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Books of Interest

George H. Weiss,

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Books of Interest

Review

The Theory of Road Traffic Flow by Winifred D. Ashton, John Wiley and Sons, New York, 1966, 178 pages, \$5.00

The function of a monograph on a research field that has not quite 'gelled' is to present the different theories that are considered relevant, and either enough data to allow the reader to form his own judgments on the usefulness of each theory, or a personal critical evaluation that puts each theory into a broader framework. Viewed in the light of these requirements, this book must be regarded as a failure since it neither presents any data, nor is there any appraisal of the state of the art other than that presented in one or two of the original papers. As a result, the book cannot be regarded as more than a rough indication of some mathematical problems of current interest.

The topics that are discussed certainly form a good part of the current research in traffic flow. These include the follow-the-leader model of traffic flow, the Light-hill-Witham continuum theory and its extensions, the design of traffic signals, queuing theory and the theory of delay at an intersection, simulation techniques, and accident statistics. However, a very serious gap is the fact that there is no reference to the voluminous work on the origin-destination studies or recent work on town planning. These certainly require consideration in any account of macroscopic traffic flow. Furthermore the discussion of computer control of traffic is sketchy and unreferenced. The treatment of any one of the topics covered is not so much incorrect as it is lifeless. For example, considerable space is allotted to the treatment of the follow-the-leader model, and it is correctly pointed out that the simple linear theory first explored by PIPES AND REUSCHEL (both unmentioned) and more extensively by HERMAN ET AL., is inadequate in many instances. However, there is a high enough correlation between theoretical and experimental results to allow its use for many purposes. A presentation of some of the data supporting different models is almost a necessity when making a comparison. The discussion of stability consists of a recital of results, when a graph of vehicle trajectories would have been very much more illuminating. There is no mention of the theory of acceleration noise in the linear follow-the-leader model.

The chapter on queuing theory is an exercise in mathematics that is of undemonstrated relevance to traffic studies. That is not to say that many traffic situations cannot be described in terms familiar to queuing theory. But the detailed application of idealized models requires experimental verification. The one instance in which this has been carried out in great detail, the beautiful work of EDIE on traffic delays at toll booths, is not even mentioned. The material that is presented relates to elementary queuing theory; practical applications are left as an exercise for the reader.

One could go through almost any chapter pointing out deficiencies, non sequiturs, and errors. However, the few that we have mentioned should be enough to suggest that the book cannot be regarded as authoritative in any way.

GEORGE H. WEISS
National Institutes of Health, Bethesda, Maryland

Vehicular Traffic Science, American Elsevier Publishing Company, Inc., New York,
1967, 373 pages, \$16.00

The Proceedings of the Third International Symposium on the Theory of Traffic Flow, contains all of the 45 technical papers presented at the symposium. Approximately half of the papers are published in full and the remainder in summary form. Together they comprise a cross-section of the work that has recently been accomplished in the field of traffic science, and they suggest the directions in which the subject of vehicular traffic science is progressing. Six main subject areas are covered: single-lane traffic; two-lane traffic; multi-lane traffic, general theory and experiment; networks; intersection control and highway crossing; and simulation, economics and scheduling.

Single-lane traffic is studied in seven papers related to traffic dynamics in tunnels (two papers) and circular and straight roadways, the propagation of disturbances in platoons, acceleration noise in a congested signalized environment, and the applicability of the theory of continuity to traffic after bottlenecks.

Two-lane traffic is studied in eight papers: queuing on rural roads, passing on two-way roads with limited visibility (three papers), lane changing on one-way roads, reversible lanes, merging, and the output of certain types of traffic queues.

General theory and experiments pertaining thereto are discussed in eight papers. They deal with macroscopic hydrodynamics approaches to traffic flow from the viewpoint of local steady-state theory in one paper to the statistical behavior in another, with Markov-renewal models, interchange spacing and driver behavior, the statistics of speed distributions, speed-density hypotheses, stability, and the application of Erlang's theory to the calculation of road capacity.

Networks are treated in seven papers. The subjects covered include the estimation of origin-destination trips by a transition matrix, models of commuter traffic in towns, traffic assignment (three papers), investment to reduce the shortest route, and the measurement of urban congestion and demand.

Nine papers cover problems of intersections and highway crossings. The aspects of intersections studied include optimal policies for the control of under-saturated intersections, control of isolated intersections, deterministic models of cyclic traffic flows, control by vehicle-actuated signals, the use of a mixed-integer linear program in synchronizing for maximum band width, and the mean waiting time at intersections. The aspects of the crossing problem studied include the delays for an N -lane highway, queuing at a N -lane intersection, and queuing for gaps.

Two papers cover the scheduling of bus transportation, one discusses the theoretical problem of optimizing routes and frequency of service, and one considers an explicit and practical problem of finding the optimal roster for bus drivers working split tours under various constraints. Two papers are concerned with economics, one with optimal tolls for tunnels and bridges, and one with the economic comparison of urban planning alternatives. One paper describes a digital traffic simulator with minimum hardware and one deals with mathematical modeling of components of a traffic system and their interconnection properties.

