OOP_PCOM7E September 2022 Object Oriented Programming

Unit 11 Summative Assessment: System Implementation

README

The programs comprises three autonomous cars' operations, namely: (1) starting (2) navigation; and (3) parking. Starting represents safety checks before the engine starts and parking is the end of the driving process. Navigation is considered to be an essential feature of an autonomous car (Reddy, 2019).

Part A – System descriptions

Operation 1: Starting

The safety check before starting a car comprised: (1) driver verification (2) child safety check, (3) doors and seat belts check, and (4) power check.

In this operation, a three-step authentication, namely driving license checking, face recognition and password is employed (IDnow, N.D.). Each driver has his own password and pin (explain below) to enhance security. Child safety is essential and children are only allowed at back seats (Amie, 2021). Passengers whose weighted below a pre-set "adult weight threshold" are identified as children. The driver, however, is allowed to accept exception to deal with case of under-weighted adults or seat occupied by non-human (e.g. pets, articles). Since the identity of the driver has already been verified, a one-digit-pin is used to simplify the process. The engine cannot be if any occupant of the front or driver seat is a child. For back seats, child occupant will only trigger reminder and enables child-lock.

Thereafter, all doors are checked if closed properly with no exception. Unbuckled seat belts, however, are considered less essential and will trigger reminder only. Driver is allow to accept exception. Lastly, power will be checked to ensure engine can be started properly.

Operation 2: Navigation

The navigation system is being provided by Carmenta TrafficWatch, a comprehensive traffic watching provided. The system consists of maps and real time traffic watch system (Carmenta TrafficWatch, N.D.).

The driver is asked to enter the destination and Carmenta TrafficWatch will calculate the fastest route and the nearest route. The fuel control system will check if the car will still have sufficient power after this journey by compare to a pre-set warning level, if not, will suggest the third route that include power station on the way. The driver is free to choose any of these proposed routes. Our test data include a scenario that traffic condition changed in the middle of the journey and re-selection of route is required. After the journey, the millage and power consumption data are updated.

Operation 3: Parking

Carmenta TrafficWatch will provide the driver choices of 3 carparks with prices for the driver. After decision is made, the parking slot will be reserved. After the driver is drop off, the car will head to the designated parking space driverless (New China TV, N.D.). Obstacle handling scenarios are added to the test data in order to simulate real life situation.

Part B – OOP Coding

The classes employed are: Car, User (sub-class: driver), seat, fuel control system, routes and car-park. All classes are written in capital letters for easy coding management. Each operation's codes contain 3 parts: Classes are defined at the beginning of the codes, followed with databases (test data) and the main program comes at the last. In program writing, some usual codes are written in functions for easy to refer to.

Part C – Notes for testing

In order to better interact during program testing, there are areas in which the tester is required to make selections or enter data, for example, choosing destination, desired route, car-park or make choice during obstacle handling. For easy reading of the testing results, pauses are added in certain sections. Just press [Enter] to continue reading. Three files are attached, each contains one operation.

To test the program smoothly, you need the following information:

Password = "1234"
One-digit-pin = "1"

Certain testing data are designed to trigger warning so that exception handling are tested, mainly, driver's and certain passenger's weights are below adult threshold, please accept exception enter "1" (pin).

Appendice – OOP diagrams

The OOP diagrams attached are updated by taking up the comments on the summative information and amend as required during the program development.

Reference:

Reddy, P. P. (2019) Driverless Car: Software Modelling and Design using Python and Tensorflow.

IDnow. (N.D.) Fully automated for the fastest identity verification [Available from:

https://www.idnow.io/autoident-express-fully-automated-identity-verification-with-a-powerful-document-learning-] Accessed on 2 November 2022.

Amie (2021) When can a child sit in the front seat of the car? [Available from: https://saferide4kids.com/blog/can-children-sit-in-the-front-seat-car/#:~:text=It%20is%20safest%20%E2%80%94%20and%20best,they%20are%2013%20years%20old.&text=The%20Centers%20for%20Disease%20Control,13%20in%20the%20back%20seat.] Accessed on 6 November 2022.

Carmenta TrafficWatch. (N.D.) [Available from: https://carmenta.com/en/automotive/carmenta-trafficwatch/?gclid=Cj0KCQjwk5ibBhDqARIsACzmgLQGjK88miy-Ty4_YD_bKCKzoD-Qu7S5Kv54yQn1yXjPwzSlYyqy7kYaAhchEALw_wcB] Accessed on 1 November 2022.

New China TV. (N.D.) How self-driving car completes parking [Available from: https://www.youtube.com/watch?v=GKxFZQxCB8M] Accessed on 6 November 2022.