A Mathematical Model for Traffic Flow Risk Management Applied to Hampton Roads Emergency Evacuation

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Hampton Roads is located on the east coast of the United States, where it faces the threat of Atlantic Ocean hurricane season. Maximize the evacuation traffic flow is essential when facing such events. A macro mathematical traffic model is proposed and discussed here to account for the effects of speed, trailing distance between vehicles, as well as the behavior of drivers changing their speeds on the traffic flow. The effect of possible accidents on the traffic flow is also considered. A simple function for the stoppage time due to accidents is proposed to reflect the effect of speed and trailing distance on accidents. In view of the randomness of the accident time during the day, the average of the stoppage time in a 24-hour period is calculated for the total traffic flow during the 24-hour period. Parameters in the model can be estimated by traffic data and/or experiences. The model predictions of traffic flow rate with different traffic conditions (speed and trailing distance) are calculated. Data of HRBT and surrounding area can be used for comparison.

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