The symposium at which the above research was first presented was held in New York City in 1965 under the auspices of the Transportation Science Section with the endorsement of ORSA and IFORS. It was attended by 140 delegates from 15 countries representing 37 universities and 38 industrial, governmental, and private organizations. The editors of the proceedings are LESLIE EDIE, ROBERT HERMAN, and RICHARD ROTHERY.

Contents

- W. LEUTZBACH, *Testing the Applicability of the Theory of Continuity on Traffic Flow after Bottle-Necks*
- R. HERMAN AND R. ROTHERY, *Propagation of Disturbances in Vehicular Platoons*
- L. C. EDIE AND E. BAVEREZ, *The Generation and Propagation of Stop-Start Traffic Waves*
- R. FOOTE AND K. CROWLEY, *Density-Speed-Flow Dynamics in Single-Lane Traffic Flow*
- T. ROCKWELL AND A. HANKEN, *A Model of Car Following Derived Empirically by Piece-Wise Regression Analysis*
- R. E. FRANKLIN, *Single-Lane Traffic Flow on Circular and Straight Tracks*
- W. HELLY AND P. G. BAKER, *Acceleration Noise in a Congested Signalized Environment*
- I. PRIGOGINE, R. ANDERSON, AND R. HERMAN, *Local Steady-State Theory and Macroscopic Hydrodynamics of Traffic Flow*
- R. BALESCU, I. PRIGOGINE, R. ANDERSON, AND R. HERMAN, *Statistical Hydrodynamics of Traffic Flow*
- W. S. JEWELL, *Markov-Renewal Models in Traffic-Flow Theory*
- T. W. FORBES, J. J. MULLIN, AND M. E. SIMPSON, *Interchange Spacing and Driver Behavior Effects on Freeway Operation*
- J. LINDER, *A Contribution to the Statistical Analysis of Speed Distributions*
- J. DRAKE, A. MAY, AND J. SCHOFER, *A Statistical Analysis of Speed-Density Hypotheses*
- D. H. EVANS, *On the Stability of Vehicular Traffic Flow—A Phenomenological Viewpoint*
- T. RALLIS, *The Application of Erlang's Theory to the Calculation of Road Capacity*
- A. J. MILLER, *Queuing in Rural Traffic*
- J. GUSTAVSSON, *A Model for Overtaking on a Two-Lane Road with Limited Visibility*
- S. ERLANDER, *A Mathematical Model for Traffic on a Two-Lane Road*
- T. THEDDEN, *Convergence and Invariance Questions for Road Traffic with Free Overtaking*
- R. M. OLIVER AND T. LAM, *Experimental Studies of a Lane-Changing Model*
- D. C. GAZIS, *Reversible Lanes: An Example of a Multi-Mode Traffic System*
- D. P. GAVUR, *Methods for Describing Time Dependent Waits at Traffic Merges*
- M. NEUTS, *Limit Theorems for the Output of Certain Types of Traffic Queues*
- E. KOMETANI, *Estimation of Origin-Destination Trips by Transition Matrix*
- R. J. SMIED, *A Theoretical Model of Commuter Traffic in Towns*
- B. ROY AND H. LEBOULANGER, *Traffic Assignment: The Atcode Model*
- K. R. OVERGAARD, *Testing a Traffic Assignment Algorithm*
- J. ALMOND, *Traffic Assignment with Flow-Dependent Journey Times*
- T. M. RIDLEY, *Investment in a Network to Reduce the Length of the Shortest Route*
- T. D. JORDAN, *Sky Count Measurement of Urban Congestion and Demand*

- R. B. GRAFTON AND G. R. NEWELL, *Optimal Policies for the Control of an Under-saturated Intersection*
- M. C. DUNNE AND R. B. POTTS, *Computer Control of an Isolated Intersection*
- D. C. GAZIS, G. F. NEWELL, P. WARREN, AND G. H. WEISS, *The Delay Problem for Crossing an N-Lane Highway*
- G. H. WEISS, *Pedestrian Queuing at an N-Lane Intersection*
- W. R. BLUNDEN AND R. L. PRETTY, *On the Theory of Deterministic Cyclic Traffic Flows in Networks*
- R. W. J. MORRIS AND P. G. PAK-POY, *Intersection Control by Vehicle Actuated Signals*
- J. D. C. LITTLE, *A Mixed Integer Linear Program for Synchronizing Traffic Signals for Maximal Bandwidth*
- P. H. FARGIER, *Mean Waiting Time at an Intersection*
- J. W. COHEN AND S. J. DELANGE, *Numerical Results for Queuing for Gaps in a Traffic Stream*
- E. M. HOLROYD, *The Optimum Bus Service for an Urban Area*
- F. G. HEATH, *A Traffic Simulator with Minimum Hardware*
- M. J. BECKMANN, *On Optimal Tolls for Highways, Tunnels, and Bridges*
- J. B. ELLIS AND D. N. MILSTEIN, *A Behavioral-Specific Component to System Construct for Traffic Flows*
- R. LOUE, M. GAUTIER, C. SCHERNER, AND M. NAIM, *The Importance of Traffic Problems in the Economic Comparison of Two Urban Planning Alternatives*
- B. T. BENNETT AND R. B. POTTS, *A Rostering Problem in Transportation*

Note

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