

DefElement

an encyclopedia of finite element definitions

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What is DefElement?

DefElement is an online encyclopedia of finite element definitions. You can view it at

defelement.com

DefElement includes definitions of a huge range of finite elements including commonly used elements such as Lagrange, Raviart-Thomas [6], and Nédélec [4, 5]; and more exotic elements such as Argyris [1], Regge [7, 2], and TNT [3].

What information is on DefElement?

- Name(s) of the element
- Definition and properties of the element
- Implementations of the element
- Example DOF diagrams and basis functions, with plots created using Symfem [8]
- References

All the information and diagrams on DefElement are available for reuse under a Creative Commons CC BY 4.0 license: you can use them for free as long as you link to or cite DefElement. All the diagrams are available to download in PNG, SVG, and TikZ formats.

Can I contribute to DefElement?

Yes! DefElement's source code is available on GitHub (MIT license). You can contribute by opening GitHub issues for:

- New elements that could be added to DefElement.
- Any improvements that you want to suggest.
- Any mistakes that you find.

Or, you could fork the repository and open a pull request to:

- Add implementation information for a finite element library that you use or maintain.
- Resolve any of the currently open issues: keep an eye out for anything tagged *good first issue*.
- Anything else you want to suggest changing.

Raviart-Thomas
 an encyclopedia of finite element definitions

Click here to read what the information on this page means.

ALTERNATIVE NAMES Rao-Wilton-Glisson, Nédélec (first kind) H(div)

DE RHAM COMPLEX FAMILIES $[S_{k+1}^d]_{k \geq 1} / \mathcal{P}_k^{d-1}(\Delta_d)$

ABBREVIATED NAMES RT, RWG

ORDERS $1 \leq k$

REFERENCE ELEMENTS triangle, tetrahedron

POLYNOMIAL SET $\mathcal{P}_{k-1}^d \oplus \mathcal{Z}_k^{(2d)}$
[Show polynomial set definitions ↓](#)

DOFS On each facet: normal integral moments with an order $k-1$ Lagrange space
 On the interior of the reference element: integral moments with an order $k-2$ vector Lagrange space

NUMBER OF DOFS triangle: $k(k+2)$ (A005563)
 tetrahedron: $k(k+1)(k+3)/2$ (A077414)

MAPPING contravariant Piola

CONTINUITY Components normal to facets are continuous

CATEGORIES [Vector-valued elements](#), [H\(div\) conforming elements](#)

Implementations

BASIX [basix.ElementFamily.RT](#)
[Show Basix examples ↓](#)

BEMPP "rnc" (triangle)
[Show Bempp examples ↓](#)

SYMFEM "rtdiv"
[Show Symfem examples ↓](#)

UFL "RT"
[Show UFL examples ↓](#)

Examples

TRIANGLE ORDER 1

[\(click to view basis functions\)](#)

TRIANGLE ORDER 2

[\(click to view basis functions\)](#)

TETRAHEDRON ORDER 1

[\(click to view basis functions\)](#)

TETRAHEDRON ORDER 2

[\(click to view basis functions\)](#)

References

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DefElement stats

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