Solving the Quasi-Neutrality Equation on Surfaces

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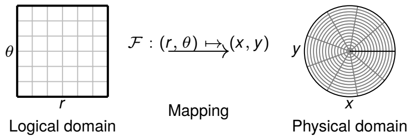
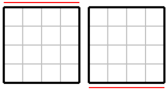
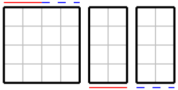
Structure of multi-patch

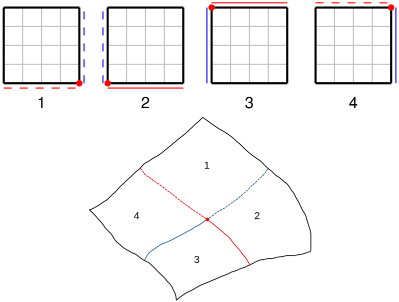




(a) Simple interface.



(b) T-joint.

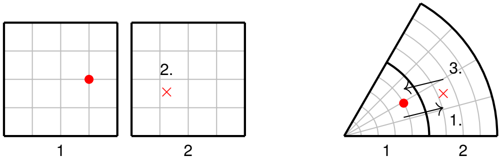


(c) X-point in logical and physical domain.

Patches in the logical domain.

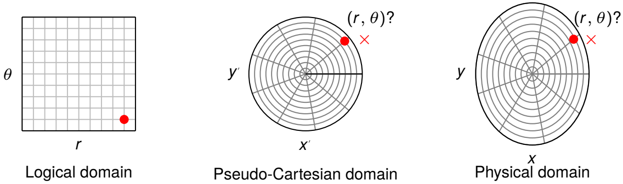
Advection

$$\partial_t \rho + A \cdot \nabla \rho = 0, \qquad \partial_t X(t^n; t^{n+1}, x) = A(t, X(t^n; t^{n+1}, x)). \tag{1}$$



1. compute feet.
2. evaluate function (need to transfer feet to patch 2).
3. transfer value to patch 1.

Example of a characteristic foot outside the patch 1 in the logical and physical domains.



APPENDIX - Structure code

GLOBAL DOMAIN CLASS

Define a global view of the domain.

- Reference to each Patch object.
- Global boundaries (outside boundaries).
- Reference to Interfaces object.
- Computation to find the patch where a given coordinate is?

INTERFACES CLASS

Define the interfaces between each patches.

- Reference to each Patch object.
- Define interfaces between each patches. (simple, T-joint, X-point).

PATCH CLASS

Define a patch.

- Dimensions `DimRi`, `DimPi`.
- Discrete domains and spline domains.
- Local mapping.

APPENDIX - Drif-kinetic equations

$$\begin{cases} \partial_t f + v_{GC} \cdot \nabla_\perp f + v_\| \partial_z f + \dot{v}_\| \partial_{v_\|} f = 0, \\ -\nabla_\perp \cdot (\alpha \nabla_\perp \phi) + \beta(\phi - \langle \phi \rangle) = n \end{cases} \tag{2}$$

Advection

- $\rightarrow$ multi-patch for space $\perp$ domain,
- $\rightarrow$ multi-patch for z domain,
- $\rightarrow$ multi-patch for velocity domain.

Poisson

- $\rightarrow$ similar to 2D0V case.