Design Document

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Contents

1 Introduction

1.1 Purpose

1.2 Scope

1.3 Abbreviations, Definitions and Acronyms

1.3.1 Abbreviations:

- Gn: the n-th Goal

- An: the n-th Assumption

- Rn: the n-th Requirement

1.3.2 Acronyms

- CC: Credit Card

- DL: Driving Licence

- AU: Active User

1.3.3 Definitions

- Visitor: person that may not be registered to the system or not logged in.

- User: a registered and logged in Visitor, that may be still waiting for his information to be verified.

- Active User: a User whose data (CC, DL) have been verified. (Shares all User's characteristics)

- Safe Zone: predefined zones where parking is allowed, parking is forbidden in any other zone.

- Park: park the car in the safe zone and terminate the rental.

2 Algorithm design

All algorithms needed in the project are trivial but the one dealing with uniform repartition of cars in the city. This problem has been studied a lot and there are in literature various algorithms that solve it. They are mainly based on mixed integer linear programming techniques and in particular [1] presented a complete model. In [2] is presented a greedy algorithm that achieves almost the same result. In [3] a more sofisticated approach is used taking into account a three dimensional objective function and exploiting genetic algorithms and local search methods. [4] offers a sort of classification of the stragies proposed in the past years.
For our purpose the approach described in [2] is the best since it minimizes the number of the operators needed to relocate cars and so the costs.

Riferimenti

[1] A. G. Kek, R. L. Cheu, Q. Meng, and C. H. Fung, "A decision support system for vehicle relocation operations in carsharing systems", Transportation Research Part E: Logistics and Transportation Review, vol. 45, no. 1, pp. 149–158, 2009.

[2] R. Zakaria, L. Moalic, A. Caminada, M. Dib, "A Greedy Algorithm for relocation problem in one-way carsharing", 10th International Conference on Modeling, Optimization and Simulation - MOSIM'14 – November 5-7-2014- Nancy – France "Toward circular Economy".

[3] Moalic, L., Lamrous, S., & Caminada, A. (2013). A Multiobjective Memetic Algorithm for Solving the Carsharing Problem. Proceedings Of The 2013 International Conference On Artificial IntelligenceIcai 2013, Vol. 1, pp. 877-883.

[4] S. Weikl, K. Bogenberger, "Relocation Strategies and Algorithms for free-floating Car Sharing Systems", 15th International IEEE Conference on Intelligent Transportation Systems Anchorage, Alaska, USA, September 16-19, 2012.

3 Effort spent

Component	Time spent (in hour)
Philippe Scorsolini	23
Lorenzo Semeria	18
Gabriele Vanoni	24.5