Macroscopic and Microscopic Assessment of Traffic Rules

Summary goes here

quantity	variable	unit
position on the freeway	x	m/s
traffic density on lane 1	$\rho_1(x,t)$	cars/m
traffic density on lane 2	$\rho_2(x,t)$	cars/m
average velocity on lane 1	$v_1(x,t)$	m/s
average velocity on lane 2	$v_2(x,t)$	m/s

TABLE I. variables used in the macroscopic model

INTERPRETATION OF THE PROBLEM

INTRODUCTION

Our writing style should follow guidelines such as [**?**].

MODEL

To simplify the model, we consider a stretch of straight two-lane freeway with no on/off ramp. To assess the performance of the given traffic rule, we would like to analyze its capacity for traffic flow under both heavy and light traffic conditions. Traffic flow rate is best captured in a macroscopic model with variables shown in Table I. The total amount of traffic flow will then be determined by

$$Q(x,t) = \rho_1(x,t) \cdot v_1(x,t) + \rho_2(x,t) \cdot v_2(x,t) \tag{1}$$

We further assume that at equilibrium, there is some velocity-density relation. Given this velocity-density relation, the flow at any given junction of the freeway at a given time is completely determined by the local traffic densities ρ_1 and ρ_2. Adopting Kerner's proposal for such a relation

$$v_e = v_o \left((\frac{1 + e^{\rho/\rho_m - 0.25}}{0.06})^{-1} - 3.76 \times 10^{-6} \right) \tag{2}$$

we plot the total flow as a function of traffic densities

To derive such a relation, we consider all cars to have uniform length $l(m)$, travel with uniform velocity $v_e(\rho)$ and maintain uniform bumper-to-bumper distance $d(m)$ from their

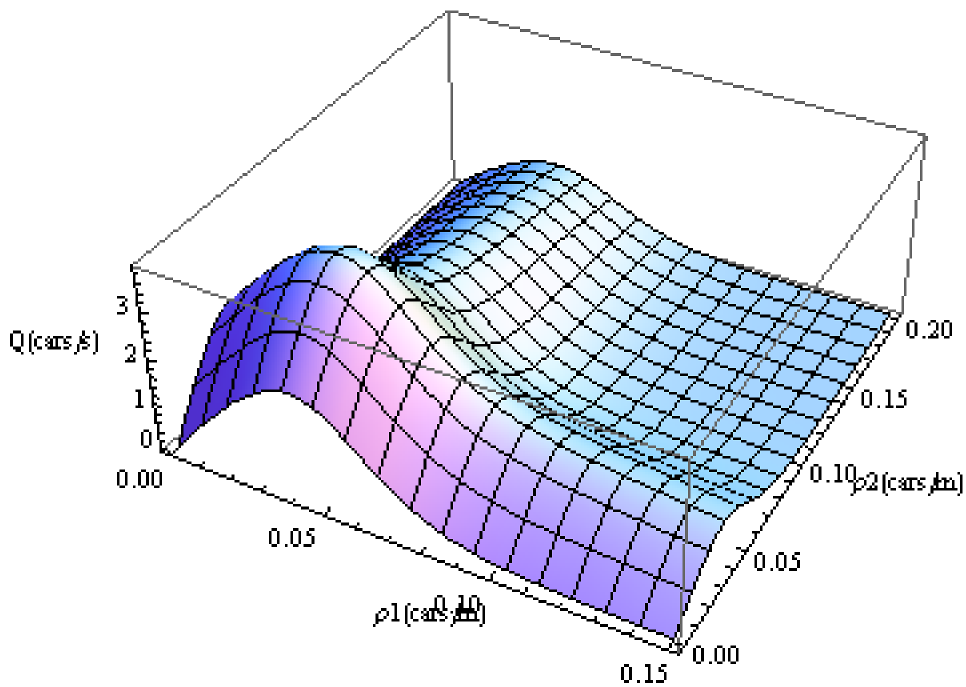

FIG. 1. equilibrium traffic flow as a function of traffic densities using Kerner's velocity-density relation

neighbors. At this equilibrium, each car will take up a total space of $d+l$ on one lane of the freeway. Therefore, the density of cars

$$\rho = \frac{1}{d+l} \tag{3}$$

Incorporating the two-second rule enforced by the New York Sate Department of Motor Vehicles [?], $d = 2v_e(\rho)$, equation (3) can be solved to obtain and expression for $v_e(\rho)$

$$v_e(\rho) = .5(\frac{1}{\rho} - l) \tag{4}$$

RESULT

DISCUSSION