

A Combinatorial Model for Merging in Traffic: Connections to Other Combinatorial Objects

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A two lane road approaches a stoplight. The left lane merges into the right just past the intersection. Vehicles approach the intersection one at a time, with some drivers always choosing the right lane, while others will always choose the shorter lane, or the right lane if they are equal in length. We identify an arrival sequence of vehicles as a binary string, where the 0s represent drivers always choosing the right lane, and the 1s represent drivers choosing the shorter lane.

The patterns of n vehicles appearing in each lane correspond to a few different mathematical constructions. The first is the expected maximum number of heads or tails appearing in a sequence of n coin flips. The second connection is to the largest domino snake that can be made using pieces up to $[n : n]$. The third is to the longest trail on the complete graph K_n with loops.

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