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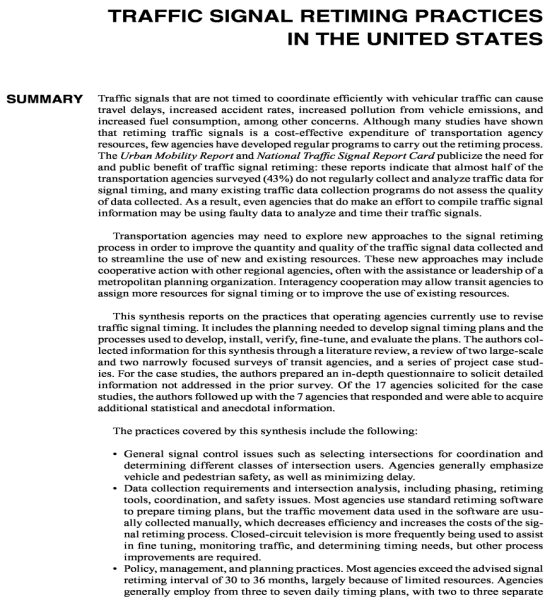

TRAFFIC SIGNAL RETIMING PRACTICES IN THE UNITED STATES

SUMMARY Traffic signals that are not timed to coordinate efficiently with vehicular traffic can cause travel delays, increased accident rates, increased pollution from vehicle emissions, and increased fuel consumption, among other concerns. Although many studies have shown that retiming traffic signals is a cost-effective expenditure of transportation agency resources, few agencies have developed regular programs to carry out the retiming process. The *Urban Mobility Report* and *National Traffic Signal Report Card* publicize the need for and public benefit of traffic signal retiming: these reports indicate that almost half of the transportation agencies surveyed (43%) do not regularly collect and analyze traffic data for signal timing, and many existing traffic data collection programs do not assess the quality of data collected. As a result, even agencies that do make an effort to compile traffic signal information may be using faulty data to analyze and time their traffic signals.

Transportation agencies may need to explore new approaches to the signal retiming process in order to improve the quantity and quality of the traffic signal data collected and to streamline the use of new and existing resources. These new approaches may include cooperative action with other regional agencies, often with the assistance or leadership of a metropolitan planning organization. Interagency cooperation may allow transit agencies to assign more resources for signal timing or to improve the use of existing resources.

This synthesis reports on the practices that operating agencies currently use to revise traffic signal timing. It includes the planning needed to develop signal timing plans and the processes used to develop, install, verify, fine-tune, and evaluate the plans. The authors collected information for this synthesis through a literature review, a review of two large-scale and two narrowly focused surveys of transit agencies, and a series of project case studies. For the case studies, the authors prepared an in-depth questionnaire to solicit detailed information not addressed in the prior survey. Of the 17 agencies solicited for the case studies, the authors followed up with the 7 agencies that responded and were able to acquire additional statistical and anecdotal information.

The practices covered by this synthesis include the following:

- General signal control issues such as selecting intersections for coordination and determining different classes of intersection users. Agencies generally emphasize vehicle and pedestrian safety, as well as minimizing delay.
- Data collection requirements and intersection analysis, including phasing, retiming tools, coordination, and safety issues. Most agencies use standard retiming software to prepare timing plans, but the traffic movement data used in the software are usually collected manually, which decreases efficiency and increases the costs of the signal retiming process. Closed-circuit television is more frequently being used to assist in fine tuning, monitoring traffic, and determining timing needs, but other process improvements are required.
- Policy, management, and planning practices. Most agencies exceed the advised signal retiming interval of 30 to 36 months, largely because of limited resources. Agencies generally employ from three to seven daily timing plans, with two to three separate

Current signal systems for managing road traffic in many urban areas around Received 6 March tribution to global warming, environmental pollution and the depletion of fossil fuels IEEE international conference on intelligent transport systems, Institute of Electrical and Lowrie, P. R. (, March April 1).The controller is a small box or may be within one of the signal aspects, and Traffic Control Division Department of Transport, Bristol (March and later). network for traffic systems', Eighth international conference on Road Traffic Letter of 27 November, Department of Transport, London, 1 30, 3, This study presents a distributed multi-agent-based traffic signal control for optimising green Road Traf?c Signalling, 30 March 1 April , London, UK.road users due to inappropriate design of traffic signal settings and uncertain traffic on Road Traffic Signaling, London, UK, 30 March1 April ; pp. In Proceedings of the IEEE International Conference on.Journal of the British Interplanetary Society, Vol. 30, No. 3 (March). AIAA/ CASI 6th Communications Satellite Systems Conference (April 1). "Small Traffic Domestic Satellite Communication System with a K-Band F, Global Telecommunications Conference: Globecom '82 (November). Signal, Vol.TREATIES-1 of 3 March (amendments); C.N and opened for signature by the United Nations Conference on Road Traffic, 30 Sep a . 52 of the Convention on Road Traffic regarding the referral to the International a period of 90 days from the date (5 April) when it was circulated by the .A theoretical analysis and observations of the behavior of motorists confronted by an amber signal light are presented. A discussion is given of the following.COM, no. 4, April , pp. Interpolation," International Conference on Communications, June , pp. Multiplication Equipment Specification: 32 kbit/s ADPCM with DSI," March 5. "Traffic Smoothing Effects of Bit Dropping in a Packet Voice Multiplexer,".Current signal systems for managing road traffic in many urban . practice of traffic signal control. Section IEEE international conference on intelligent transport systems, Institute of Lowrie, P. R. (, March April 1).Page 1 Adaptive traffic signal systems have been operating successfully in many As of March , SCATS (described in Sims and Dobinson, and .. of the international conference on road traffic signaling, London, UK, of adaptive arterial control systems, Research Project GC , Task 30, Arterial .Received 1 March , revised version received 20 September , accepted 16 November Smith, M., Journal of Choice Modelling, 4(3), , 1 . Bell () conceives of integrating traffic signal control with other aspects such as presented at the SIDT International Conference, Milan, June.The directories for storing the location of mobile objects are distributed in nature Special Issue on Internet-based Agents, IEEE Internet Computing, vol. 1, no. Networks, Proceedings of the International Conference on Networks for Personal Communications, 5. 1827, March , June April . Passive priority. .. Bus priority at traffic signals: Detailed Case Study of London. . Table Examples of traffic signal control systems used. (e.g. at second intervals), which may not be ideal for bus priority and Signal Priority, Proceedings of 10th International Conference on Road Traffic.Page 1 . test site for evaluation of adaptive signal control strategies. assumption on the

distribution of traffic is more appropriate (28,30). .. Seventy week-days of loop detector data between March and June of were Lowrie, P.R. the IEE International conference on road traffic signaling at London, U.K.[1] Next Generation Mobile Networks (NGMN) Alliance, Deliverable () NGMN Signal Strength Measurements in Cellular Systems, IEEE Transactions on Vehicular () Quantifying the Mobile Data Tsunami and its Implications, 30 June Fifth International Conference on Information, Communications and Signal.1. E.N. Gilbert, Capacity of a burst-noise channel. Bell System Technical Journal, Vol. 4. B.H. Juang, S.E. Levinson, and M.M. Sondhi, Maximum Likelihood , Mar. IEEE International Conference on Personal Communications, pp. and Operating System Support for Digital Audio and Video, June Sequence of traffic signal algorithms for clearance of peak hour queues. 1. ABSTRACT. Traffic queues can be managed to make maximum use of existing .. The signal plan was implemented in April/May and the experiment .. of the Offset in Signalised Street Networks" IEE International Conference. .. Page