Inviscid Burgers Equation Notes

Strong form:

$$\frac{\partial u}{\partial t} + \frac{1}{2}\frac{\partial u^2}{\partial x} = 0$$

Space-time divergence form:

$$\nabla_{xt} \cdot \begin{pmatrix} \frac{1}{2}u^2 \\ u \end{pmatrix} = 0$$

Ultra-weak form:

$$-\left(\begin{pmatrix} \frac{1}{2}u^2 \\ u \end{pmatrix}, \nabla_{xt} v \right) + \langle \hat{t}, v \rangle = 0$$

where $\hat{t} = \begin{pmatrix} \frac{1}{2}u^2 \\ u \end{pmatrix} \cdot \boldsymbol{n}_{xt}$.

Linearized form:

$$-\left(\begin{pmatrix} \tilde{u}\Delta u \\ \Delta u \end{pmatrix}, \nabla_{xt} v \right) + \langle \hat{t}, v \rangle = \left(\begin{pmatrix} \frac{1}{2}\tilde{u}^2 \\ \tilde{u} \end{pmatrix}, \nabla_{xt} v \right)$$

I don't see a way of relating the definition of $\hat{t}$ as a linear term of Δu. As the background flow, $\tilde{u}$ converges to the exact solution, Δu converges to zero. Ideally, for a converged solution, $\hat{t} = \begin{pmatrix} \frac{1}{2}\tilde{u}^2 \\ \tilde{u} \end{pmatrix} \cdot \boldsymbol{n}_{xt}$, but the current LinearTerm code does not allow this possibility.