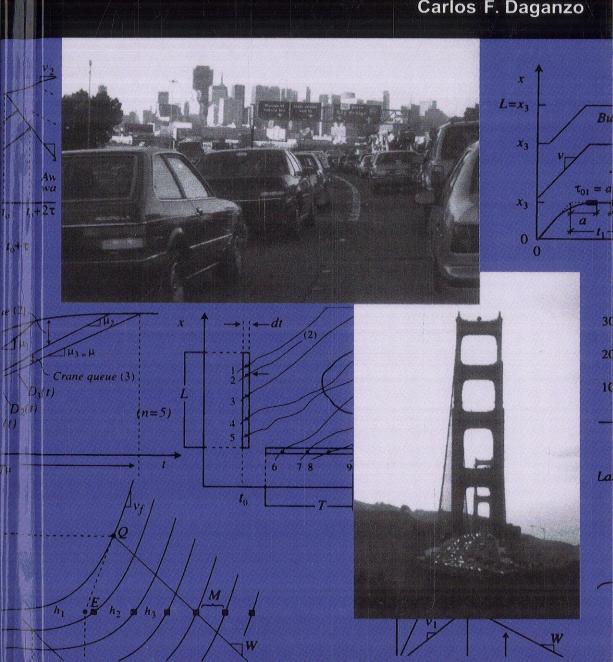
## **Fundamentals of Transportation** and Traffic Operations

Carlos F. Daganzo



## Contents

Prej	reface		
Ch	apter	1 The time-space diagram	1
1.1	Trajectories for a single vehicle		1
	1.1.1	Propulsive force, $F_p$	4
	1,1.2	Fluid resistance, $F_{f}$	5
	1,1.3	Rolling resistance, $F_{\rm r}$	6
	1,1.4	Braking resistance, F <sub>b</sub>	6
	1,1.5	Guideway resistance, $F_g$ : motion along a profile	6
	1.1.6	Analytical derivation of a trajectory	7
	1.1.7	Numerical derivation of a trajectory	9
	1.1.8	Additional background	11
1.2	Trajectories for many vehicles		
	1.2.1	(17 11) 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1	12
	1.2.2	Definitions of traffic stream features	13
1.3	Applications of the (t,x) diagram		
		Traffic flow theory with straight trajectories	16
		Closed loops	18
	1,3.3	••	20
		Problem Solution	20
		Solution	20
Ch	apter	2 Cumulative plots	25
2.1	Defini	itions	26
2.2	Applications		
	2.2.1	Restrictions with constant service rates: virtual arrivals and	30
		'delay' 2.2.1.1 Time in queue and the distance taken up by the physical	
		queue queue and the distance taken up by the physical	34
	2.2.2	On-off service: traffic signal example	36
2.3	Stochastic fluctuations		
	2.3.1	Relationships among averages	38 38
			20

## Fundamentals of transportation and traffic operations

	5.2.1 5.2.2	Warnings and comparisons: the relaxation time Pretimed control	177 180	
5.3	Actuated control			
5.4	Serial systems			
	5.4.1	Time-dependent control	189	
		Smooth controls	190	
	5.4.2	Diverging systems	194	
5.5	Networks: multiple routes			
	5.5.1	Equilibrium analysis	199	
	5.5.2	Sizing and control	203	
		Network dynamics	205	
Chapter 6 Observation and measurement				
6.1	Probability and stochastic processes			
	6.1.1	The normal random variable	219	
		Example	220	
		Table 6.1	220	
	6.1.2	Stochastic processes	221	
	6.1.3	The Brownian process	222	
		The inverse process	224	
	6.1.4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	225	
	6.1.5	Forgetfulness, Intervals	227	
	6.1.6		230	
	6.1.7	The binomial process	231	
	6.1.8	Simulation	234	
		Example and discussion	238	
6.2	Data interpretation			
	6.2.1	Estimation concepts	242	
		6.2.2.1 Correlated samples	243	
	6.2.2	Illustration: observation of stationary processes and queues	245	
	6.2.3	Sample size and accuracy considerations	251	
		6,2,3,1 Length of a simulation run:	252	
6.3	Applications: stream and serial system measurements			
	6.3.1	Measurement and comparison of N-curves; model validation	254	
	6.3.2	Counts and time-series data	256	

## Contents

		6.3.2.1	Identification of highway bottlenecks	259				
			Merges	260				
		6.3.2.2	Measurement of serial system capacity	261				
		6.3.2.3	Measurement of stationary stream parameters	261				
	6.3.3	Occupa	ncy. Detectors	263				
		6.3.3.1	Experimental procedures	264				
		6.3.3.2	Statistical treatment of systematic and random errors	269				
		6.3.3.3	Joint observations of counts and occupancy	270				
	6.3.4	Small no	etworks: entering and exiting flows	271				
			Moving observers	272				
		6.3.4.2	<del></del>	274				
Ch	Chapter 7 Scheduled transportation systems							
7.1.	. Passenger waiting time							
			for uninformed passengers	287				
		Advertis	sed schedules	291				
		Transfer	rs	293				
7.2	Multi stop routes							
	7.2.1	The veh	ricle fleet needed for a given task	295				
		7.2.1.1	The stationary, deterministic problem	296				
			Example	299				
		7.2.1.2	Time-dependent O-D's	301				
	7.2.2		ment of headway and occupancy fluctuations	302				
		7.2.2.1	Schedule instability and control	304				
7.3	Obser	Observation issues						
			ow estimation	310 311				
	7.3.2	3.2 Trip time estimation						
7.4	_	Design and evaluation						
	7.4.1	Design		312				
	7.4.2	Evaluat		314				
		7.4.2.1	Some remarks on welfare maximization	315				
			Example	317				
	erences			322 328				
Author index								
Subject index								