONFISCATE LISENCE
   2.SIEZE VEHICLE
--------------------------------
Process exited after 57.5 seconds with return value 0
Press any key to continue . . .
```

BY :-
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