

# Test Results for Mesh Hydro Code

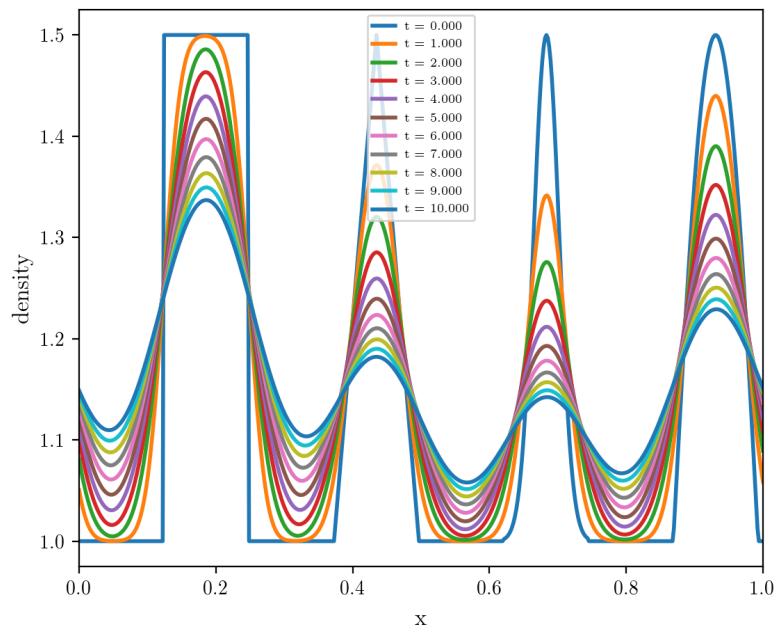
This computer

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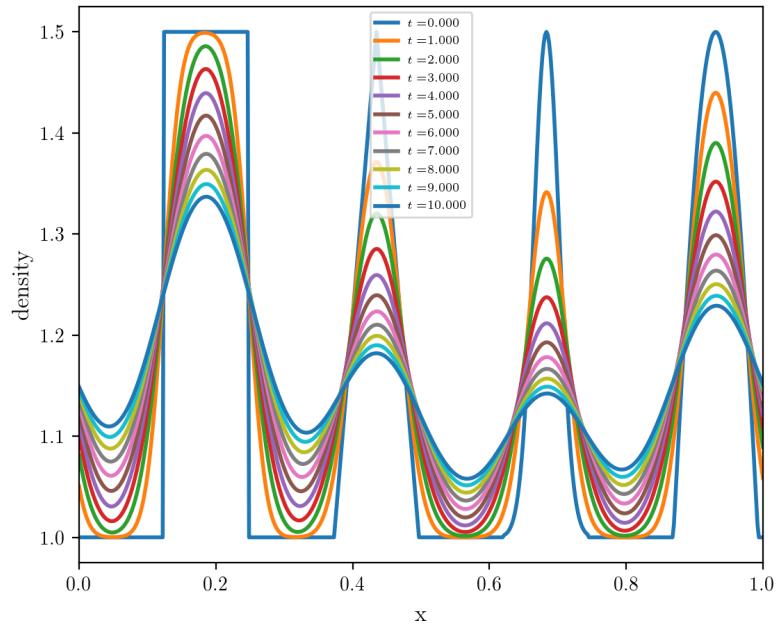
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# 1 Advection

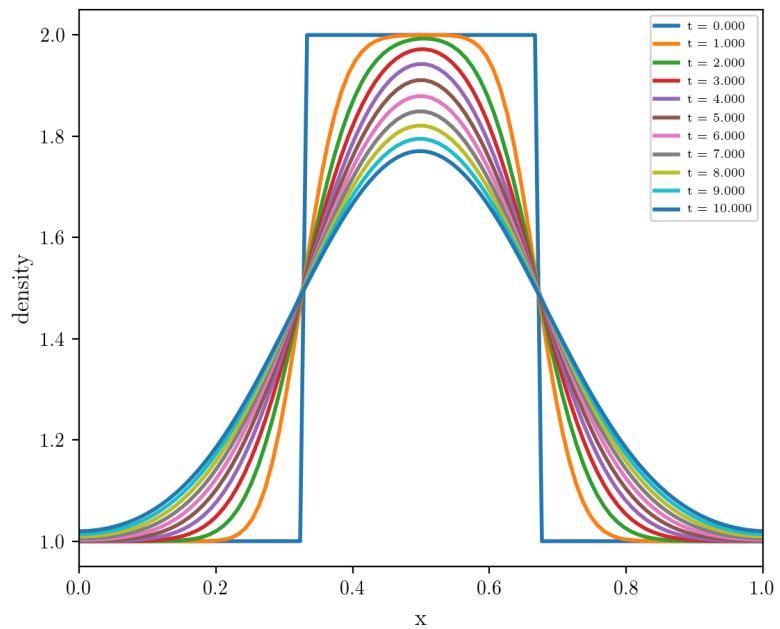
## 1.1 Piecewise Constant



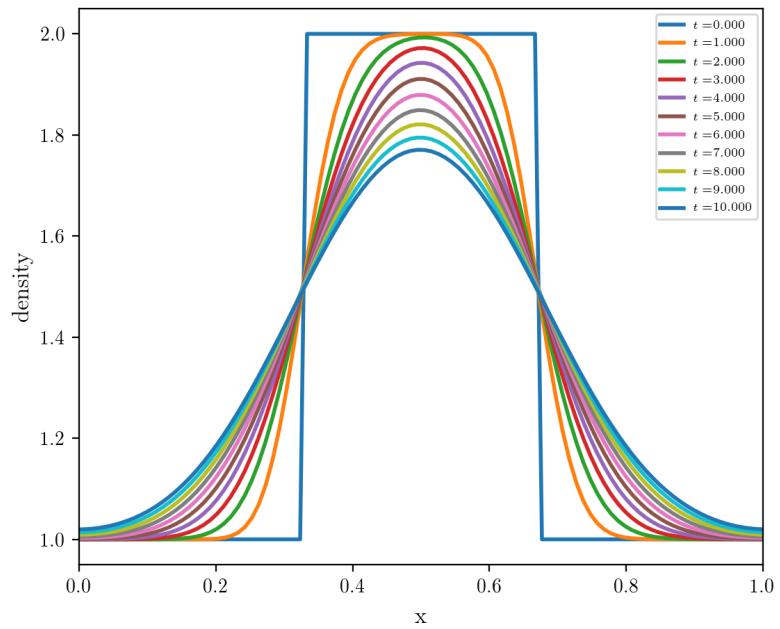
**Figure 1:** Expected result 1D



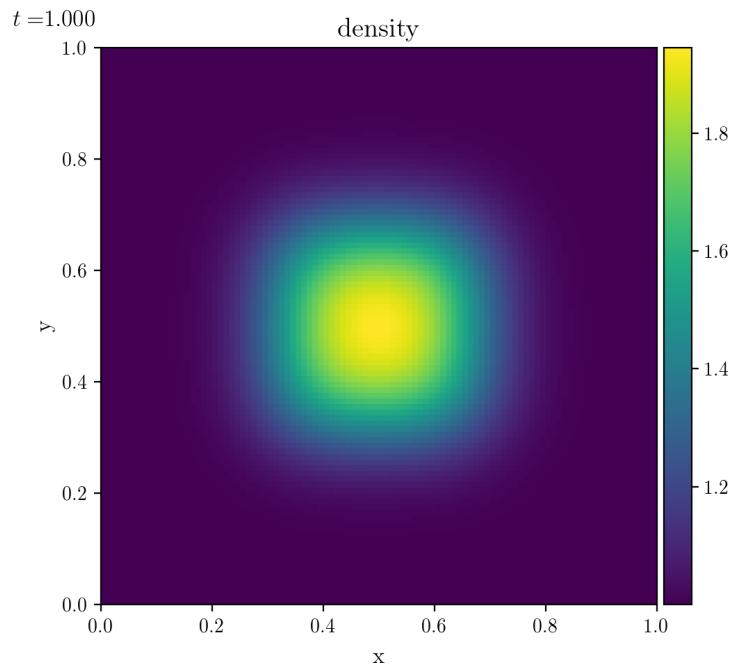
**Figure 2:** Obtained result 1D



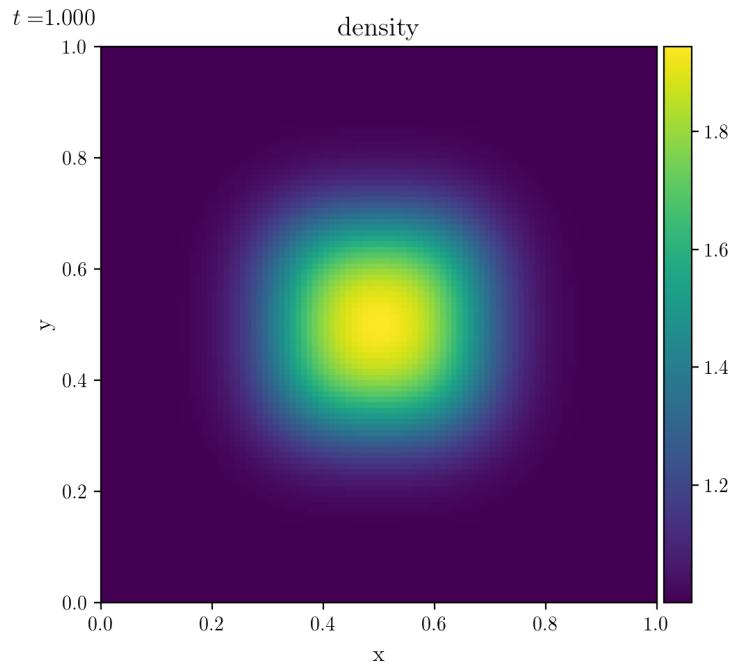
**Figure 3:** Expected result 1D negative velocity



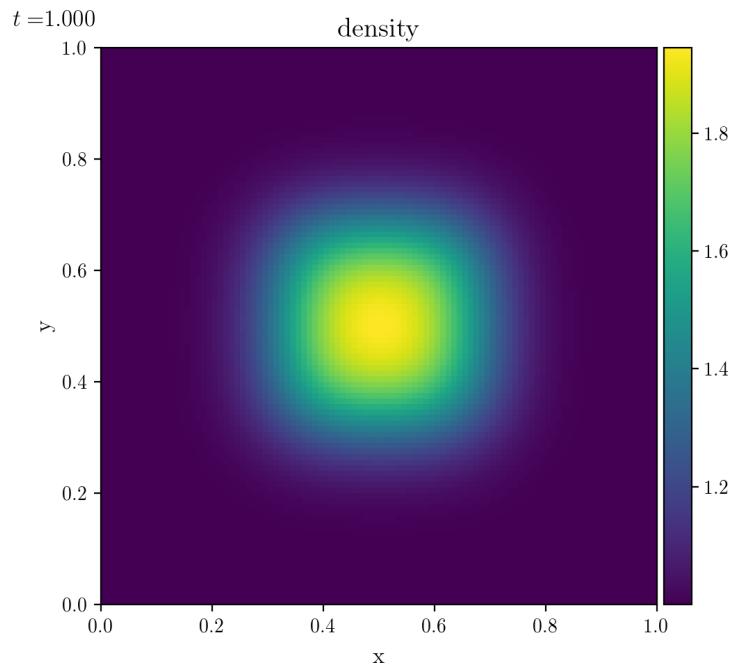
**Figure 4:** Obtained result 1D negative velocity



