

Domain cloning techniques using MPI/OpenMp hybridisation in a particle-in-cell code simulating the plasma distribution around pulsars using DYMPHNA3D

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DYMPHNA3d is a relativistic, parallel three-dimensional particle-in-cell (PIC) code used for studying the magnetospheric plasma distribution in the vicinity of a pulsar at various inclinations. Parallelisation is carried out using domain cloning through MPI/OpenMP hybridisation. This paper discusses the results, benefits and draw backs of domain cloning using this hybrid code. In particular we will show that we can obtain computational efficiencies of approaching 88% using up to 32 nodes with 8 cores each. Our eventual aim is to perfrom part of these computations on a GPU architecture and we will discuss our progress on this to date. This work has relevance both to simulating astrophysical plasmas as well as terrestrial plasmas in, for example fusion reactors.