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Abstract

Development of Vehicle Fleet Management System Based on Global Positioning System and Artificial Intelligence

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This project aims at developing a vehicle fleet management system and Global Positioning System as an assistance for locating the vehicles. This fleet takes two hundred vehicles for testing in government department. The government department has a manual vehicle management procedure for storing driving records such as location, time, distance traveled (read from the meter). The essential data are submitted to the related department for manual processing. Yet, the manual vehicle management procedures cannot show crucial information, such as the driving behavior, working sites and vehicle driving data of the drivers, assuming that the driver has an unusual driving behavior such as irregular speed, staying out of working site, traffic rule violation and devious route. Moreover, the manual system cannot plan or record all the important information. Due to the fact that Macau is now having its own digital map, with the assistance of the Global Positioning System (GPS) technology, it is possible to develop a management system for vehicle fleet. Good

vehicles management not only keeps track of vehicle usage but also verify the daily or weekly workload assigned by related leaders. A GPS assisted fleet system is therefore developed to resolve the above-mentioned problems and reduce the workload of leaders. The fleet system developed consists of hardware section for GPS data logging and several software modules for data collection, data analysis and working report. For the hardware section, a commercial product of the GPS data logger with a card writer for writing the GPS data to a Multi Media Card (MMC) is used. For the system application software, it is separated into three main systems as follows: GPS data collection system, GPS data analysis system and Vehicle fleet management system. The GPS data collection system is the data collected from the drivers' description or the GPS data stored in MMC. While the GPS data analysis system is the analysis of the vehicle position from the GPS data. Since the GPS data are fluctuated by interference or geographic environmental reason, an artificial intelligent method - Fuzzy Logic, and some geographic mathematical methods, are used in this research for the locating of vehicle. The map matching is employed to analyze vehicle driving data to determine the driving direction with the Macau digital map. The vehicle fleet management module is for the abnormal driving events, vehicle tracking simulation and report generation. An ORACLE server is used to exchange the data between the modules. Owing to the convenient maintenance of the ORACLE server and the application software used in the system, it is developed under Microsoft Windows based operation system and programming tools.

A complete system is developed with the following functions: (1) data collection and valid data selection from the drivers' MMC cards, (2) Geographic Information System

(GIS) for route planning and vehicle locating, (3) fuzzy map matching algorithm for correcting the GPS data, and (4) route comparison between route planning from the driver and the route logged from the GPS data. The developed system is installed in a government fleet with more than 200 vehicles and the results are proved to be successful.