Poster Abstract: Eco-driving System Using Dedicated Short Range Communication

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***Abstract*—Eco-driving plays a significant role in reducing greenhouse gas that causes global warming and air pollution. In this work, we introduce a field test of eco-driving system using dedicated short range communication (DSRC). The primary objective is to reduce the fuel consumption at an intersection. To this end, a vehicle receives the signal information and the coordinates of a roadside unit (RSU) via infrastructure-to-vehicle (I2V) communication and determines its speed based on the received information.**

Keywords- eco-driving; infrastructure-to-vehicle (I2V);

I. INTRODUCTION

Vehicles are one of the most essential transportations in our daily life. The vehicles provide comfort when traveling to the destination, but they are one of the major causes to pollute the earth. They emit greenhouse gas, which causes global warming and air pollution, as a result of fuel consumption. Due to globally increasing vehicle population, the above problems are expected to get worse. To solve the problems, lots of researches have been studied in diverse fields such as electronic vehicles, efficient engine technology, and traffic control. The recent advances in vehicular networks such as dedicated short range communication (DSRC) facilitate the more adequate eco-driving system in vehicle traffic. In our work, we introduce the eco-driving field test using DSRC at an intersection. To this end, a roadside unit (RSU) broadcasts the signal phase and RSU's GPS coordinates to a vehicle so that the vehicle determines either the acceleration or the deceleration based on the received information.

II. SYSTEM MODEL

In our demo, a RSU is deployed on roadside and a vehicle equips with an on-board unit (OBU) including the global positioning system (GPS) and a laptop as shown in Fig. 1. RSU periodically broadcasts an a-la-carte message (ACM) including signal phase information and its GPS coordinates. OBU receives the broadcast information through the I2V communication and calculates the current speed based on the GPS signal. After that, OBU transmits the signal phase information, the RSU's and the vehicle's GPS coordinates, and the current speed to the laptop through the user datagram protocol (UDP). The laptop determines the vehicle speed using the eco-driving algorithm based on the received information.

We adopt the eco-driving algorithm proposed by H. Xia et al. [1]. The main ideas of the algorithm are as follows.

(a) (b)

Figure 1. (a): Equipped OBU in a vehicle, (b): Deployed RSU on roadside

Figure 2. The place of test in DGIST

First, a vehicle accelerates or keeps the current speed if it can cross the intersection through the green light. Second, the vehicle coasts to a stop line when the vehicle cannot make itself through the intersection on the current green light or the red light. Third, if a vehicle is far from the stop line, it coasts to the stop line to avoid a complete stop and then accelerates on the next green light.

We have a testbed in DGIST as shown in Fig. 2 and plan to test our idea on it.

III. CONCLUSION

This system is expected to decrease the fuel consumption and emission of greenhouse gas. We plan to apply this system to the more complicated situation on the road.

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