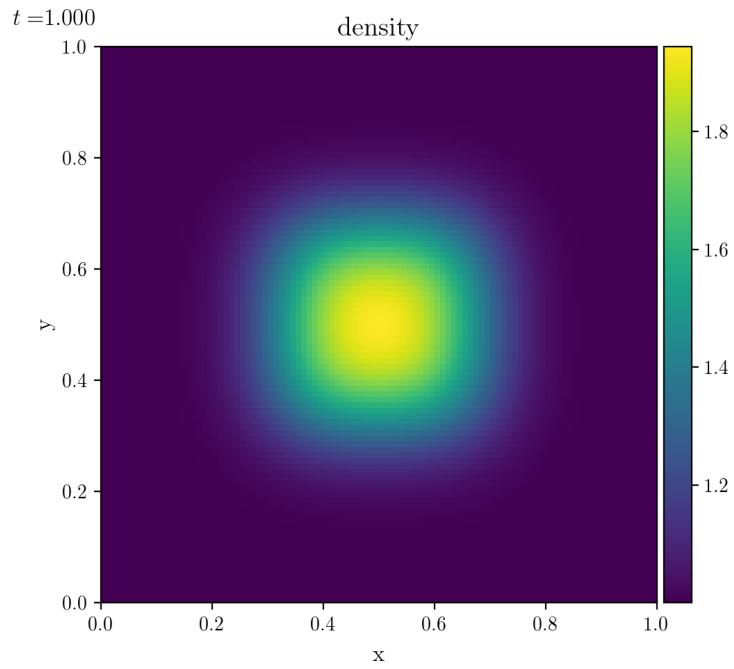
**Figure 5:** Expected result 2D



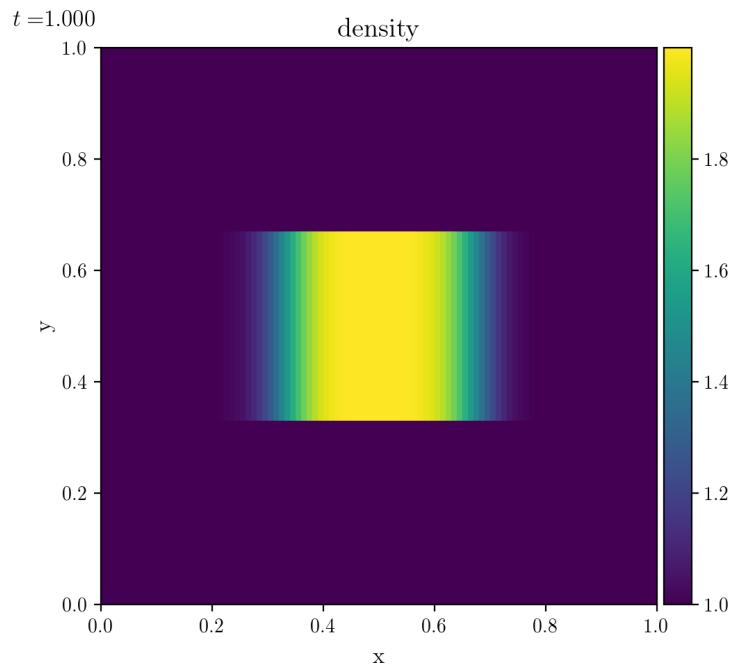
**Figure 6:** Obtained result 2D



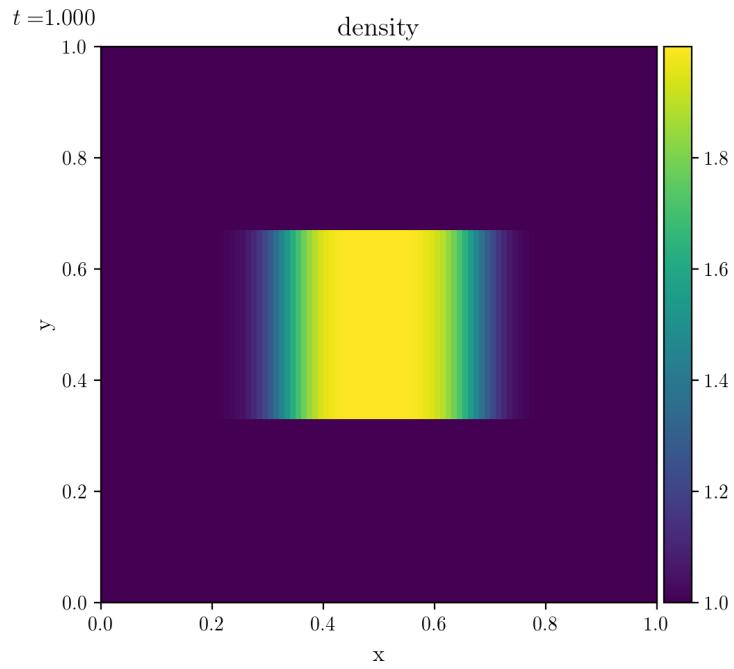
**Figure 7:** Expected result 2D negative velocity



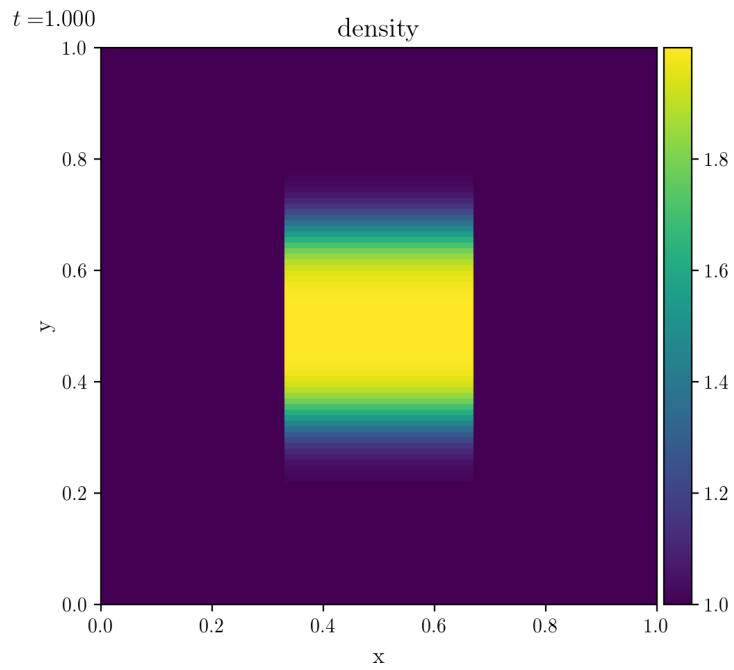
**Figure 8:** Obtained result 2D negative velocity



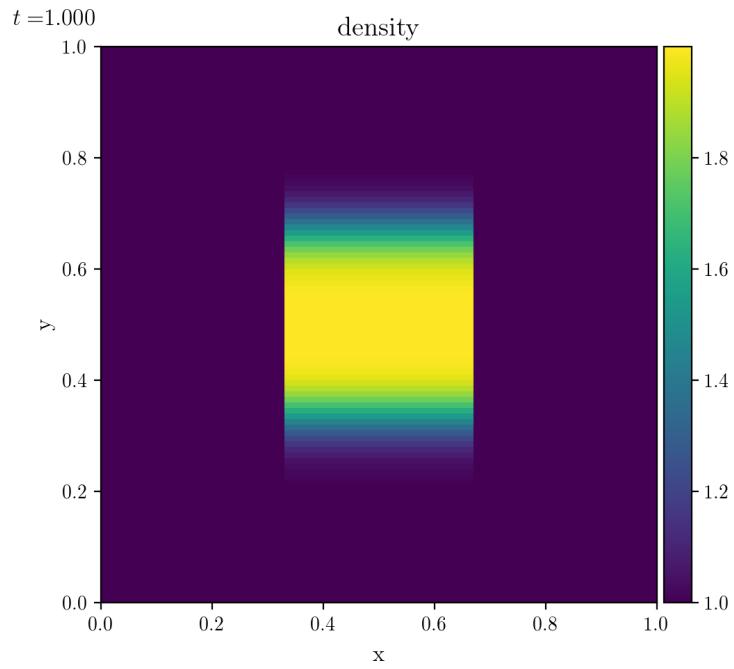
**Figure 9:** Expected result 2D velocity in x direction only



