Experimentalphysik Übung (R. Weis)

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1 Aufgabe 3

$$s_z = \frac{1}{2}at^2 + v_0 t$$
$$s = v(t - t_v)$$

3 Möglichkeiten:

1. zu langsam
2. "zu" schnell
3. "perfekt" richtig $\implies$ gesucht

$$\frac{1}{2}at^2 + v_0 t = v_p(t - t_v)$$
$$\implies t_{1,2} = \frac{v_p - v_0 \pm \sqrt{(v_0 - v_p)^2 - 2av_p t_v}}{a}$$

$$(v_0 - v_p)^2 - 2av_p t_v = 0$$

$\to v_p$

$$at + v_0 = v_p \implies t = \frac{v_p - v_0}{a}$$
$$v_p = v_0 + at_v \pm \sqrt{(at_v + v_0)^2 - v_0^2} \approx 11.9\,\mathrm{m\,s^{-1}}$$

$$x(t) = tv_{x0} = tv_0 \cos\alpha$$

$$y(t) = tv_0 \sin\alpha - \frac{1}{2}gt^2$$

$$x(T) = d \quad d = Tv_0 \cos\alpha \implies t = \frac{d}{v_0 \cos\alpha}$$

$$y(T) = \frac{d \sin\alpha}{\cos alpha} - \frac{1}{2}g\frac{d^2}{v_0^2 \cos^2\alpha}$$

$$\implies v_0 = \sqrt{\frac{gd^2}{2\cos^2\alpha(d\tan\alpha - h)}}$$

$$\Delta h = \frac{D_L - D_B}{2}$$

$$v_0 = \sqrt{\frac{gd^2}{2\cos^2\alpha(a\tan\alpha - (h + \Delta h))}}$$