

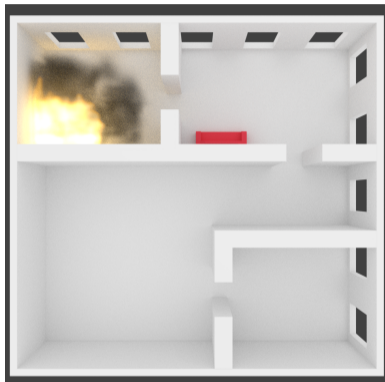
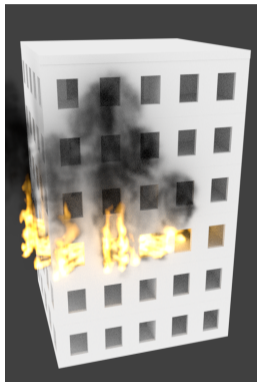


DYNAMIC DOMAIN EXPANSION

in Smoke Spread Simulations with ARTSS: Speedup and Overhead

27.04.2021 | My Linh Würzburger, Lukas Arnold | Forschungszentrum Jülich, Germany

Motivation



Goal: Reduction of the calculation time by minimising the domain to be calculated

Software ARTSS

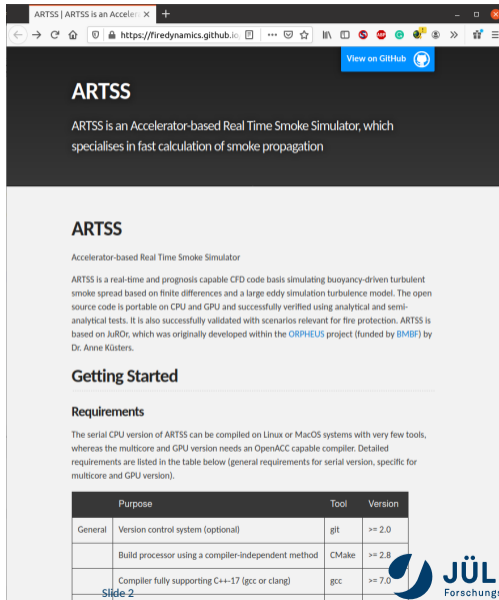
Accelerator-based → usage of GPU

Real Time } calculation time \leq simulation time

Smoke → no combustion/pyrolysis

Simulator

- focus on runtime/speed
- continuous development
- open source project: GitHub 
github.com/FireDynamics/ARTSS

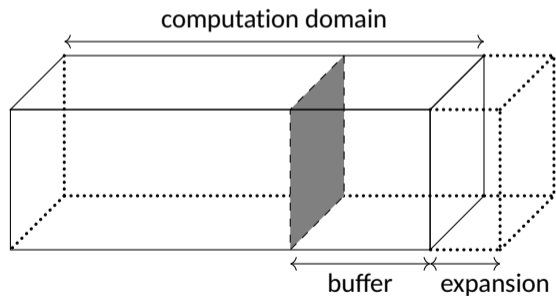


The screenshot shows the GitHub repository page for ARTSS. The page title is "ARTSS | ARTSS is an Accelerator-based Real Time Smoke Simulator". The main heading is "ARTSS" with a subtitle "ARTSS is an Accelerator-based Real Time Smoke Simulator, which specialises in fast calculation of smoke propagation". Below this, there is a section "ARTSS" with a subtitle "Accelerator-based Real Time Smoke Simulator" and a paragraph describing the simulator. A "Getting Started" section is also visible, followed by a "Requirements" section. A table lists the requirements for the serial CPU version of ARTSS.

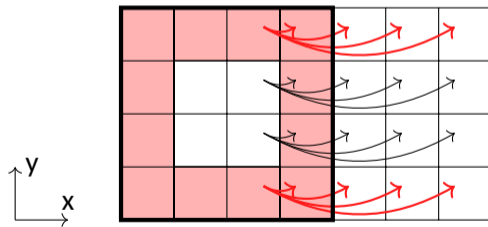
	Purpose	Tool	Version
General	Version control system (optional)	git	≥ 2.0
	Build processor using a compiler-independent method	CMake	≥ 2.8
	Compiler fully supporting C++-17 (gcc or clang)	gcc	≥ 7.0

Concept

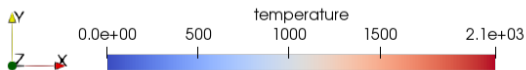
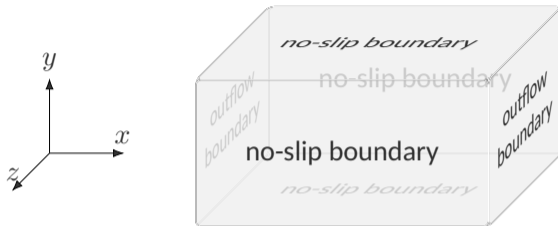
- time counter (how often)
- buffer size (where to check)