**Figure 10:** Obtained result 2D velocity in x direction only

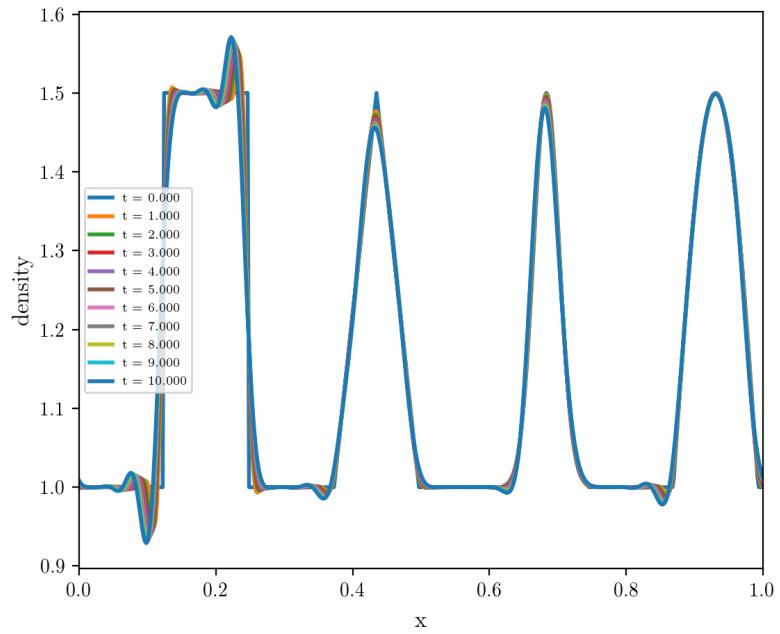


**Figure 11:** Expected result 2D velocity in y direction only

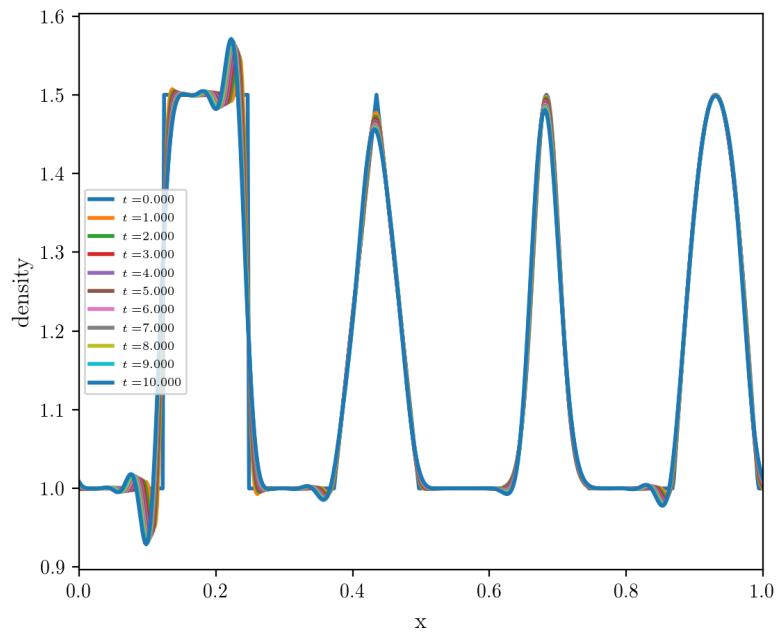


**Figure 12:** Obtained result 2D velocity in y direction only

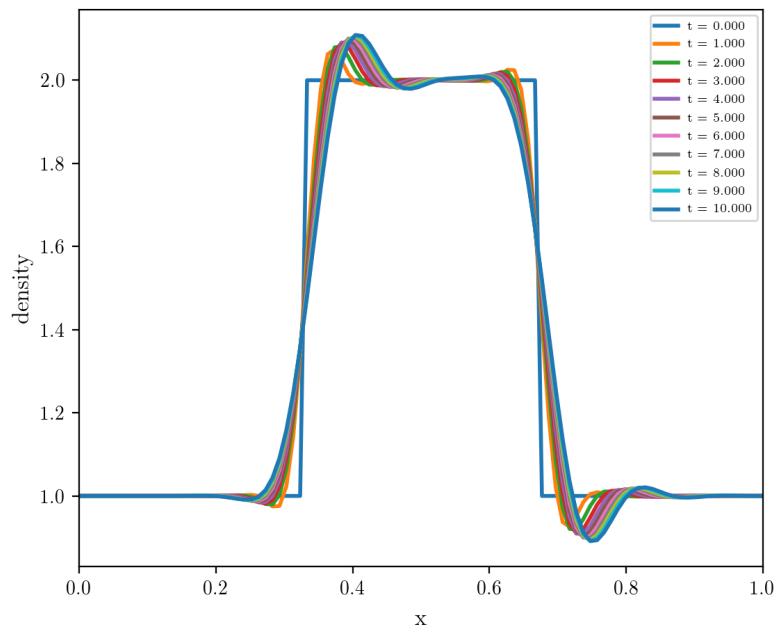
## 1.2 Piecewise Linear



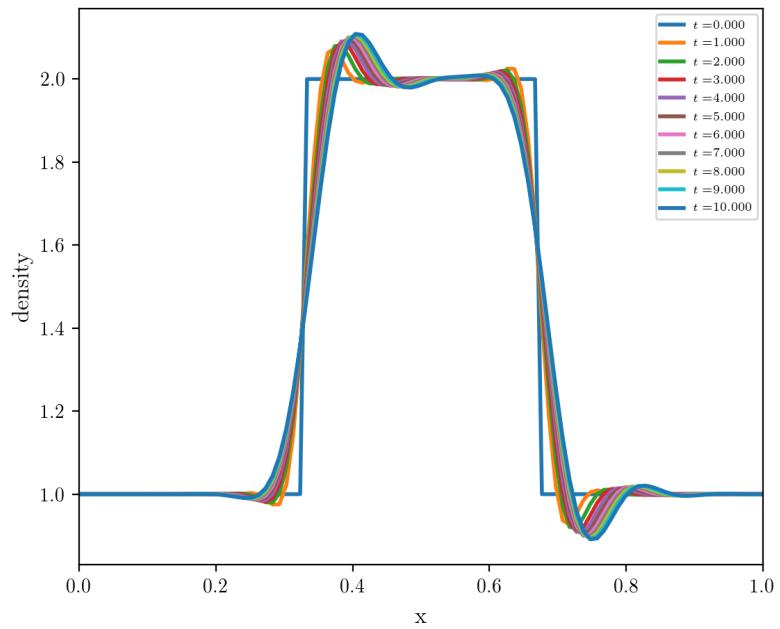
**Figure 13:** Expected result 1D



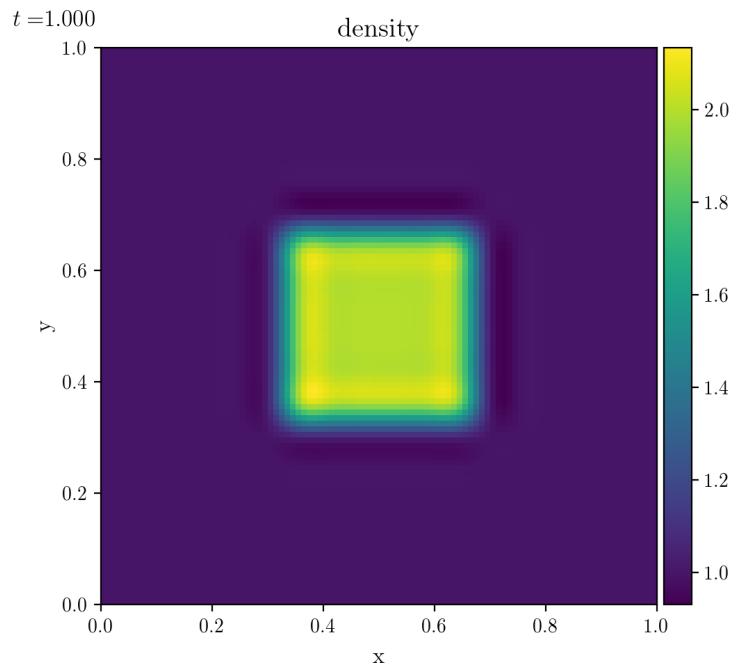
**Figure 14:** Obtained result 1D



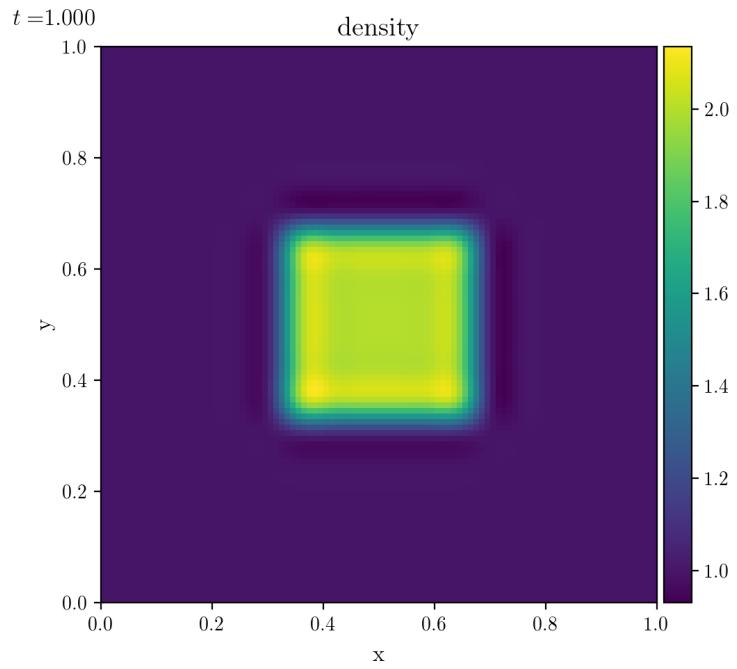
**Figure 15:** Expected result 1D negative velocity



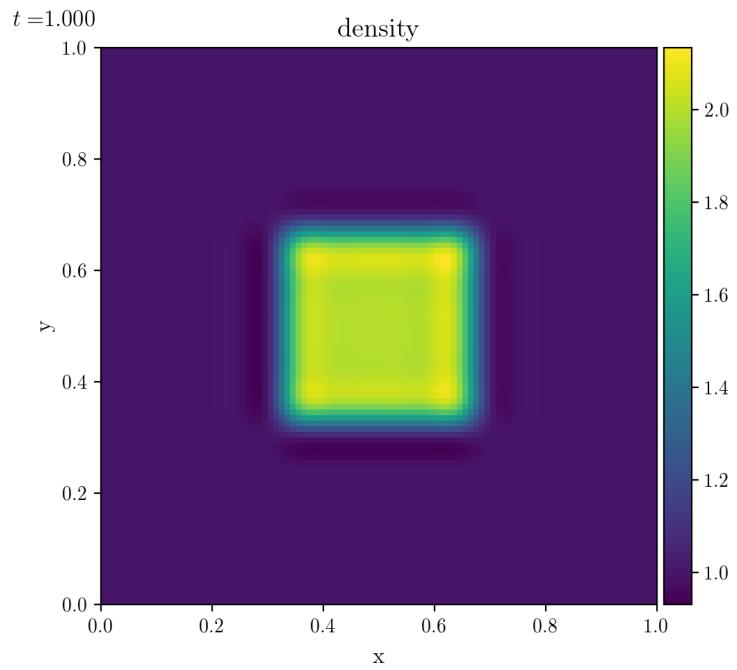
**Figure 16:** Obtained result 1D negative velocity



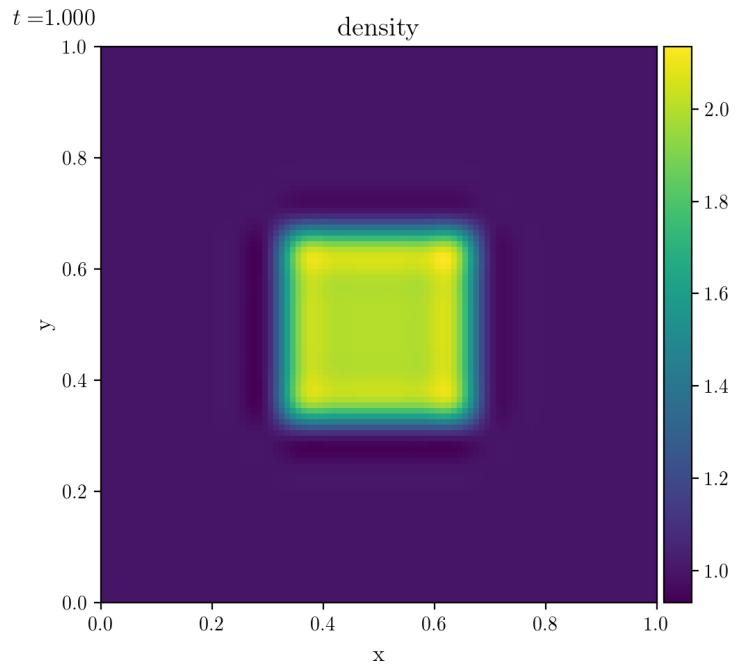
**Figure 17:** Expected result 2D



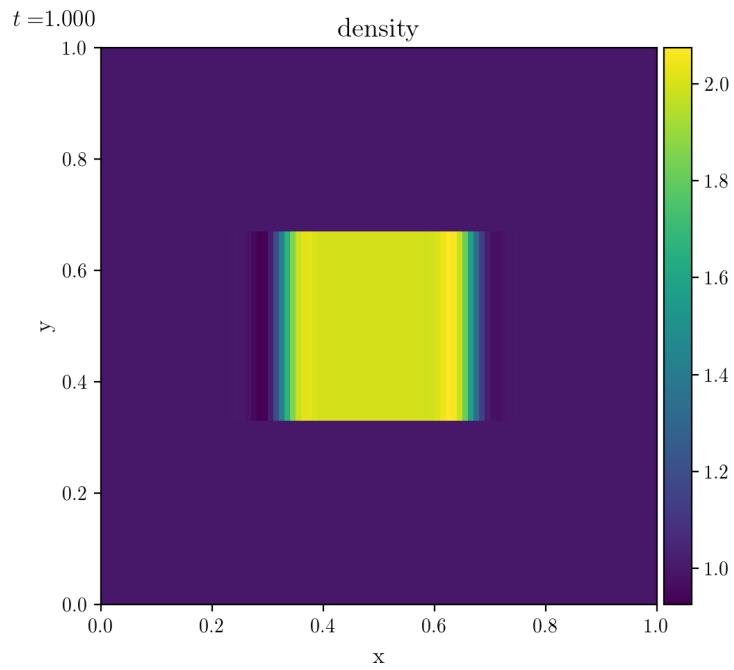
**Figure 18:** Obtained result 2D



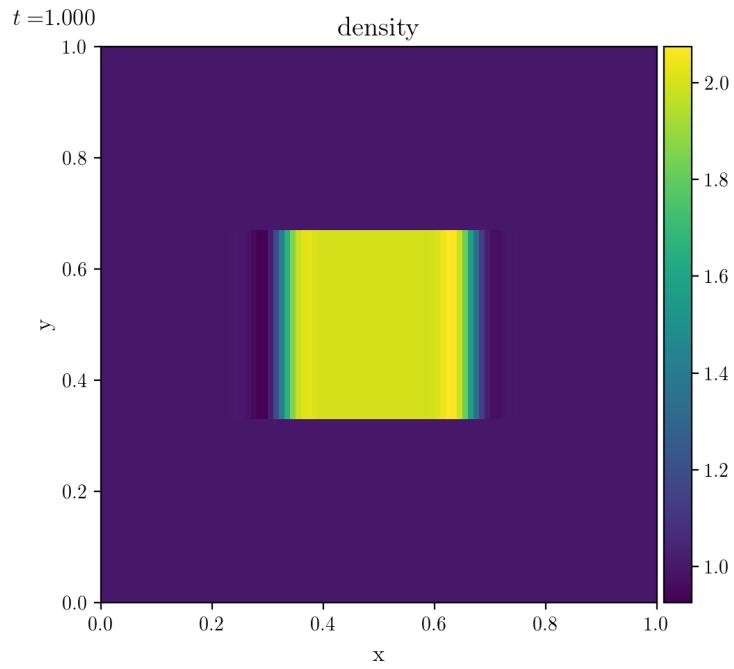
**Figure 19:** Expected result 2D negative velocity



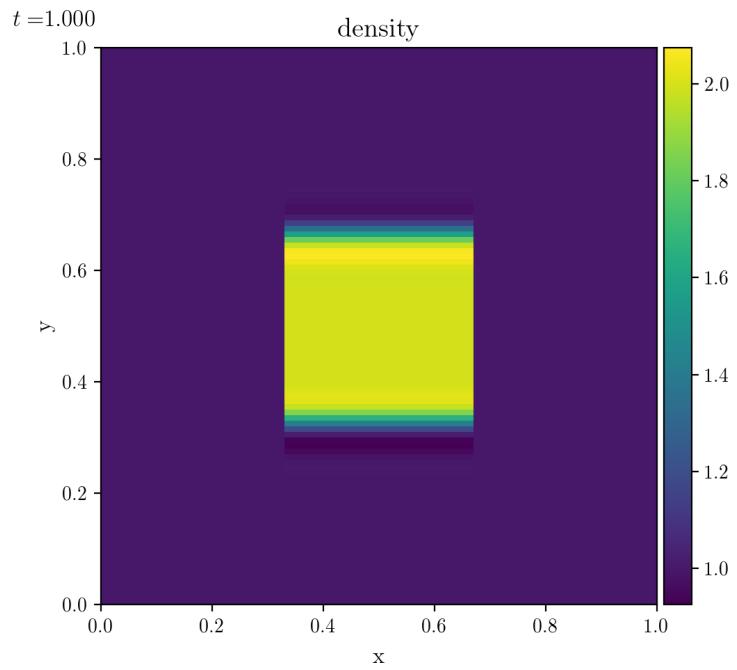
**Figure 20:** Obtained result 2D negative velocity



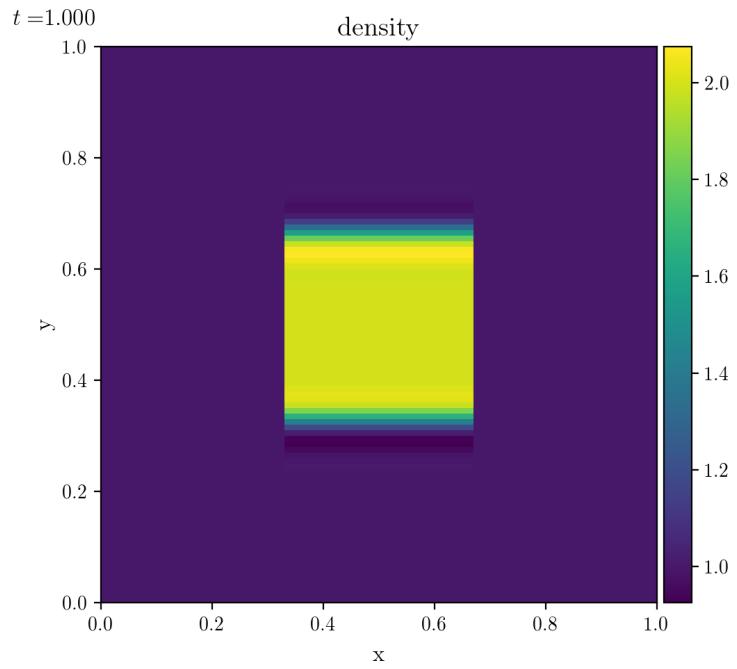
**Figure 21:** Expected result 2D velocity in x direction only



