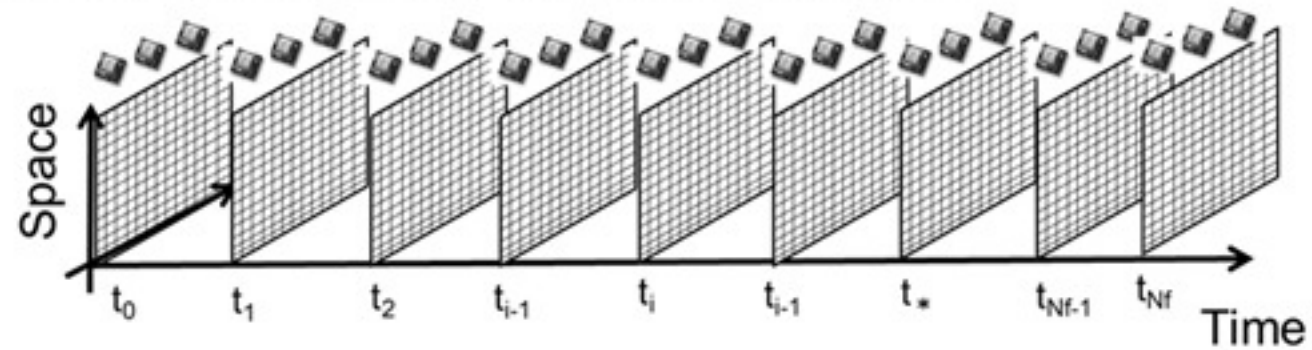
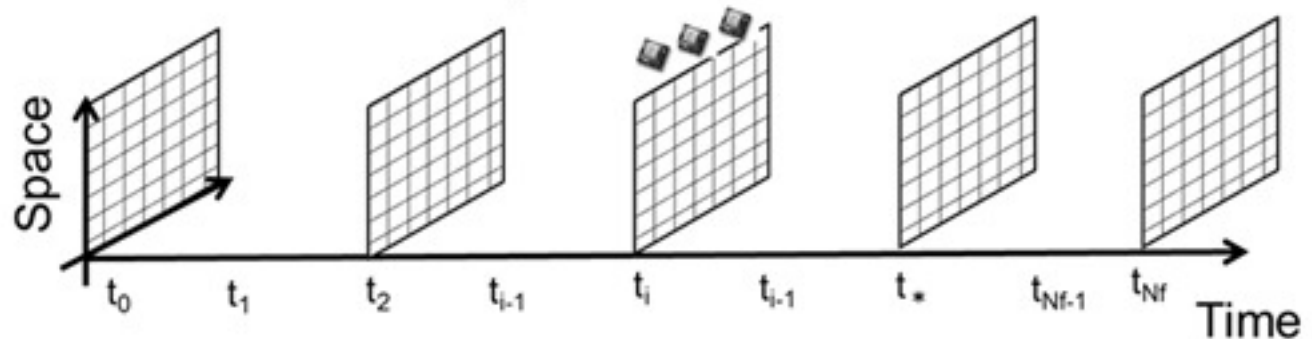


(a)
$$\left. \begin{aligned} U_n^k &= G(T_n, T_{n-1}, U_{n-1}^k) \\ &- G(T_n, T_{n-1}, U_{n-1}^{k-1}) \\ &+ F(T_n, T_{n-1}, U_{n-1}^{k-1}) \end{aligned} \right\} \begin{array}{l} \text{Coarse-Solver} \\ \text{Fine-Solver} \end{array}$$

Residual calculation by Fine-solver in parallel



Correction calculation by Coarse-solver in serial



(b)

```
Framework() {
  • activator-get_solver_type
  open_solver_mpi
  inp_solver ←
  init_solver ←
  inp_pit
  init_pit

  • initializer-coarse-solvers
  k=0
  while (error > tol) {
    k = k + 1
    • set initial value
    for kth iteration
    • Time Slice loop: parallel
    fine-solvers
    coarse-solvers
    • get Time Slice edge data
    from previous process
    • Time Slice loop: serial
    coarse-solvers
    • put Time Slice edge data
    to next process
    • error_cal }
}
```

Input part

Init. part

Splitting

Time loop part

Ex. solvers

ODE : few freedom and nonlinear

- Simple harmonic motion
- Von der Pol oscillation
- Brusselator
- Double well potential

PDE:

- Parabolic: Diffusion (2D, FDM)
- Hyperbolic: Structural analysis (3D, linear, Parallel FEM)

interface

UTIL:

Put/Get (Send/Receive) tools
SDC tool, etc.