Since $u(0) = 0$, $\dot{u}(0) = 0$ and $\ddot{u}(0) = 0$ we have $q(0) = 0$ et $q'(0) = 0$.
Thus, if q is a degree n polynomial, then $q(u) = u^2 p(u)$ where p is a degree $n-2$ polynomial, and $\sqrt{q(u)}$ is lipschitz in the neighborhood of 0.
From this it follows that the initial value problem associated to finding $u(t)$

$$\begin{cases} \dot{u}(t) &= \sqrt{q(u(t))} \text{ for } t \geq 0 \\ u(0) &= 0 \end{cases}$$

has a unique solution, being of course the solution $u(t) = 0$, i.e. the motion gets stuck at standstill.
Furthermore, $q''(u(t))\dot{u}(t) = 2\dddot{u}(t)$ and hence, if $\dddot{u}(0) > 0$, then $\lim_{u \to 0_+} q''(u) = \infty$ and the function q cannot be well approximated by a polynomial!
Indeed, the time-optimal solution right at the beginning of the trajectory starting from standstill must feature a maximum jerk phase. If $u = \frac{1}{6} j_{ps} t^3$ then $t = \left(\frac{6u}{j_{ps}}\right)^{\frac{1}{3}}$ and $q(u) = \frac{3}{2} 6^{\frac{1}{3}} j_{ps}^{\frac{2}{3}} u^{\frac{4}{3}}$. Note the fractional power in the expression of $q(u)$.
The above explanations motivate our approach used at standstill.