Answer on Question #76298, Physics Mechanics Relativity

The horizontal range of a bullet fired with angle of projection 45 degree to the horizontal is 360 metres if it is fired from a lorry movie in the direction of bullet with the uniform velocity 18 km per hour and with same elevation, what is the new range horizontal distance travelled by the bullet ?

Solution.

The projection on the axis X: $v_{0x} = v_0 \cdot \cos\alpha$

The projection on the axis Y: $v_{0y} = v_0 \cdot \sin\alpha$

Flight time: $t = \frac{2 \cdot v_0 \cdot \sin\alpha}{g}$

Range horizontal distance travelled by the bullet: $L = \frac{v_0^2 \cdot \sin 2\alpha}{g}$

$$v_0 = \sqrt{\frac{L \cdot g}{\sin 2\alpha}} = \sqrt{\frac{360 \cdot 10}{\sin 90^\circ}} = 60\ \frac{m}{s}$$

If it is fired from a lorry movie in the direction of bullet with the uniform velocity 18 km per hour and with same elevation:

18 km per hour = 5 metres per second

$$v_0' = v_0 + 5 = 60 + 5 = 65\ \frac{m}{s}$$

$$L = \frac{v_0'^2 \cdot \sin 2\alpha}{g} = \frac{(65)^2 \cdot \sin 90^\circ}{10} = \frac{4225 \cdot 1}{10} = 422.5\ m$$

Answer: $L = 422.5\ m$