

# FEM Completely Implemented for GPUs by Available Algorithm Libraries

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A finite element code is developed in which all computational expensive steps are performed on a graphics processing unit (GPU) via the THRUST and the PARALUTION library. The code is focused on simulation of transient problems where the repeated computations per time step create the computational cost. It is applied to solve partial and ordinary differential equations as they arise in thermal-runaway simulations of automotive batteries. The speedup obtained by utilizing the GPU for every critical step is compared against the single core and the multi-threading solution which is also supported by the chosen libraries. This way a high total speedup on the GPU is achieved without the need for programming a single classical Compute Unified Device Architecture (CUDA) kernel.

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