We use limiters in [Colella and Woodward, 1984]. The equation 6 becomes:

$$
\begin{aligned}
p_{i+\frac{1}{2}}(x) &= (1-\eta_i)[\frac{1}{2}(p_{i+1}+p_i)+\frac{1}{6}(\Delta p_i-\Delta p_{i+1})]+\eta_i(p_{i+1}-\frac{1}{2}\Delta p_{i+1}) \\
p_{i-\frac{1}{2}}(x) &= (1-\eta_i)[\frac{1}{2}(p_i+p_{i-1})+\frac{1}{6}(\Delta p_{i-1}-\Delta p_i)]+\eta_i(p_{i-1}+\frac{1}{2}\Delta p_{i-1})
\end{aligned} \tag{1}
$$

where Δp is the slope of between two cells:

$$
\Delta p_i = \begin{cases} \min(|\delta p_i|, 2|p_i - p_{i-1}|, 2|p_{i+1}-p_i|)\mathrm{sgn}(\delta p_i) & (p_{i+1}-p_i)(p_i-p_{i-1}) > 0 \\ 0 & \text{otherwise} \end{cases} \tag{2}
$$

where δp is the slope of two cells:

$$
\delta p_i = \frac{1}{2}(p_{i+1}-p_{i-1}) \tag{3}
$$

Another component of equation 1 is η_i:

$$
\eta_i = \max(0, \min(\eta^{(1)}(\widetilde{\eta}_i - \eta^{(2)}), 1) \tag{4}
$$

where

$$
\begin{aligned}
\widetilde{\eta}_i &= -\frac{p_{i+2}-3p_{i+1}+3p_i-p_{i-1}}{6(p_{i+1}-p_{i-1})} \\
& \quad \text{if } -\delta^2 p_{i+1}\delta^2 p_{i-1} > 0, |p_{i+1}-p_{i-1}| - \varepsilon \min(|p_{i+1}|, |p_{i-1}|) > 0 \\
&= 0 \\
& \quad \text{otherwise,}
\end{aligned} \tag{5}
$$

In equation 5, $\delta^2 p_i = \frac{p_{i+1}-2p_i+p_{i-1}}{6\Delta x}$. The $\eta^{(1)} = 20, \eta^{(2)} = 0.05$ and $\varepsilon = 0.05$

References

P. Colella and P. Woodward. The piecewise parabolic method (PPM) for gas-dynamical simulations. *J. Comput. Phys.*, 1984.