**Figure 22:** Obtained result 2D velocity in x direction only

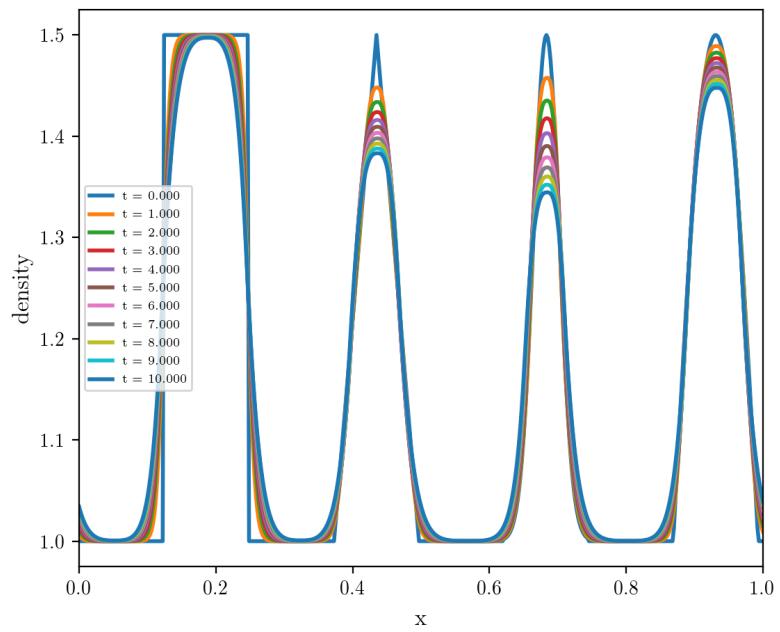


**Figure 23:** Expected result 2D velocity in y direction only

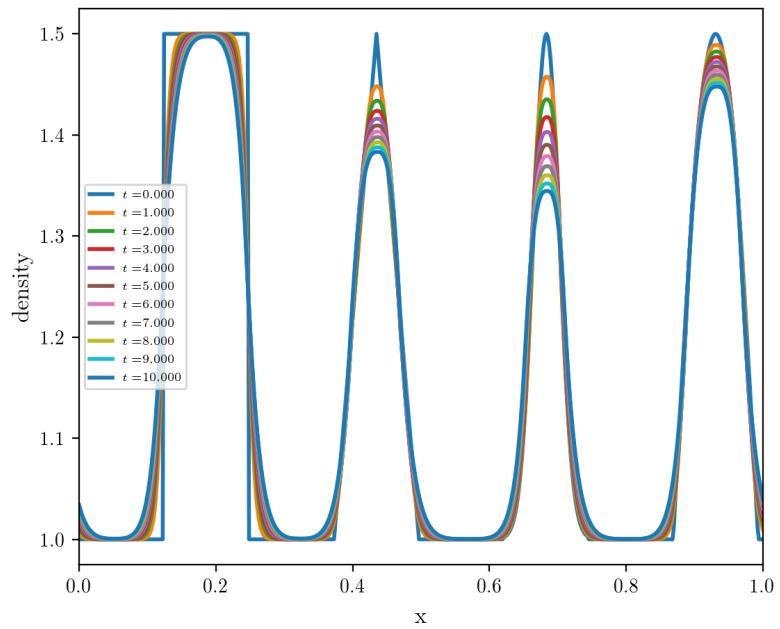


**Figure 24:** Obtained result 2D velocity in y direction only

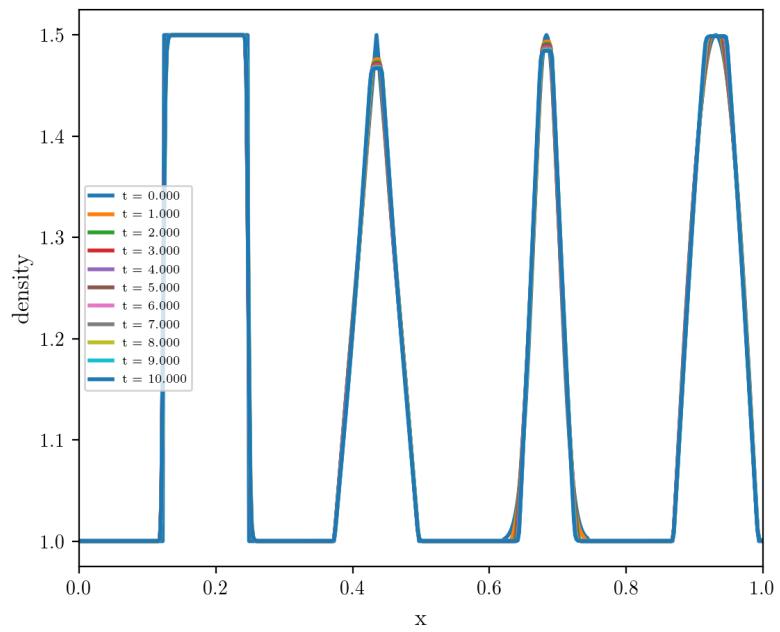
### 1.3 Piecewise Linear with Slope Limiters



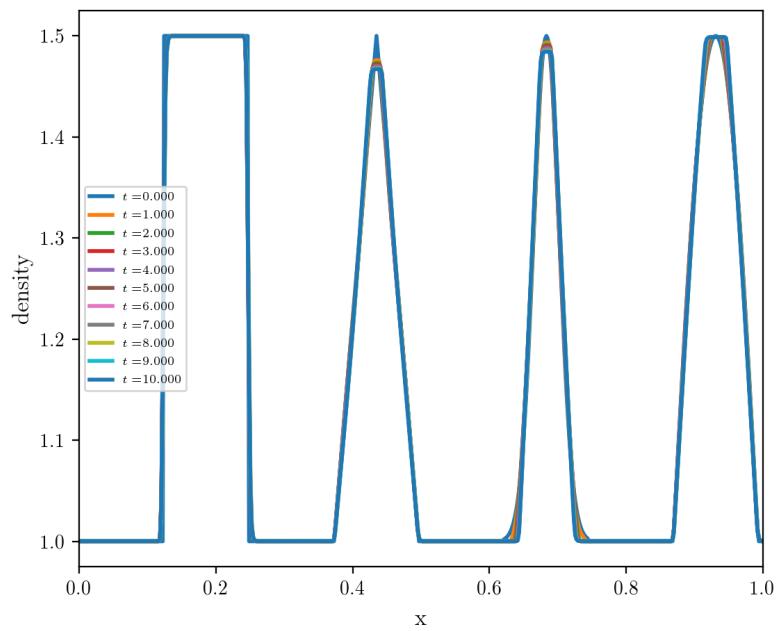
**Figure 25:** Minmod Slope Limiter. Expected result 1D



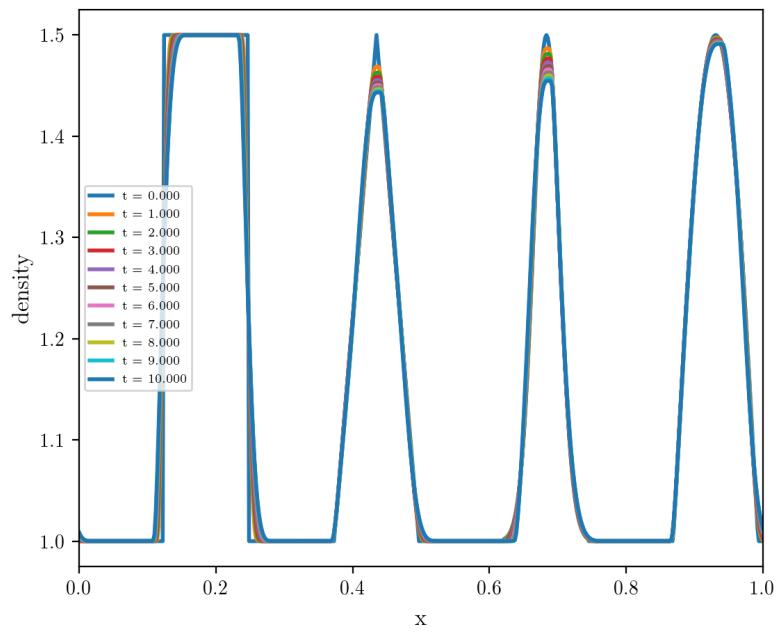
**Figure 26:** Minmod Slope Limiter. Obtained result 1D



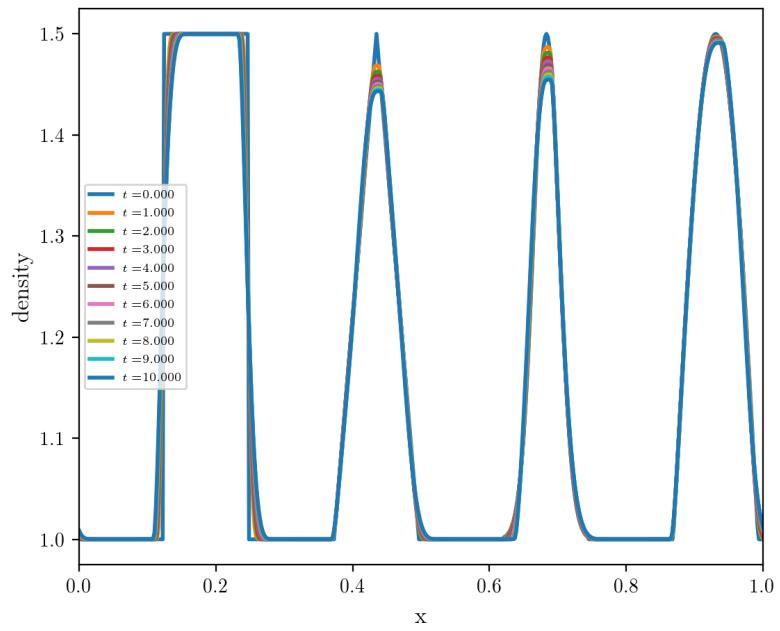
**Figure 27:** Superbee slope limiter. Expected result 1D negative velocity



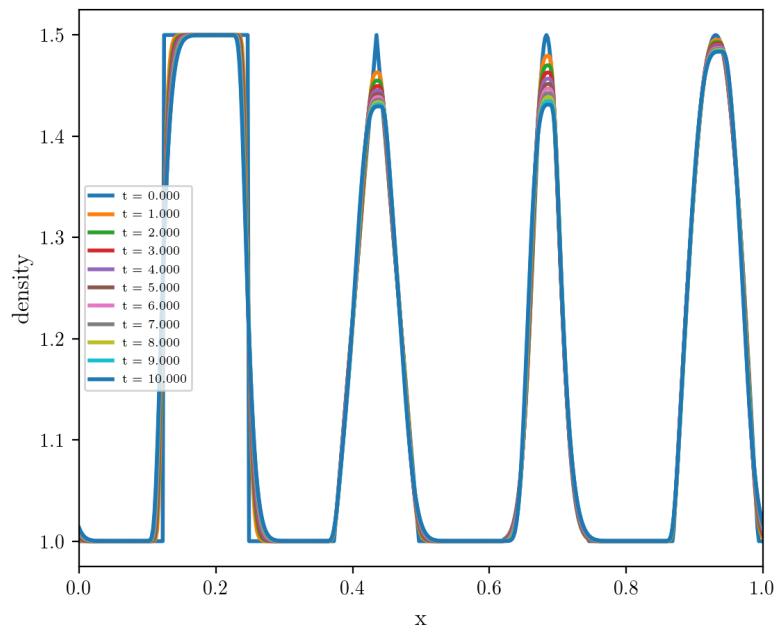
**Figure 28:** Superbee slope limiter. Obtained result 1D negative velocity



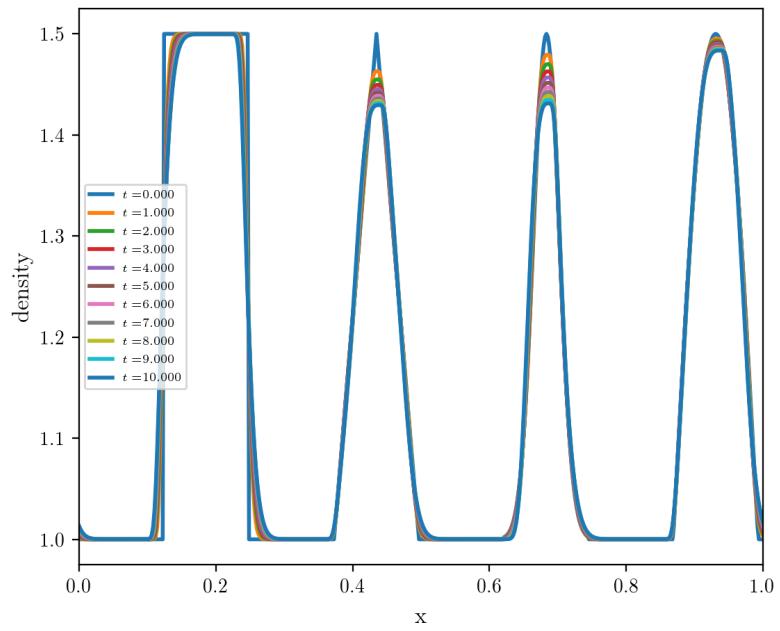
**Figure 29:** Monotonized central limiter. Expected result 1D