- check value (threshold)
- expansion size (how much)

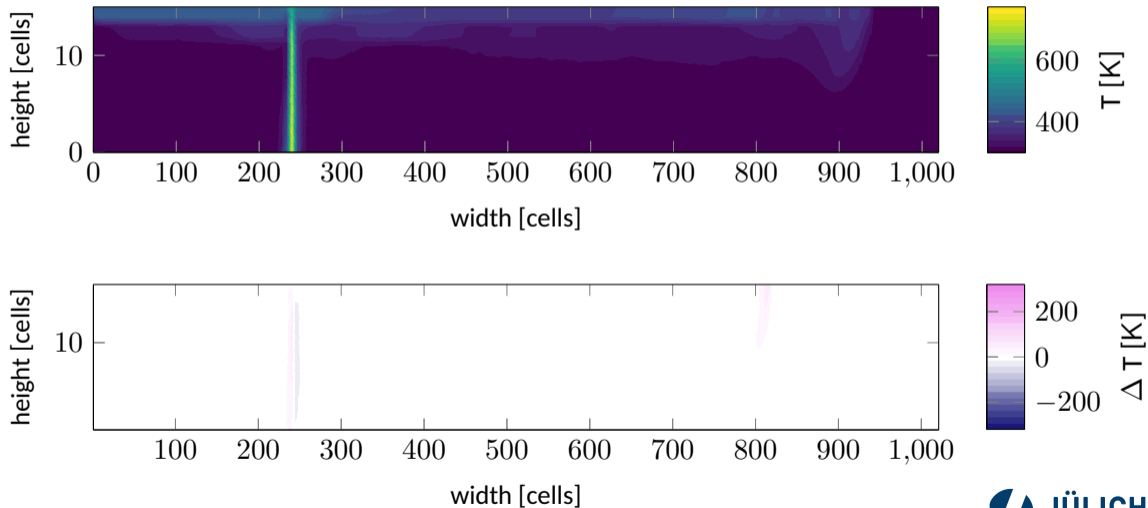


Setup



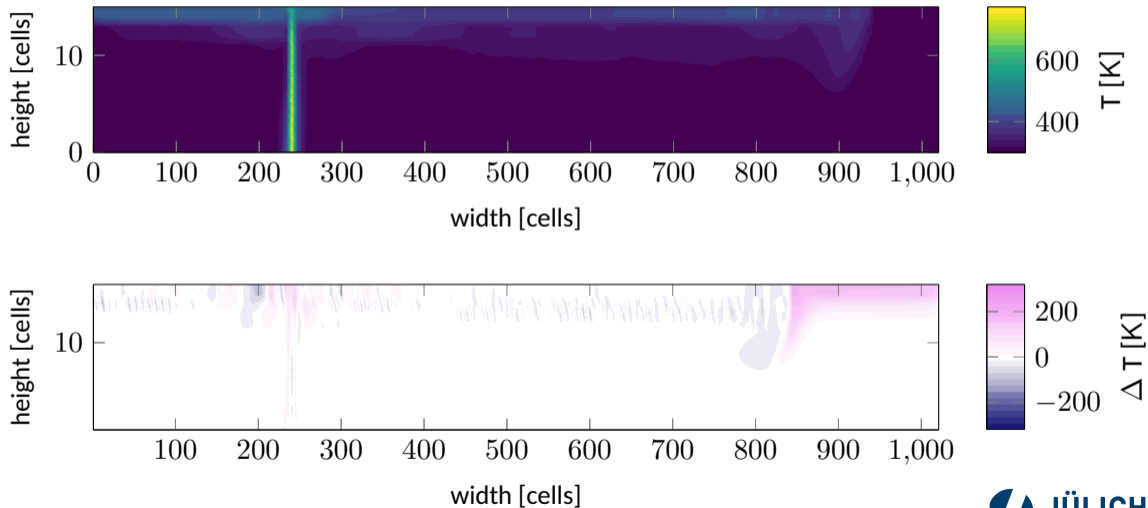
Analysis

Does it work? - Yes



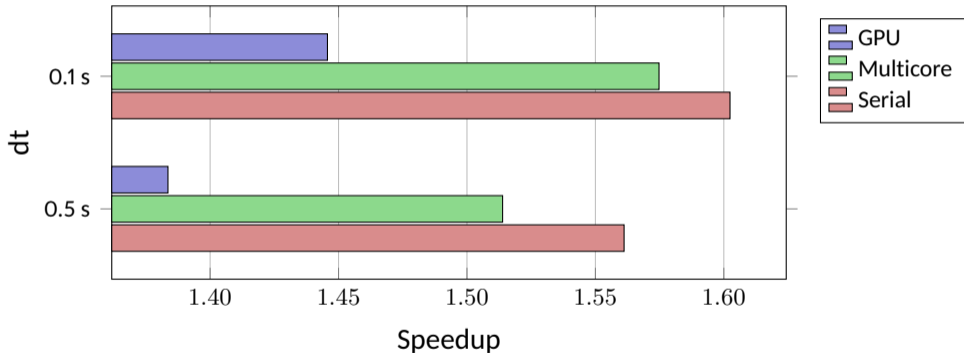
Analysis

Does it work? - No



Analysis

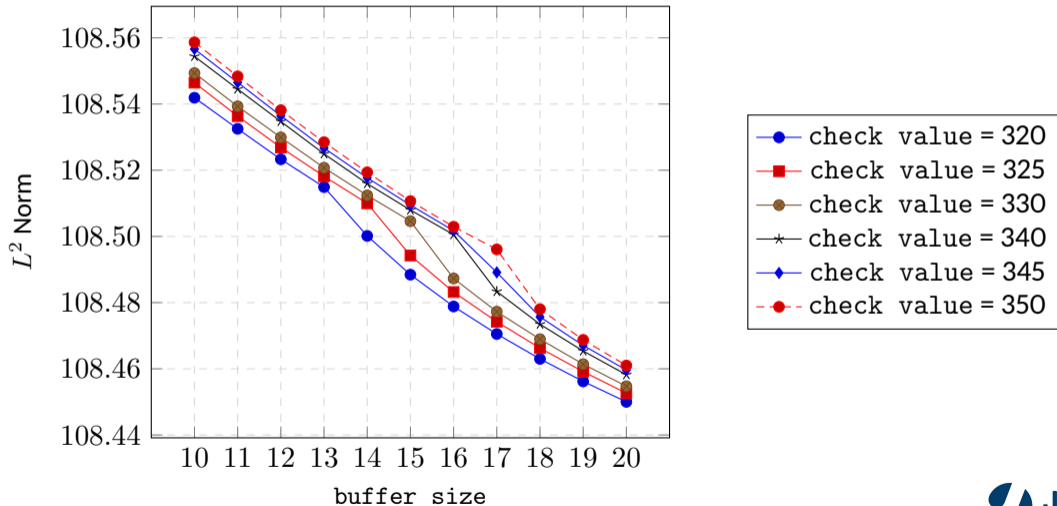
How much speed up do I get?



It depends on the time until the domain is fully expanded

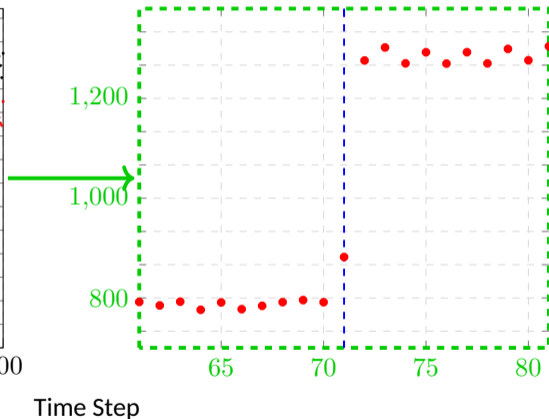
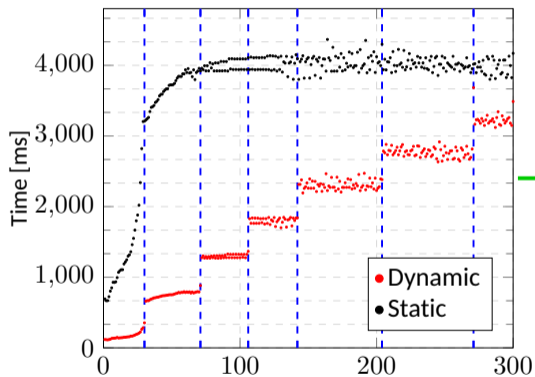
Analysis

Parameter Analysis



Analysis

More complex functions



Conclusions and Outlook

Conclusion

- reduction of the runtime
- small loss of accuracy

Outlook

- more complex expansion method (→ reduce loss of accuracy)
- adjust parameters during the simulation
- expansion in a fully closed room

Contact Information

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ARTSS: github.com/FireDynamics/ARTSS 