Probability distribution function for speed value of an arc

Let *V* (*t*) be the random variable of the speed for arc *a* between two nodes at time *t*. Assume that there are *m* road segments within arc *a, and* ϵ_i is the proportion of the distance of road segment *i* of the total distance of arc *a*.

Assume that the random variable of the speed for each segment is independent and normal distributed (reported the proof in the last presentation)

The mean and variance of *V* (*t*) are derived as follows:

$$E[V(t)] = \epsilon_1 E[V_1(t)] + \epsilon_2 E[V_2(t)] + \ \dots + \epsilon_m E[V_m(t)]$$

$$Var[V(t)] = \epsilon_1^2 Var[V_1(t)] + \epsilon_2^2 Var[V_2(t)] + \ \dots + \epsilon_m^2 Var[V_m(t)]$$

Therefore, the *V* (*t*) follows a normal distribution of $N(E[V(t)], Var[V(t)])$.

Risk assessment

Suppose that an arc α from node n to node n’ includes *i* units of road segments, each with the same incident probability $P_{nn'}^{(i)}$, length $m_{nn'}^{(i)}$ and consequence probability $O_{nn'}$, considering $O_{nn'}$ equal to the expected number of people in an impact zone of a unit road segment.

It is assumed that the trip ends when the driver arrives at the destination. The risk of a path A will be calculated using the traditional risk model:

$$\sum_{(n,n')\in A} r_{nn'}$$

where $r_{nn'} = \sum \mathrm{m}_{\mathrm{nn}'}^{(\mathrm{i})} \mathrm{p}^{(\mathrm{i})} \mathrm{o}_{\mathrm{nn}'}$ is the risk value of arc (n, n')