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Recent advances in numerical simulation of time-dependent problems

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Nearly all problems which arise in mathematical modelling, engineering application, and science, e.g., wave propagation, elasticity, and fluid-structure interaction problems, are time-dependent. The development of spatial discretization techniques for these classes of problems is relatively mature and has seen tremendous development in recent decades. The mathematical nature of transient problems is such that temporal discretization techniques require particular care in their design to ensure numerical stability and robustness. Various time marching schemes have been proposed with features such as high-order accuracy, shape conservation, and energy conservation. However, numerical stability may not be guaranteed, and significant analysis may be needed to ascertain CFL conditions. Also, in recent years, space-time finite element discretization techniques have been used to benefit from its advantages such as simulating complex computational domains that may move or deform, space-time adaptivity, and parallel computing. The computational cost of space-time methods remains a challenge that requires significant computational resources or careful design of the numerical schemes.
In this Mini-Symposium, we will discuss the latest advances in techniques for dealing with time-dependent problems, including linear, non-linear, and multiscale problems. We invite contributions with a focus on:

- New and novel time marching methods
- Adaptive techniques for space-time methods
- Exponential integrators
- Efficient time integrators for advanced spatial discretizations such as isogeometric analysis
- Methods with features such as dissipation control, geometric conservation, and energy stability
- Stability analyses
- Parallel and high-performance computing
- Temporal meshing techniques
- Application of time-marching schemes in areas modelling of various applications engineering and science