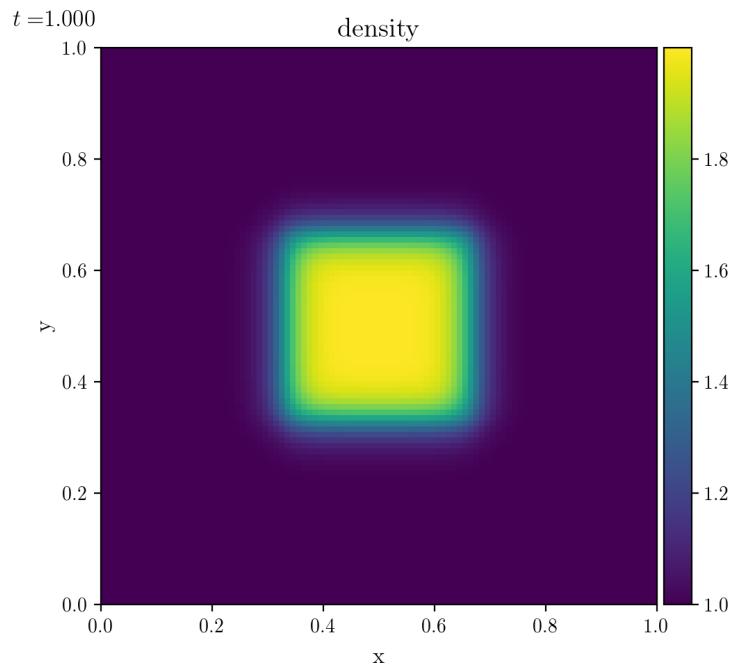
**Figure 30:** Monotonized central limiter. Obtained result 1D



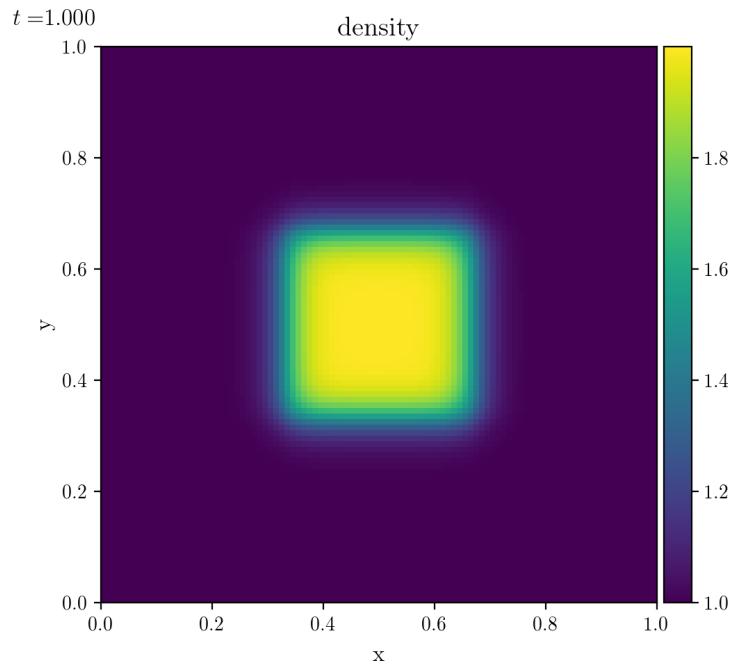
**Figure 31:** Van Leer Limiter. Expected result 1D



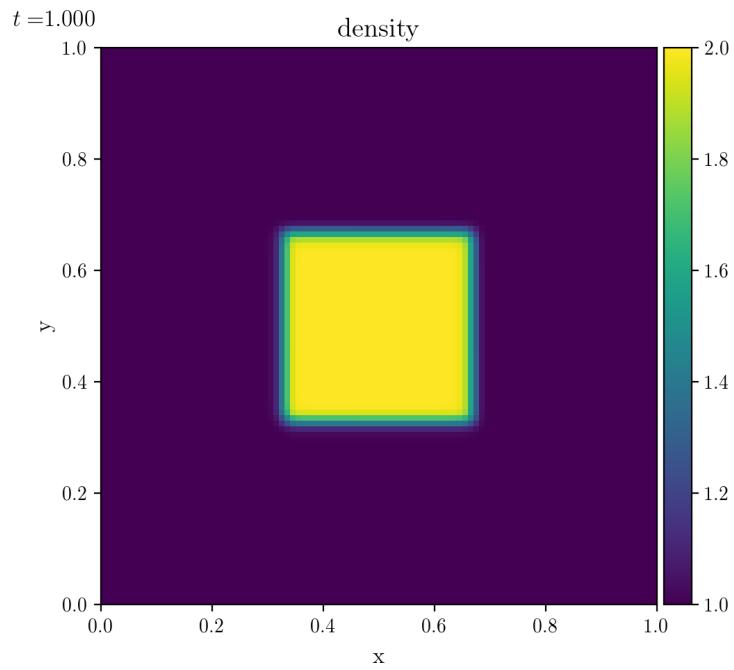
**Figure 32:** Van Leer Limiter. Obtained result 1D



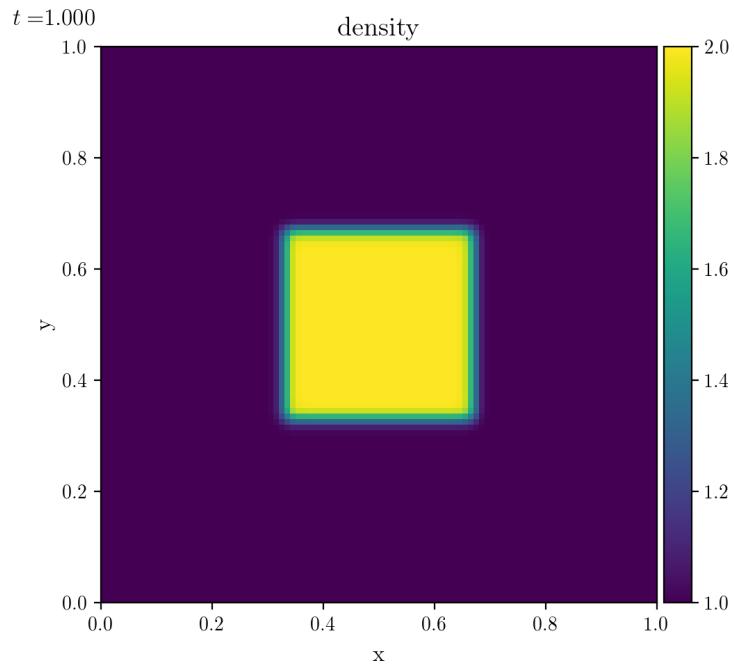
**Figure 33:** Minmod Slope Limiter. Expected result 2D



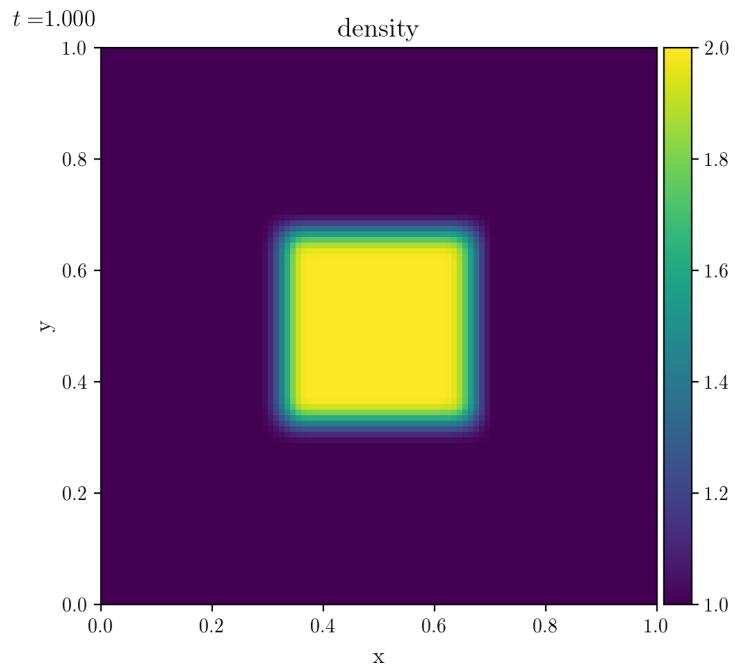
**Figure 34:** Minmod Slope Limiter. Obtained result 2D



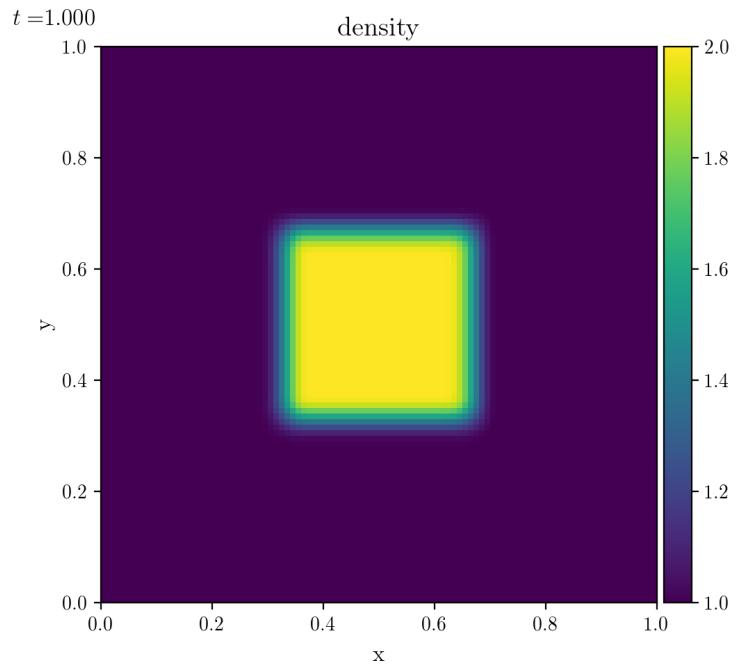
**Figure 35:** Superbee slope limiter. Expected result 2D negative velocity



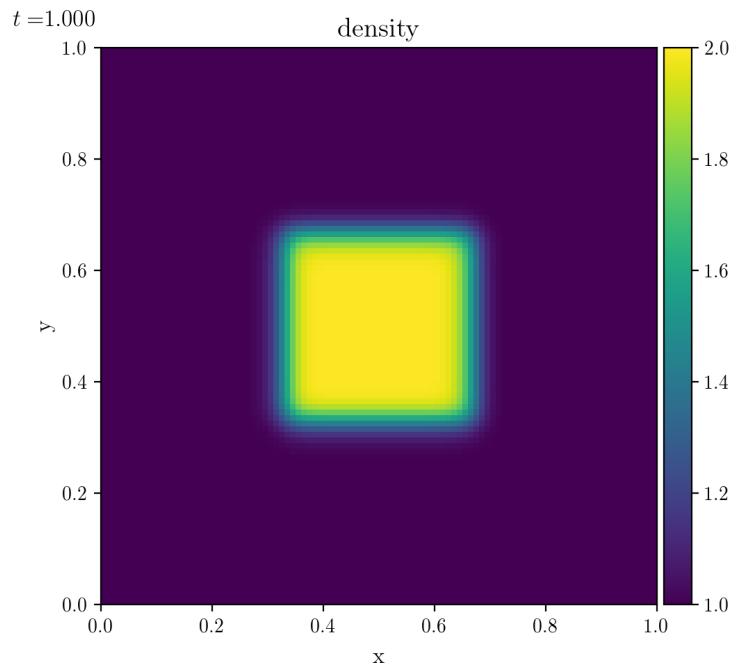
**Figure 36:** Superbee slope limiter. Obtained result 2D negative velocity



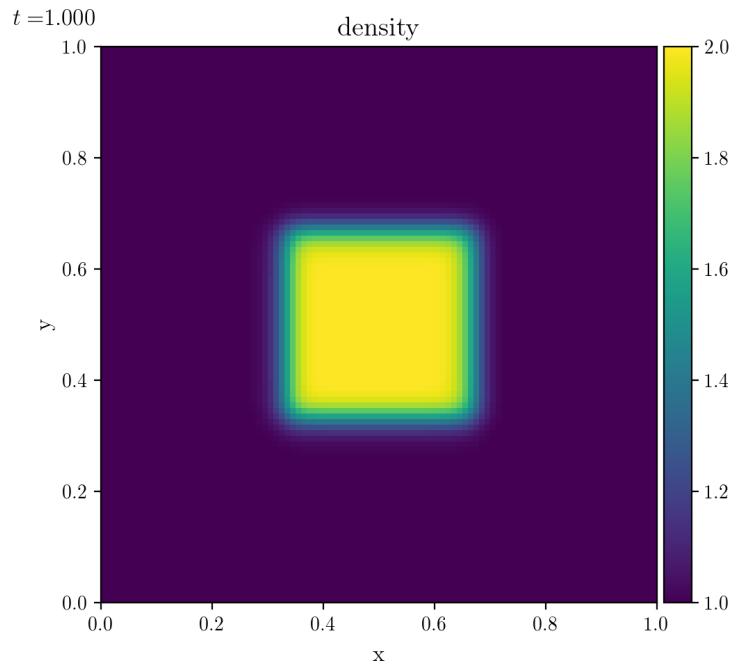
**Figure 37:** Monotonized central limiter. Expected result 2D



