Convergence acceleration of heterogeneous domain decomposition method for EMT-TS electrical network DAE system.

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Simulation of power grid consists in solving a system of differential algebraic equations (DAE) where the unknowns are currents and voltages. The Modified Augmented Nodal Analysis allows us to build the DAE system where each component of the grid contributes through relations between currents and voltages and the Kirshoff's laws give the algebraic constraints. The introduction of power electronic components implies faster dynamics than before. Therefore, as some areas of the network require a high level of detail in the simulation as well as the ability to model faster dynamics, they are modeled by Electromagnetic Transient (EMT) modeling type, while the rest of the network is modeled using a more computationally efficient type of modeling: dynamic phasor model (TS). These two types of modeling lead to adapted DAE subsystems. To co-simulate these two subsystems, which involve different time steps, we use an overlapping Schwarz heterogeneous domain decomposition method (DDM) to exchange transmission conditions between models. We examine the influence of the cutting location on the method, as well as the influence of two different models (EMT-TS) on the information to be exchanged. We show on a linear electric circuit the convergence property of the DDM with and without overlap and use the pure linear divergence of the method to accelerate it towards the solution with the Aitken's acceleration technique.