Short-term scientific mission in the frame of COST Action IC0801 Final report

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1 Introduction

I spent three months at LIACC, Artificial Intelligence and Computer Science Laboratory, University of Porto (Portugal), within a short-term scientific mission (STSM) under the supervision of Prof. Eugenio Oliveira and Prof. Rosaldo Rossetti. The aim of this STSM was to improve the knowledge on multiagent systems applied to the traffic and transportation domain, and in particular how to assess the effectiveness of multiagent-based distributed control strategies.

2 Background

Autonomous vehicle navigation in urban road networks will be possible in the future, making traveling yet another activity that does not need the human intervention. In this conext, Dresner and Stone [2] proposed a reservation-based infrastructure facility to regulate the transit of autonomous vehicles through intersections. This raises new challenges for future traffic control systems: intelligent traffic infrastructures, provided with sensors and computing power, will aim at resolving congestions and speeding up the traffic flow of millions of drivers, commuting every day from their homes to their respective workplaces and back, making autonomous decisions about route assignment and departure time selection, learning from their past experiences and influencing each other in both positive and negative ways.

3 Objective

The goal of this STSM was empirically evaluate different policies to manage a reservation-based intersection. In the Dresner and Stone's original work, the

intersection manager applies a simple first-come-first-served policy, evaluating the reservation requests in the same order they are received by the intersection manager. Nevertheless, allowing the intersection manager to evaluate a bunch of requests at the same time, it may make more informed decisions so as to optimize the intersection throughput. Thus, we made an empirical evaluation of different policies, inspired by the adversarial queueing theory (AQT) [1], comparing them with the first-come-first-served policy proposed by Dresner and Stone.

The experimental results showed that the reservation-based intersection is best suited for low-load situations, because it reduces drastically the average delay. Furthermore, we showed that the first-come-first-served policy, albeit very simple, is quite efficient and performs very well in all the situations. Nevertheless, in the simulated scenarios some other policies outperformed the first-come-first-served one, especially in low-load situations.

As a result of this STSM, we wrote a paper titled *Evaluating policies for reservation-based intersection control.*, which has been accepted for presentation at the 14th Portuguese Conference on Artificial Intelligence (EPIA'09).

4 Further research and cooperation

The visit at LIACC generated a strong relationship with the people of the laboratory, in particular with Prof. Rosaldo Rossetti. We are planning to write a joint paper for the 7th European Workshop on Multi-Agent Systems (EUMAS'09) and, if possible, we'd like to establish a strict cooperation for future applications to research projects, European as well as national ones.

References

1. M. Blesa and D. Calzada and A. Fernández and L. López and A. Martínez and A. Santos and M. Serna. *Adversarial Queueing Model for Continuous Network Dynamics.* Proceeding of Mathematical Foundations of Computer Science, vol. 3618, pp. 144-155, Lecture Notes in Computer Science, 2005.
2. K. M. Dresner and P. Stone. *A Multiagent Approach to Autonomous Intersection Management.* Journal of Artificial Intelligence Research, 31:591-656, 2008.