**Figure 38:** Monotonized central limiter. Obtained result 2D



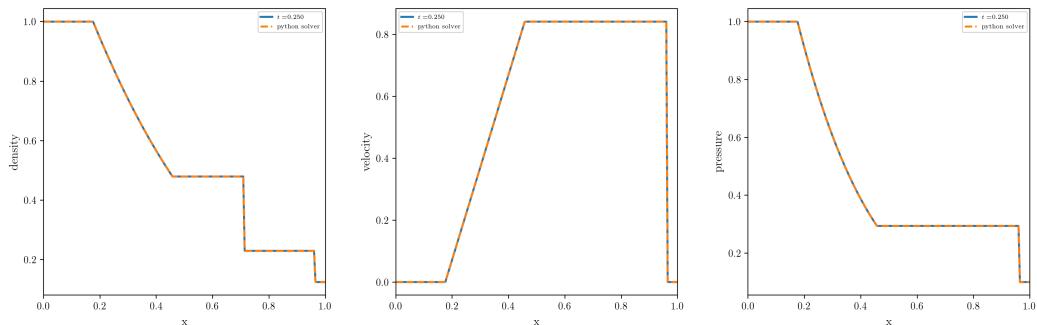
**Figure 39:** Van Leer Limiter. Expected result 2D



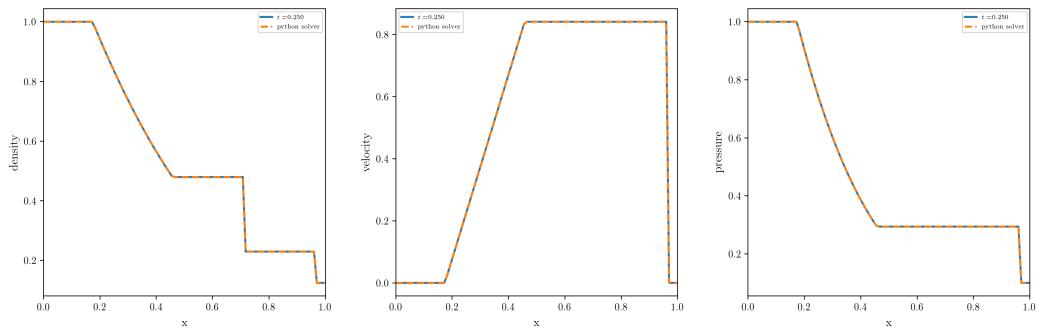
**Figure 40:** Van Leer Limiter. Obtained result 2D

## 2 Riemann Solvers

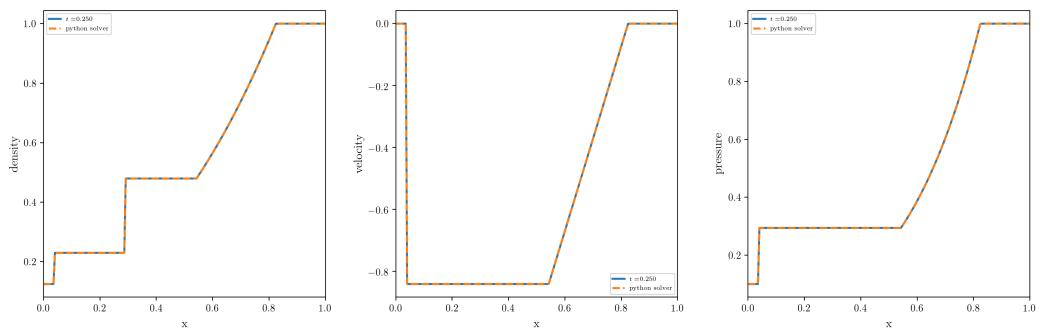
### 2.1 Exact vs Python



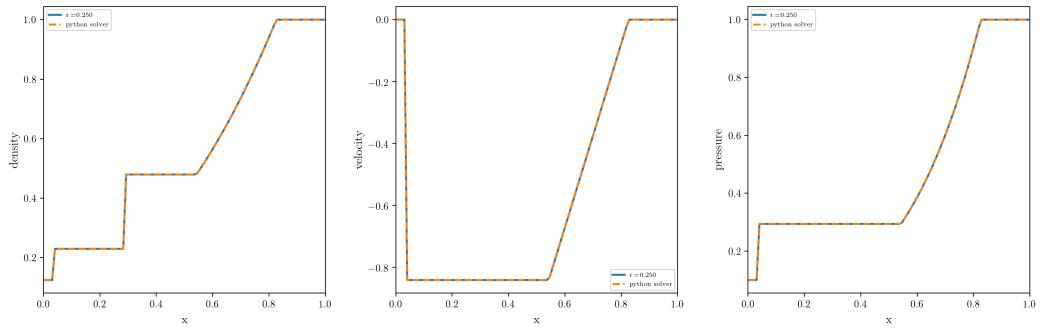
**Figure 41:** Exact solver for (right facing) sod shock. Expected result.



**Figure 42:** Exact solver for (right facing) sod shock. Obtained result.

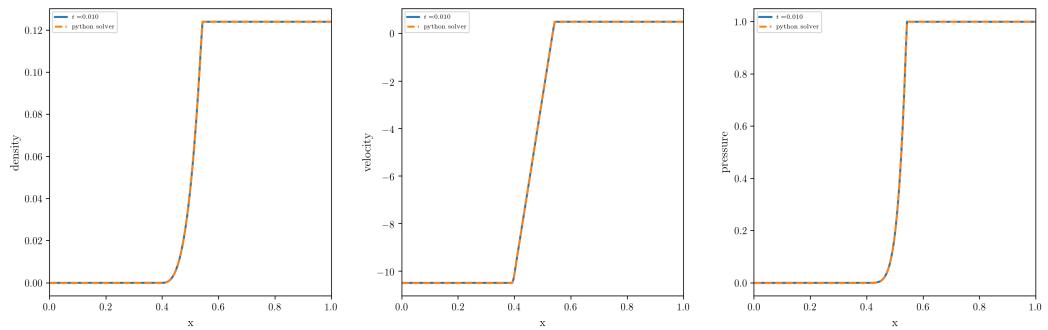


**Figure 43:** Exact solver for (left facing) sod shock. Expected result.

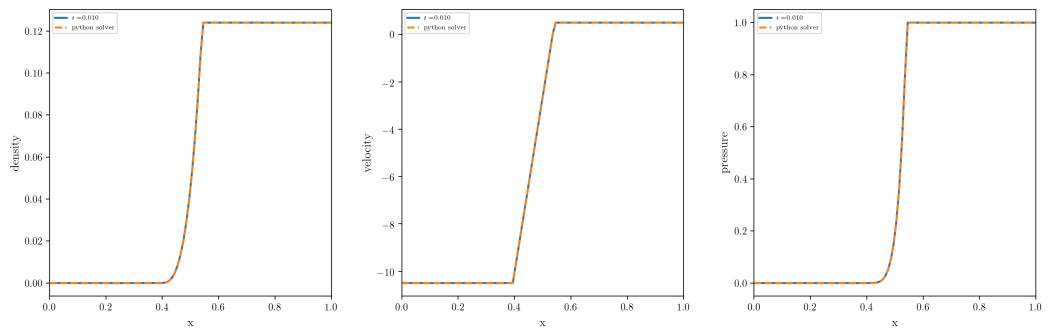


**Figure 44:** Exact solver for (left facing) sod shock. Obtained result.

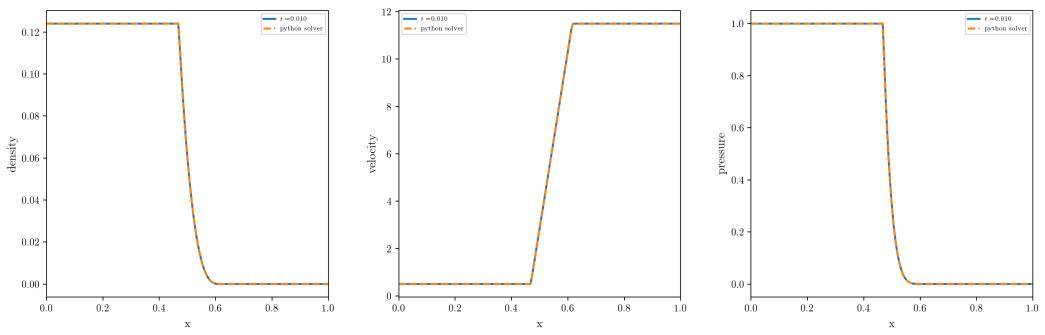
## 2.2 Vacuum



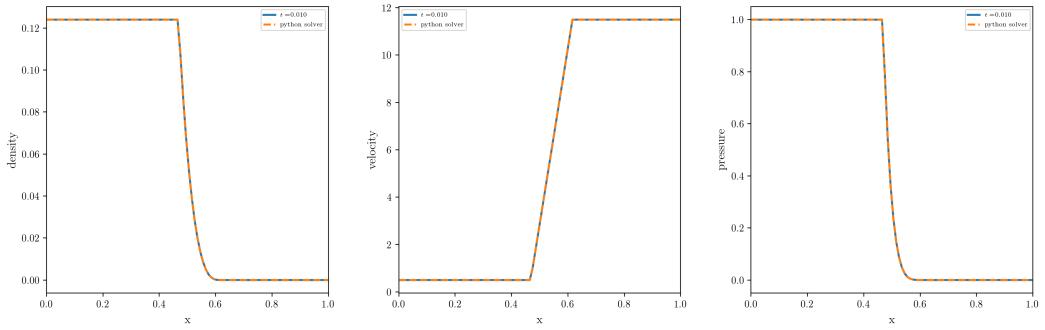
**Figure 45:** Exact solver for left vacuum state. Expected result.



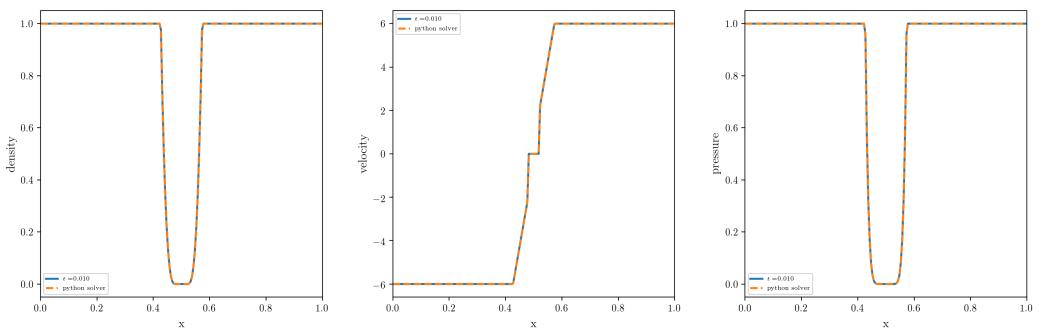
**Figure 46:** Exact solver for left vacuum state. Obtained result.



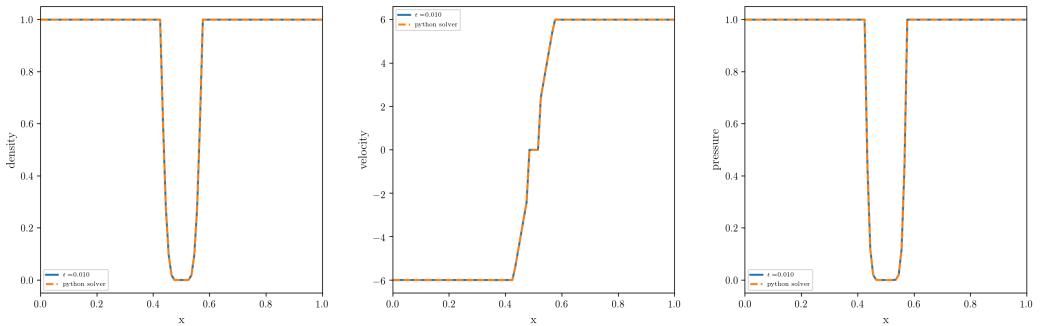
**Figure 47:** Exact solver for left vacuum state. Expected result.



**Figure 48:** Exact solver for left vacuum state. Obtained result.



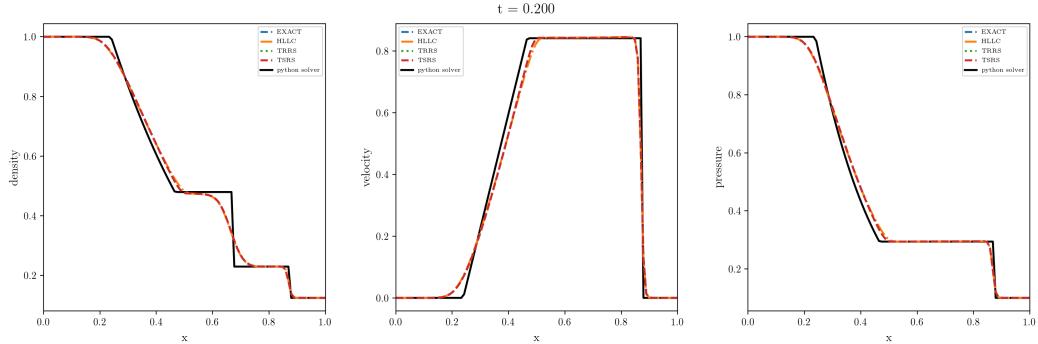
**Figure 49:** Exact solver for vacuum generating conditions. Expected result.



