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# DG-FEM in Life V

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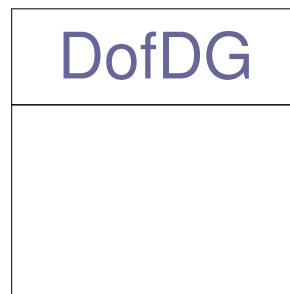
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# DG-FEM and DofDG class

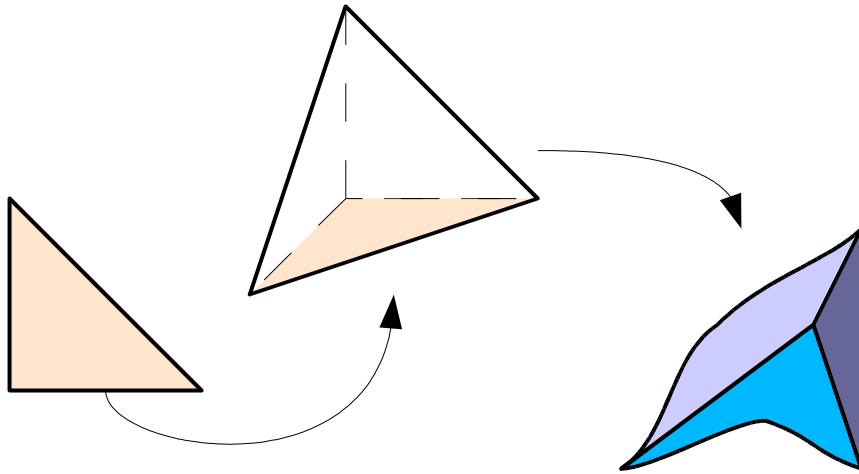
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$$\sum_{K \in T_h} \int_K \dots d\omega + \sum_{i \in \Gamma^0} \int_i \dots d\gamma + \sum_{b \in \Gamma^\partial} \int_b \dots d\gamma$$



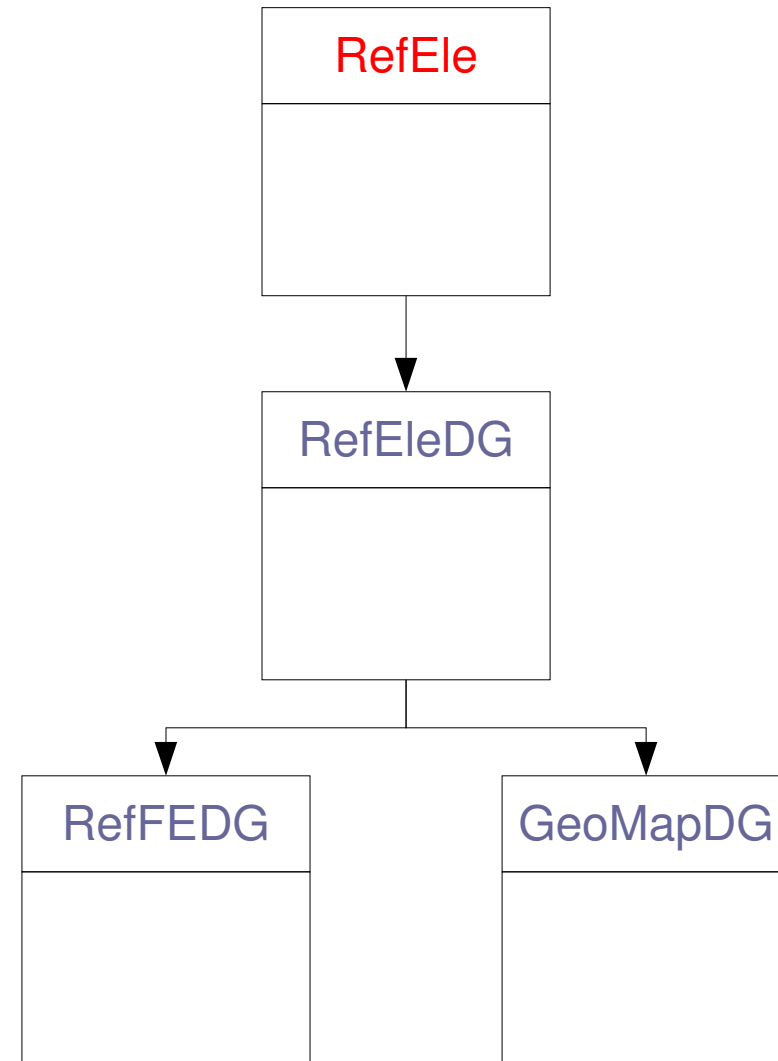
+ **weakly imposed b.c.** (simplified handling)

