Finite Volumen Verfahren erster Ordnung

University of Stuttgart

Studentenvortrag
December 3, 2022

Presentation Overview

Vergleich verschiedener Riemann Löser

TORO3 Testcase

Riemann Löser	Rechenzeit [s]	$L_1[-]$	$L_2[-]$	$L_{inf}[-]$
Godunov	0,0052	2,13E-1	6,34E-1	3,32
Roe 3	0,0027	2,16E-1	6,35E-1	3,33
HLL	0,0026	2,15E-1	6,32E-1	3,38
HLLE	0,0036	2,15E-1	6,32E-1	3,38
HLLC	0,0029	2,13E-1	6,34E-1	3,32
Lax-Friedrichs	0,0023	2,60E-1	6,99E-1	3,45
Steger-Warming	0,0029	2,19E-1	6,41E-1	3,42
AUSMD	0,0026	2,12E-1	6,31E-1	3,31

Table: Rechenzeit und Diskretisierungsfehler verschiedener Riemann Löser

Konvergenzordnung mit AUSMD Riemann Löser

2D SineWaveO1 Testcase

Die empirische Konvergenzordnung des Verfahrens ergibt sich zu

$$n = \frac{log(\frac{E_1}{E_2})}{log(\frac{h_1}{h_2})},$$

wobei E die Diskretisierungsfehler und h den gemittelten Gitterabstand darstellen.

Gitterauflösung [x]	Rechenzeit [s]	$L_1[-]$	$L_2[-]$	$L_{inf}[-]$	$N_{L1}[-]$	$N_{L2}[-]$	N_L
100x100	1,02	3,37E-3	4,28E-3	1,11E-2	0,970	0,973	0,9
200x200	8,20	1,72E-3	2,18E-3	5,73E-3	0,987	0,987	0,9
400x400	61,79	1,72E-3	2,18E-3	5,73E-3	0,990	0,992	0,9
800x800	488,60	4,37E-4	5,53E-4	1,49E-3	0,997	0,992	0,9
1600x1600	3985,18	2,19E-4	2,78E-4	7,57E-4			

Table: Rechenzeit, Diskretisierungsfehler und empirische Konvergenzordnung

Druckfeld des SineWaveO1 Testcase

Figure: SineWave mit AUSDM auf einem kartesischen 1600x1600 Netz

Paragraphs of Text

Sed iaculis dapibus gravida. Morbi sed tortor erat, nec interdum arcu. Sed id lorem lectus. Quisque viverra augue id sem ornare non aliquam nibh tristique. Aenean in ligula nisl. Nulla sed tellus ipsum. Donec vestibulum ligula non lorem vulputate fermentum accumsan neque mollis.

> *Sed diam enim, sagittis nec condimentum sit amet, ullamcorper sit amet libero. Aliquam vel dui orci, a porta odio.*
> *— Someone, somewhere...*

Nullam id suscipit ipsum. Aenean lobortis commodo sem, ut commodo leo gravida vitae. Pellentesque vehicula ante iaculis arcu pretium rutrum eget sit amet purus. Integer ornare nulla quis neque ultrices lobortis.

Lists

Bullet Points and Numbered Lists

- Lorem ipsum dolor sit amet, consectetur adipiscing elit
- Aliquam blandit faucibus nisi, sit amet dapibus enim tempus
  - Lorem ipsum dolor sit amet, consectetur adipiscing elit
  - Nam cursus est eget velit posuere pellentesque
- Nulla commodo, erat quis gravida posuere, elit lacus lobortis est, quis porttitor odio mauris at libero

1. Nam cursus est eget velit posuere pellentesque
2. Vestibulum faucibus velit a augue condimentum quis convallis nulla gravida

Blocks of Highlighted Text

Block Title

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer lectus nisl, ultricies in feugiat rutrum, porttitor sit amet augue.

Example Block Title

Aliquam ut tortor mauris. Sed volutpat ante purus, quis accumsan.

Alert Block Title

Pellentesque sed tellus purus. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos himenaeos.

Suspendisse tincidunt sagittis gravida. Curabitur condimentum, enim sed venenatis rutrum, ipsum neque consectetur orci.

Multiple Columns

Subtitle

Heading

1. Statement
2. Explanation
3. Example

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer lectus nisl, ultricies in feugiat rutrum, porttitor sit amet augue. Aliquam ut tortor mauris. Sed volutpat ante purus, quis accumsan dolor.

Table

Subtitle

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table: Table caption

Figure

Figure: Creodocs logo.

Definitions & Examples

Definition

A prime number is a number that has exactly two divisors.

Example

- 2 is prime (two divisors: 1 and 2).
- 3 is prime (two divisors: 1 and 3).
- 4 is not prime (three divisors: 1, 2, and 4).

You can also use the `theorem`, `lemma`, `proof` and `corollary` environments.

Theorem, Corollary & Proof

Theorem (Mass–energy equivalence)

$E = mc^2$

Corollary

$x + y = y + x$

Proof.

$\omega + \phi = \epsilon$ □

Equation

$$\cos^3\theta = \frac{1}{4}\cos\theta + \frac{3}{4}\cos 3\theta \tag{1}$$

Verbatim

Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

Slide without title.

Citing References

An example of the `\cite` command to cite within the presentation:

This statement requires citation [Smith, 2022, Kennedy, 2023].

References


John Smith (2022)
Publication title
Journal Name 12(3), 45 – 678.


Annabelle Kennedy (2023)
Publication title
Journal Name 12(3), 45 – 678.

Acknowledgements

Smith Lab

- Alice Smith
- Devon Brown

Cook Lab

- Margaret
- Jennifer
- Yuan

Funding

- British Royal Navy
- Norwegian Government

The End

Questions? Comments?