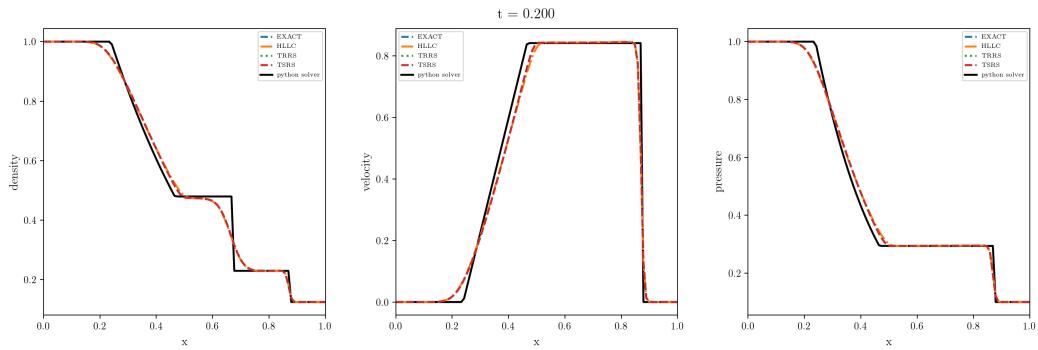
**Figure 50:** Exact solver for vacuum generating conditions. Obtained result.

### 3 Godunov's Method

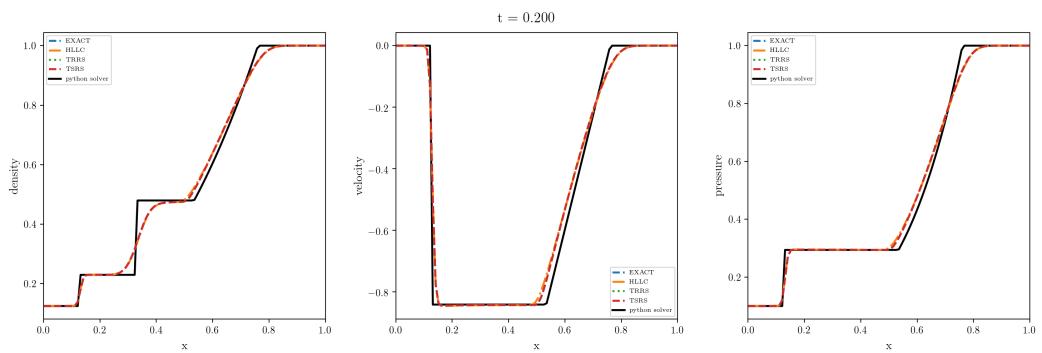
#### 3.1 1D with different Riemann Solvers



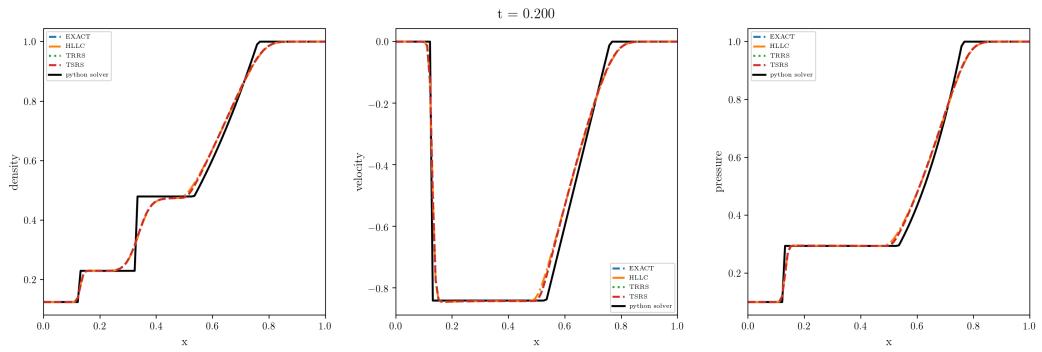
**Figure 51:** Godunov's method for (right facing) sod shock. Expected result.



**Figure 52:** Godunov's method for (right facing) sod shock. Obtained result.

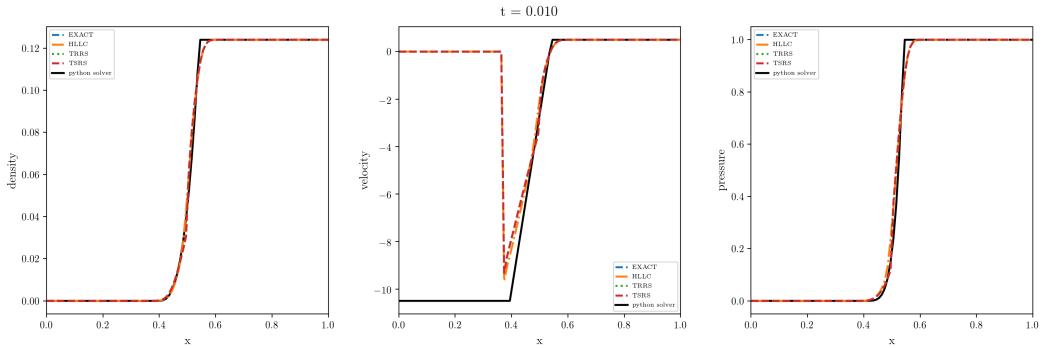


**Figure 53:** Godunov's method for (left facing) sod shock. Expected result.

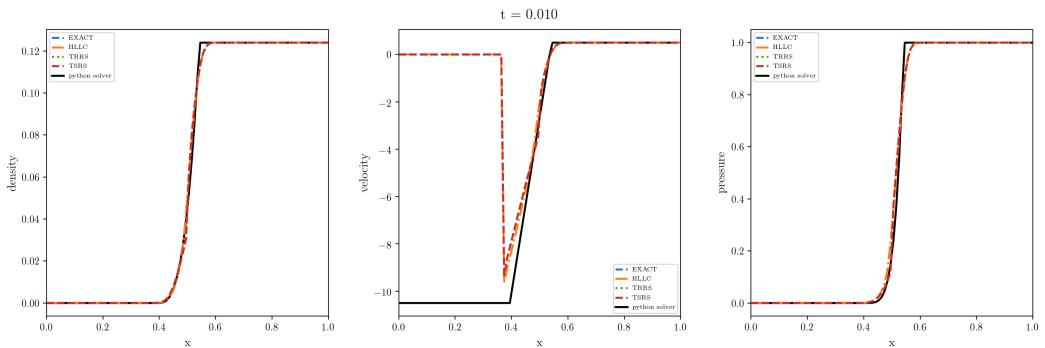


**Figure 54:** Godunov's method for (left facing) sod shock. Obtained result.

### 3.2 Vacuum in 1D

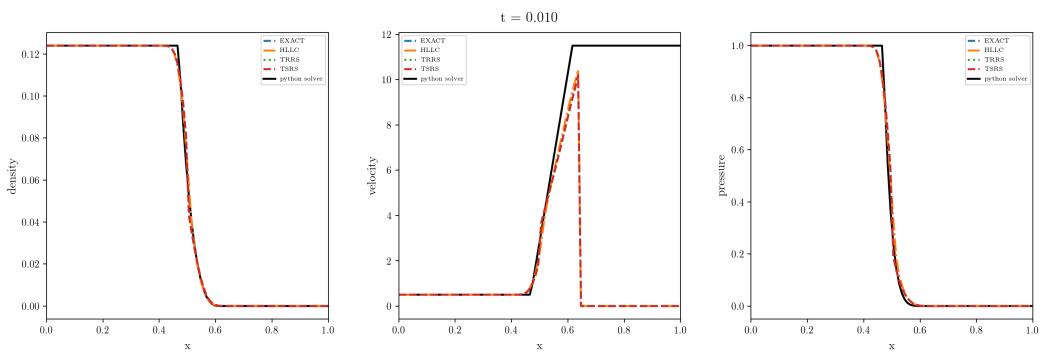


**Figure 55:** Godunov's method for left vacuum state. Expected result.

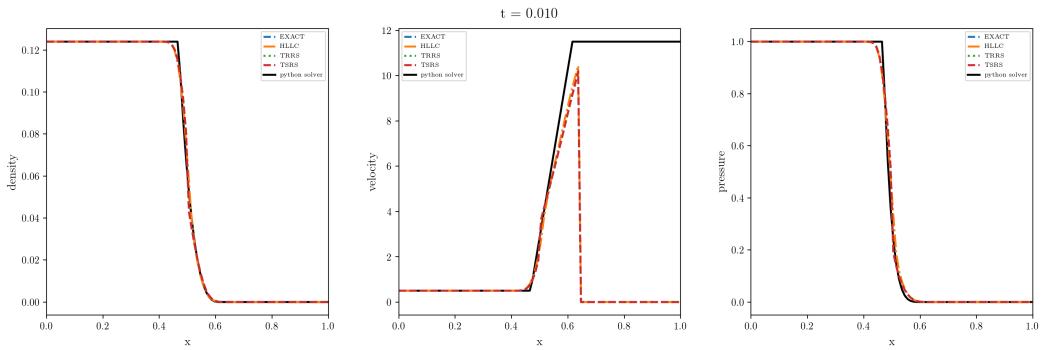


**Figure 56:** Godunov's method for left vacuum state. Obtained result.

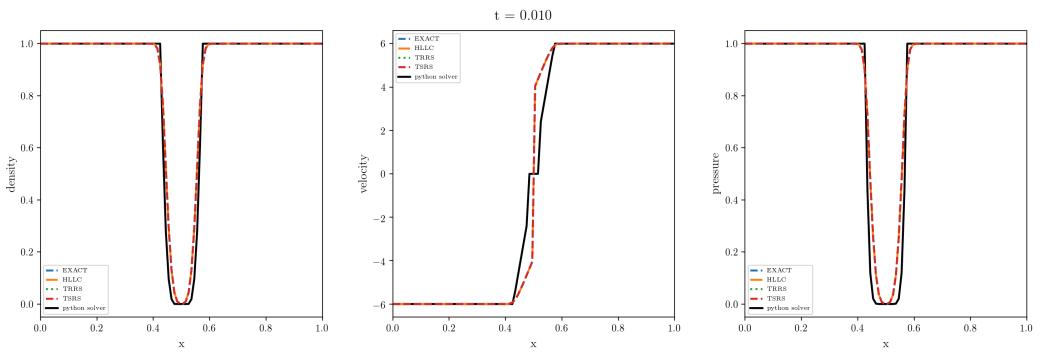
### 3.3 2D with different Riemann Solvers



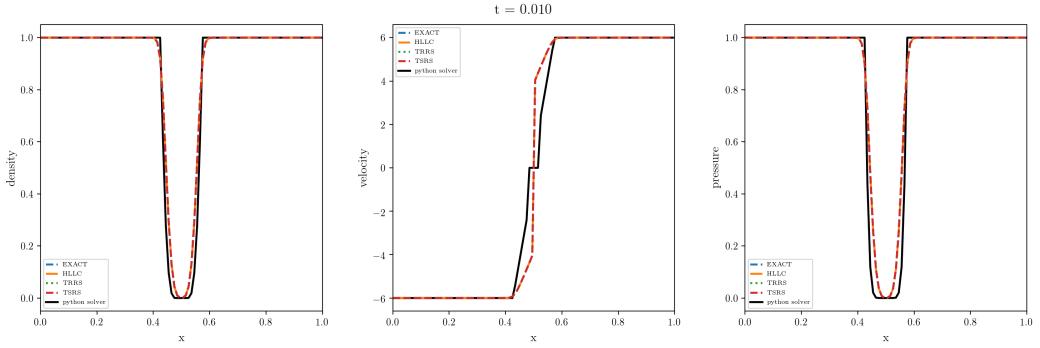
**Figure 57:** Godunov's method for left vacuum state. Expected result.



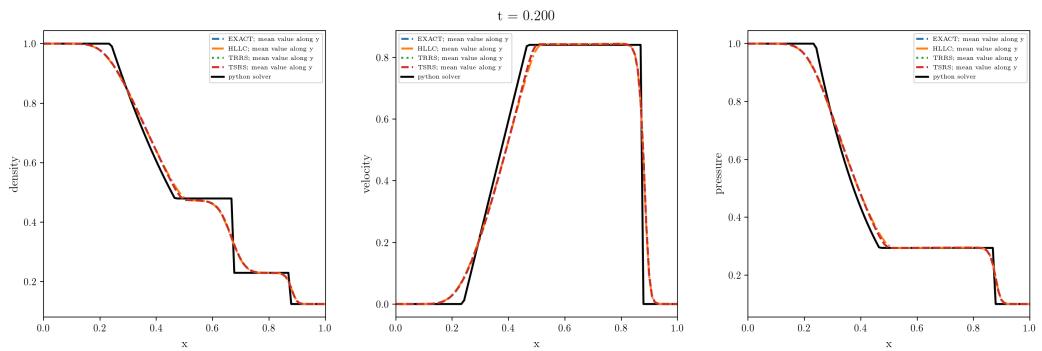
**Figure 58:** Godunov's method for left vacuum state. Obtained result.



