

On the probability of hitting a deer with a car

Robert Estalella

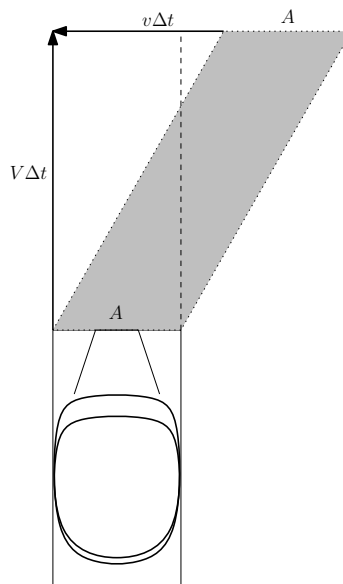
2003 August

1 Introduction

Hitting an animal while driving a car, or even being close to hitting it, is terribly upsetting. This is what happened to me and my family when driving during our vacation in Utah (USA). We missed for a few cm a deer that jumped across the road just in front of our car.

I started thinking about the probability of hitting a deer with a car. Assuming that you do not have time to react when a deer crosses the road, is it better to slow down the car in order to lower the probability of hitting a deer, or, on the contrary is it better to run faster in order to be less time exposed to the danger?

2 Model



Let us assume that along a road of length L there are n deers per unit length and unit time that cross perpendicularly the road with speed v . The car, of width A , runs along the road at a speed V . Let us consider a time interval Δt , during which the car advances a length $V\Delta t$. The deers found inside a parallelogram with base A and height $V\Delta t$ (shaded area in Figure) will be hit by the car during this time. The crossing time of the car width A by the deers is A/v . Thus, the number of deers inside the hitting area is $nAV\Delta t/v\Delta t$. This is the number of hits per unit time. The total number of hits is the former, multiplied by the total travel time of the car, L/V ,

$$N = \frac{nAV\Delta t}{v\Delta t} \frac{L}{V} = \frac{nAL}{v}.$$

3 Conclusion

The conclusion is that the number of deers hit by the car, or more exactly, the probability of hitting a deer, does not depend on the car speed. Of course, this result is obtained with the assumption that the car does not avoid hitting the deers, but this is the usual situation when the driver has no time to react to the presence of a deer crossing the road.

However, keep in mind that the damage caused by hitting a deer increases dramatically with the car speed, being proportional to its kinetic energy, which goes as V^2 .