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**Fluid–structure–electrophysiology interaction (FSEI) for the heart: a GPU accelerated computational framework** FRANCESCO VIOLA, Gran Sasso Science Institute, Italy, VAMSI SPANDAN, Harvard University, USA, VALENTINA MESCHINI, University of Rome Tor Vergata, Italy, JOSHUA ROMERO, MASSIMILIANO FATICA, NVIDIA Corporation, USA, ROBERTO VERZICCO, University of Rome Tor Vergata, Italy — The reliability of cardiovascular simulations depends on the accurate solution of the hemodynamics, the realistic modeling of the tissues and of the electrical activation of the myocardium. The resulting FSEI thus requires an immense computational power and implies long time to get the results or to rely on external computational resources if multi–CPU processors are used (MPI acceleration). In the recent years, the GPU has emerged as a platform for high performance computing and allows for considerable reductions of the time–to–solution. In order to develop a reliable and efficient computational tool to support medical decision, our multi-physics solver has been ported to GPU clusters and workstations. Indeed, the GPU architecture yields a substantial reduction of the number of host nodes required to reach a target performance level. The porting relies on CUDA Fortran that allows the programmer to define subroutines running on the GPUs as well as CUF kernel directories that automatically run single and nested loops on the GPU device without modifying the original CPU code. The GPU accelerated multi-physics heart model shows good strong scaling characteristics, thus allowing for a timely solution of cardiac simulations and to provide data for medical decision.

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