Title (EN): **Parallel realization of computer simulation of automobile fire and its spread to an adjacent vehicle using high-performance computer cluster**

Title (SK)**: Paralelná realizácia počítačovej simulácie požiaru automobilu a jeho šírenia na susedné vozidlo na vysokovýkonnom klastri počítačov**

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Annotation: Computer simulation of an automobile fire in open air and its spread to an adjacent vehicle was performed using the high-performance computing cluster at the Institute of Informatics, Slovak Academy of Sciences in Bratislava to test applicability of the Fire Dynamics Simulator (FDS) system for the purposes of fire modelling. The study included designing a 3D model of the automobile seat compartment and its material properties as well as a thorough analysis of the simulation parallelization. The simulation results were validated by full-scale fire automobile experiments. The used MPI model of parallelization implemented on the computer cluster allows reducing the total computational time significantly. The impact of parallelisation on simulation accuracy was examined as well. The results demonstrate achievement of considerably increased performance without significant loss of accuracy caused by parallelization. The validated model of automobile fire and its spread to adjacent objects including the feedback of external conditions on fire was subsequently used for modelling of fire scenarios in an underground car park.

Ability to model the course of automobile fire is important means for fire safety of automobiles and transport structures such as car parks and road tunnels.

Main scientific outputs:

1. WEISENPACHER, Peter - GLASA, Ján - HALADA, Ladislav. Automobile interior fire and its spread to an adjacent vehicle: parallel simulation. In Journal of fire sciences, 2016, vol. 34, no. 4, p. 305-322. (0.758 - IF2015). ISSN 0734-9041. Typ: ADCA
2. WEISENPACHER, Peter - GLASA, Ján - HALADA, Ladislav. Parallel computation of smoke movement during a car park fire. In Computing and Informatics, 2016, vol. 35, no. 6 (0.524 - IF2015). ISSN 1335-9150. Typ: ADDA
3. WEISENPACHER, Peter - GLASA, Ján - ŠIPKOVÁ, Viera. Performance of FDS versions 5 and 6 in passenger car fire computer simulation. In Proceedings of the European Modelling and Simulation Symposium, 2016, p. 155-161. ISBN 978-88-97999-76-8. Typ: ADMB