20. Transformace rychlostí

Vezmeme Lorentzovu transformaci a zdiferencujme

$$\tilde{x} = \gamma(x - vt) \quad \rightarrow d\tilde{x} = \gamma(dx - vdt)$$

$$\tilde{t} = \gamma\left(t - \frac{xv}{c^2}\right) \rightarrow d\tilde{t} = \gamma\left(dt - \frac{vdx}{c^2}\right)$$

$$u = \frac{dx}{dt}$$

$$\tilde{u} = \frac{d\tilde{x}}{d\tilde{t}} = \frac{\gamma(dx - vdt)}{\gamma\left(dt - \frac{vdx}{c^2}\right)} = \frac{dx - vdt}{dt - \frac{vdx}{c^2}} = \frac{\frac{dx}{dt} - v}{1 - \frac{v}{c^2} \cdot \frac{dx}{dt}} = \frac{u - v}{1 - \frac{u \cdot v}{c^2}}$$

$$\tilde{u} = \frac{u \pm v}{1 \pm \frac{uv}{c^2}}$$

Pokud soustavy letí od sebe tak

$$\tilde{u} = \frac{u + v}{1 + \frac{uv}{c^2}}$$