# RefEleDG, RefFEDG, GeoMapDG

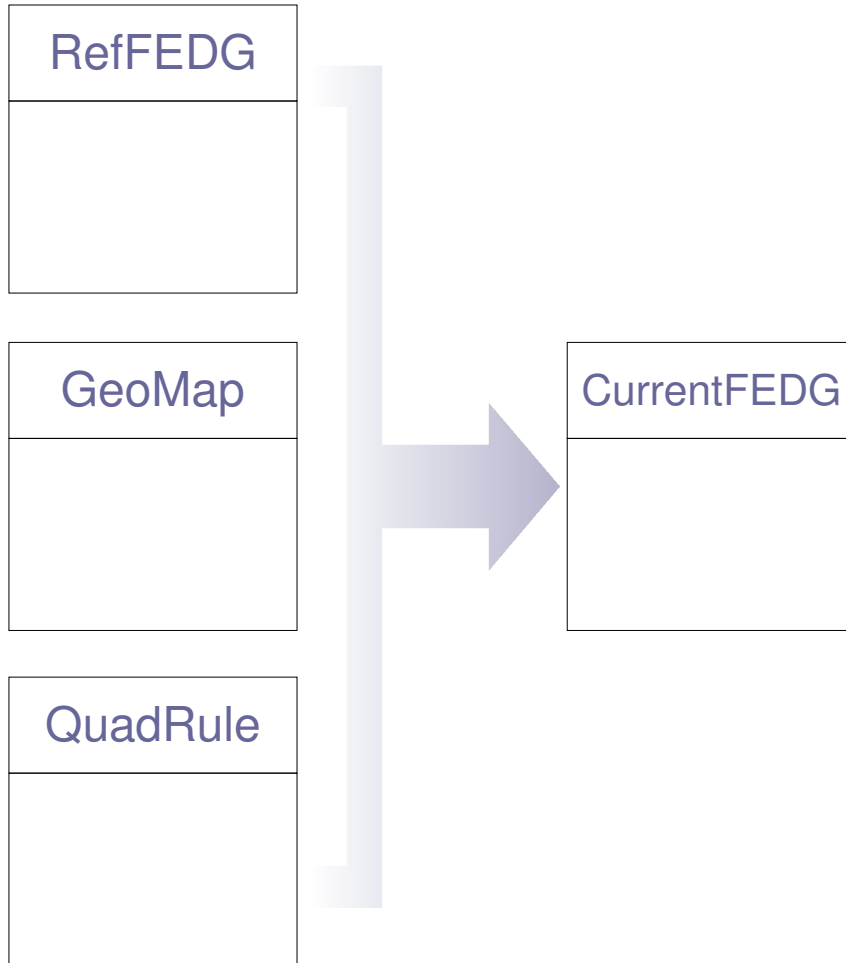


- + face mapping on element (**not only Lagrangian shape funcs**)
- + shape funcs on face quad nodes

- + pattern for volume contributions
- + pattern for boundary contributions



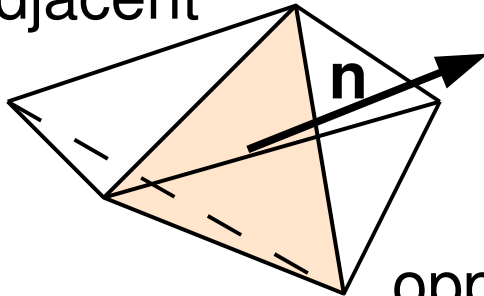
# CurrentFEDG



- Volume integration stuff
- Local mass and its inverse  
(**elliptic term handling**)

# CurrentBFDG, CurrentIFDG

adjacent



opposite

StaticBdFE

CurrentBdDG

+ adjacent element integration stuff  
+ local mass and its inverse

CurrentBFDG

CurrentIFDG

+ opposite element int. stuff  
+ local mass and its inverse  
+  $r_e$  (grad correction)

+  $r_e$  (grad correction)



# Moreover

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- `elemOper_ext.hpp`: features were added on operator templates to handle **trace operators** (dependence on two elements sharing a face)
- `assemb.hpp`: **matrix and rhs assembling** functions were added
- A **hyperbolic test case** was successfully run on an older version of LifeV and must be updated for the new version
- ...



# Todos

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- **Abstraction work on Dof/DofDG classes**
- Other **test cases** (non-linear hyperbolic, elliptic, parabolic,...)
- **Hierarchical bases** (in global coords?) for  **$p$ -adaptivity**
- Isotropic non-conforming  **$h$ -adaptivity** (adds on `RegionMesh3d` class...)
- Co-existence of element of different shape in the same mesh (again `RegionMesh3d`, `readMesh` functions, internal face generation utility,...)
- **Block MSR and CSR** (symmetric block-wise pattern w/full blocks should give faster element access)
- **“Separation” of DG-FEM** (`dg` namespace?)
- ...

