**Example 6.14 Cruise control**

Consider again the cruise control system from Example 6.11, whose dynamics are given in equation (6.30):

$$m\frac{dv}{dt} = \alpha_n u T(\alpha_n v) - mgC_{\mathrm{r}}\,\mathrm{sgn}(v) - \frac{1}{2}\rho C_{\mathrm{d}} A v|v| - mg\sin\theta.$$

If we choose $u$ as a feedback law of the form

$$u = \frac{1}{\alpha_n T(\alpha_n v)}\left(\tilde{u} + mgC_{\mathrm{r}}\,\mathrm{sgn}(v) + \frac{1}{2}\rho C_{\mathrm{d}} A v|v|\right), \tag{6.38}$$

then the resulting dynamics become

$$m\frac{dv}{dt} = \tilde{u} + d, \tag{6.39}$$