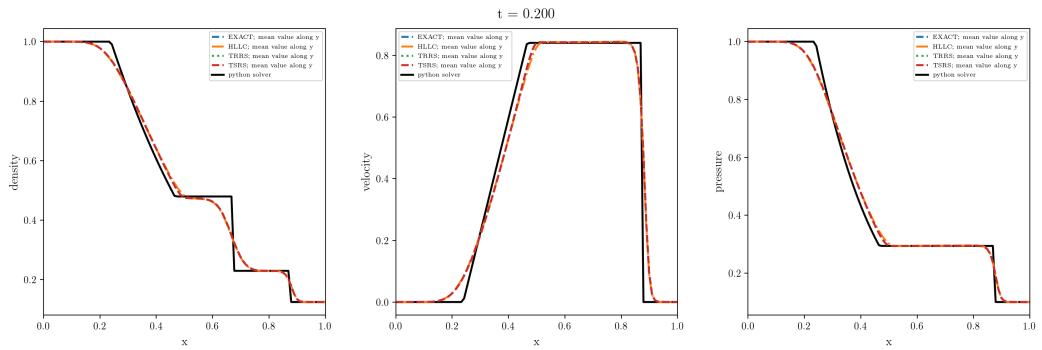
**Figure 59:** Godunov's method for vacuum generating conditions. Expected result.



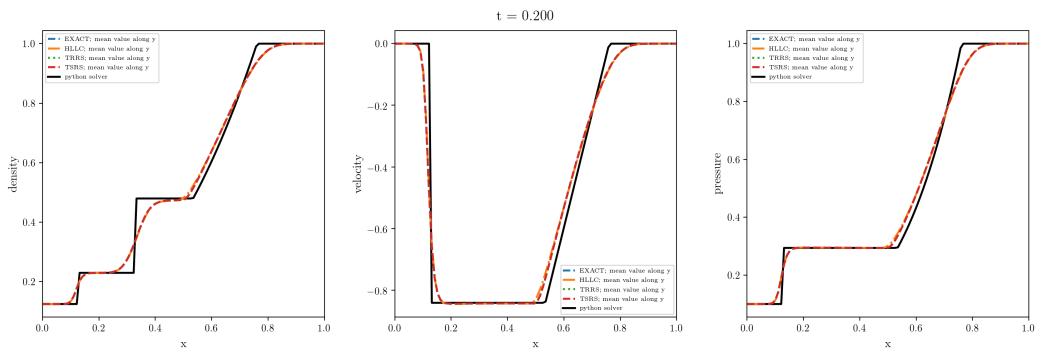
**Figure 60:** Godunov's method for vacuum generating conditions. Obtained result.



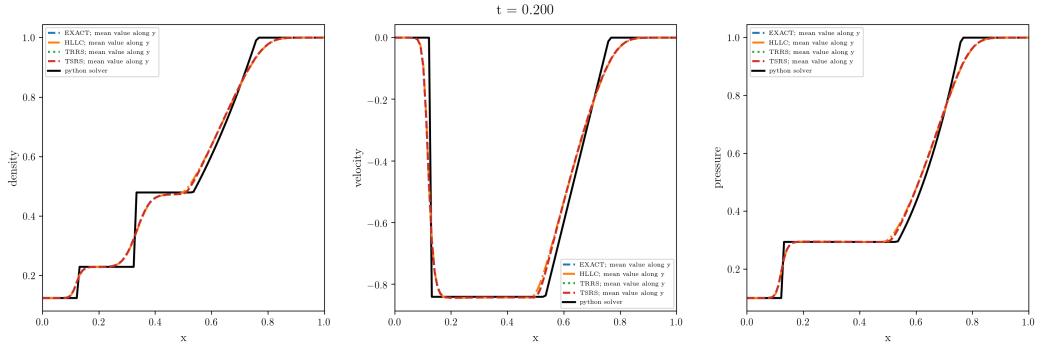
**Figure 61:** Godunov's method for (right facing) sod shock. Expected result.



**Figure 62:** Godunov's method for (right facing) sod shock. Obtained result.

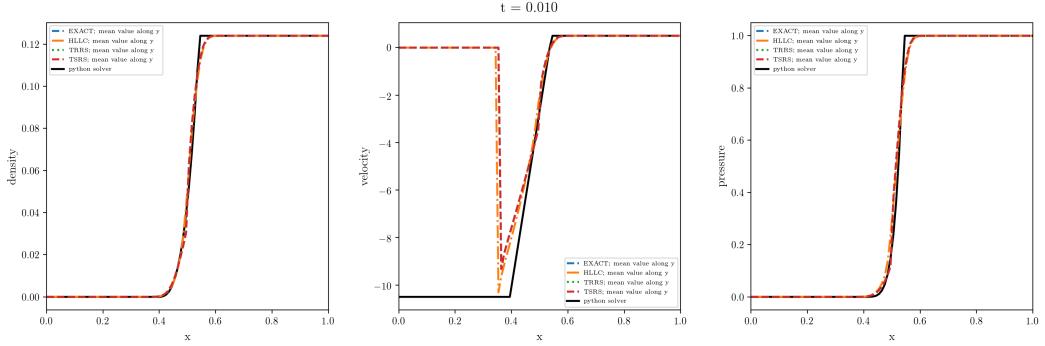


**Figure 63:** Godunov's method for (left facing) sod shock. Expected result.

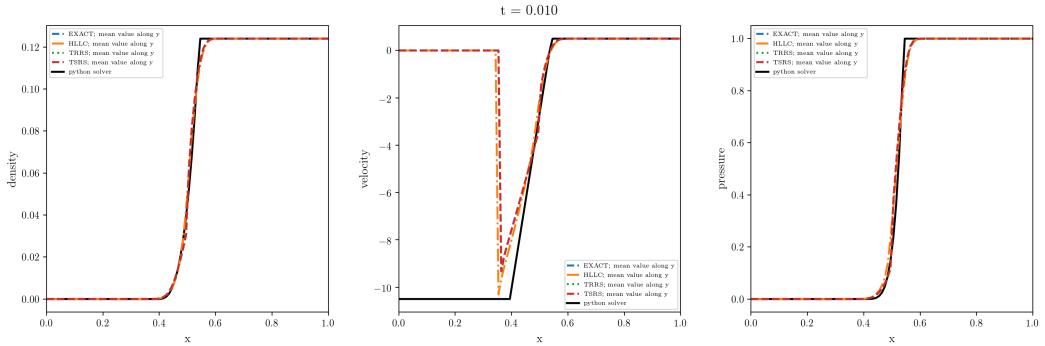


**Figure 64:** Godunov's method for (left facing) sod shock. Obtained result.

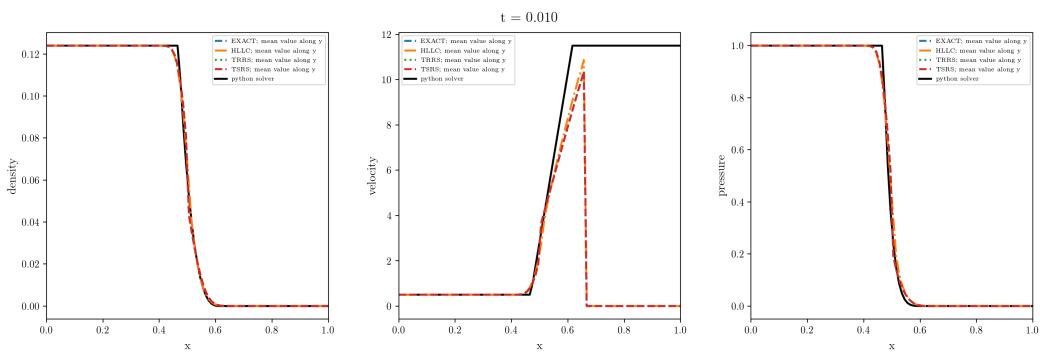
### 3.4 Vacuum in 2D



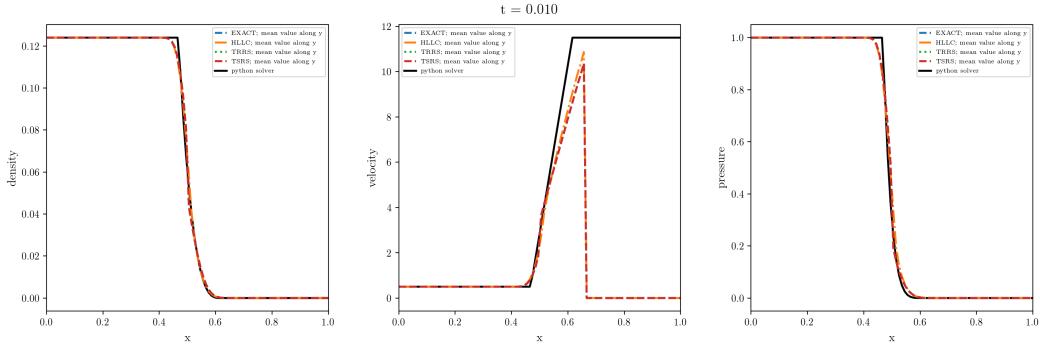
**Figure 65:** Godunov's method for left vacuum state. Expected result.



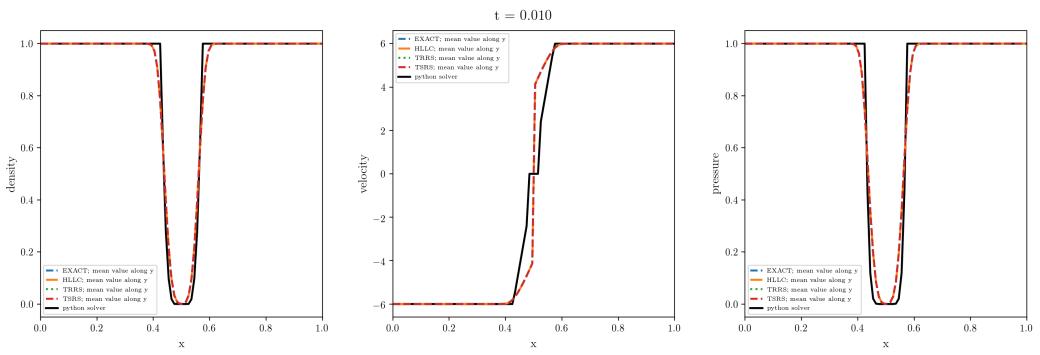
**Figure 66:** Godunov's method for left vacuum state. Obtained result.



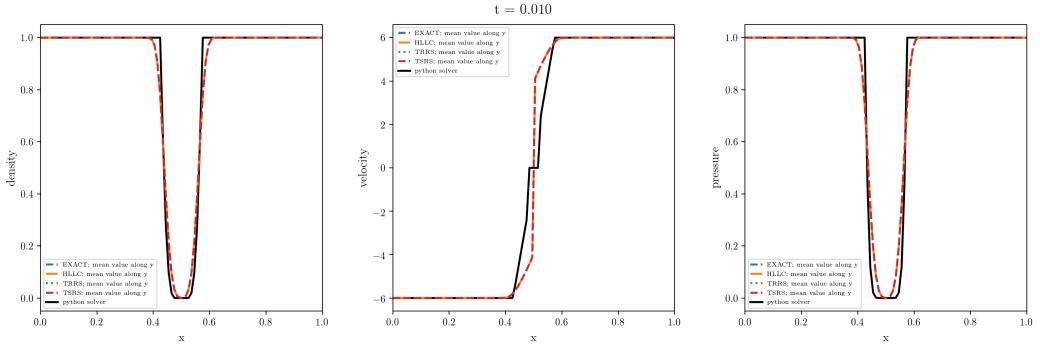
**Figure 67:** Godunov's method for left vacuum state. Expected result.



**Figure 68:** Godunov's method for left vacuum state. Obtained result.

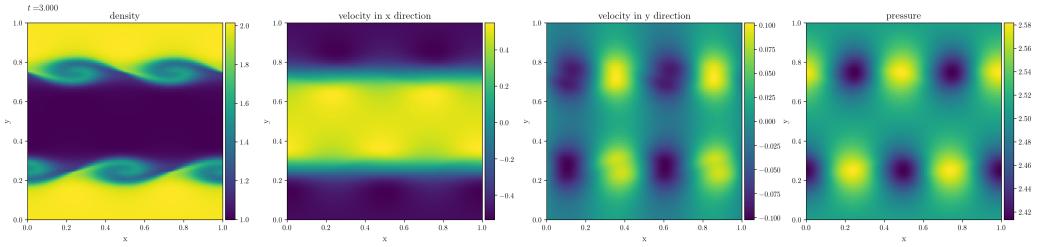


**Figure 69:** Godunov's method for vacuum generating conditions. Expected result.

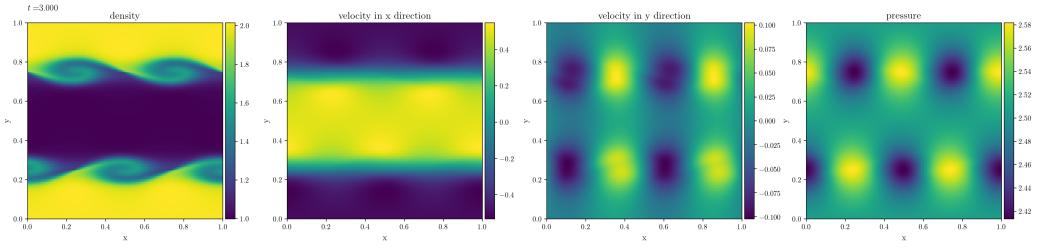


**Figure 70:** Godunov's method for vacuum generating conditions. Obtained result.

### 3.5 Others in 2D



**Figure 71:** Godunov's method for Kelvin Helmholtz instability. Expected result.



**Figure 72:** Godunov's method for Kelvin Helmholtz instability. Obtained result.