Supporting Integrated Traffic Signal Controllers Using Embedded System and Software Agent

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Abstract. Advanced traffic signal controllers are able to facilitate the realization of advanced traffic management strategies. The traffic signal controllers nowadays can not provide complex computation for supporting the requirements of Advanced Traffic Management System (ATMS). Therefore, the performance of advanced traffic management strategy will be lowered. This research aims at combining the technologies of embedded systems and software agents to support ATMS for performing advanced traffic management strategies. The experimental system proposed in this paper includes three major components: Virtual Traffic Police (VTP), Status Monitor Agent (SMA) and Traffic Control Integration Module (TCIM). In the proposed system, a traffic signal controller is the hardware platform for performing the VTP. A VTP owns the information of traffic strategies and supports the information exchange and message publishing among traffic signal controllers. A SMA is responsible for monitoring the execution of traffic strategies to ensure the execution accuracy of traffic signals. A TCIM integrates the hardware, such as traffic control module, electric information board, and camera, for supporting a high efficient and various traffic control mechanism.

Keywords: embedded system, virtual traffic police (VTP), traffic signal controller

References

[1] U.S. Department of Transportation, "National ITS Architecture Version- 6.0," http://www.its.dot.gov/, 2007.

[2] T.H. Chang and Z.H. Chang, "Adaptive Signal Control Via an Intelligent Traffic Controller," *IEEE Transportation Planning Journal*, Vol. 33, No. 1, pp. 203-206, 2004.

[3] F.B. Lin, "A Compartive Analysis of Two Logics for Adaptive Control of Isolated Intersections," *The 67" Annual Meeting of Transportation Research Board*, Washington, D. C., 1988.

[4] X.F. Chen, Z.K. Shi, and K. Zhao, "Research on an Intelligent Traffic Signal Controller," *Proceedings of IEEE Intelligent Transportation Systems,* IEEE Press, pp.884-887, 2003.

[5] Department of Transportation, Taiwan, NTCIP-compatible wireless ATMS 1 & 2, 2005-2006.

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[6] F.Y. Wang, "Agent-Based Control for Networked Traffic Management Systems," *IEEE Intelligent Systems*, Vol. 20, No. 5, pp.92-96, 2005.

[7] Z. Li, F. He, Q. Yao, and F.Y. Wang, "Signal Controller Design for Agent-Based Traffic Control System," *Proceedings of IEEE International Conference on Networking, Sensing and Control*, IEEE Press, pp.199-204, 2007.

[8] F.Y. Wang and C.H. Wang, "Agent-based control systems for operation and management of intelli- gent network-enabled devices," *Proceedings of IEEE International Conference on Systems, Man, and Cybernetics*, IEEE Press, pp. 5028-5033, 2003.

[9] K.Y. Chin, Z.W. Hong, J.M. Lin, A.J. Lin, and S.S. Kuo, "An Internet Mobile Marketing Agent Mobile for Facilitating E-Business", *Proceedings of The XIV ACME International Conference on Pacific Rim Management (ACME 2004)*, (CD-ROM), Chicago, USA, 2004.

[10] L. Xu, B. Xu, H. Chen, W. Chu, J.M. Lin, and H. Yang, "Test Web Applications Based on Agent", *Journal of Software*, Vol. 14, pp. 9-16, 2003.

[11] Java Agent Development Framework, http://jade.tilab.com/.

[12] LEAP Administrative Tutorials, http:// www.ryerson.ca/~dgrimsha/jade/LEAPTutorials.htm.