FINEL

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3.1 File List

Here is a list of all files with brief descriptions:

Chapter 4

Module Documentation

4.1 mscalar Module Reference

Contains variables and subroutine related to a general scalar problem.

Functions/Subroutines

- subroutine localelem (x1, x2, n, ni, mat)

  Computes a master element contribution.

4.1.1 Detailed Description

Contains variables and subroutine related to a general scalar problem.

Author

Diego T. Volpatto

4.1.2 Function/Subroutine Documentation

4.1.2.1 localelem()

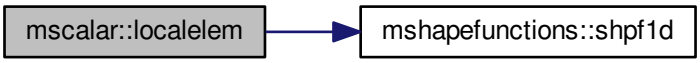
```
subroutine mscalar::localelem (
             real*8 x1,
             real*8 x2,
             integer n,
             integer ni,
             integer mat )
```

Computes a master element contribution.

Parameters

x1	Lower bound coordinate of element
x2	Upper bound coordinate of element
n	Nodal points number of element
ni	Order of integration rule
mat	Material number

Here is the call graph for this function:



4.2 mshapefunctions Module Reference

Module for shape functions computations and relate operations.

Functions/Subroutines

- subroutine setint

  Gauss quadrature data set routine.
- subroutine shpf1d (xl, n, psi, dpsi)

  Calculates the values of the shape functions and their derivatives.

Variables

- real ∗8, dimension(4, 4) xi

  Gauss point integration.
- real ∗8, dimension(4, 4) w

  Gauss weights.

4.2.1 Detailed Description

Module for shape functions computations and relate operations.

Author

Diego T. Volpatto

4.2.2 Function/Subroutine Documentation

4.2.2.1 setint()

```
subroutine mshapefunctions::setint ( )
```

Gauss quadrature data set routine.

Here is the caller graph for this function:

4.2.2.2 shpf1d()

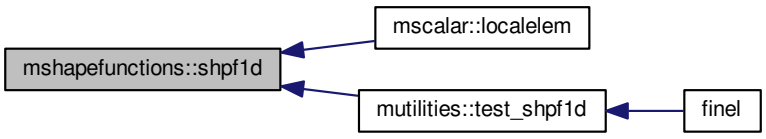
```
subroutine mshapefunctions::shpf1d (
             real*8 xl,
             integer n,
             real*8, dimension(n) psi,
             real*8, dimension(n) dpsi )
```

Calculates the values of the shape functions and their derivatives.

Parameters

xl	[in] specified value of master element coord
n	[in] number of element nodes
psi	[out] shape function values
dpsi	[out] derivatives shape functions values

Here is the caller graph for this function:



4.2.3 Variable Documentation

4.2.3.1 w

```
real*8, dimension(4,4) mshapefunctions::w
```

Gauss weights.

4.2.3.2 xi

```
real*8, dimension(4,4) mshapefunctions::xi
```

Gauss point integration.

4.3 mutilities Module Reference

Module for auxiliar routines.

Functions/Subroutines

- subroutine linspace (x1, x2, nintv, x)

  Generate points between x1 and x2 equally spaced in x(i). Same idea of numpy subroutine.
- real ∗8 function f1 (x)

  A function to test purpose.
- subroutine quad1 (n, x1, x2)

  Subroutine that computes gaussian quadrature of f1.
- subroutine test_shpf1d (n, nelem, x)

  Check if shpf1d works properly.

4.3.1 Detailed Description

Module for auxiliar routines.

Author

Diego T. Volpatto

4.3.2 Function/Subroutine Documentation

4.3.2.1 f1()

```
real*8 function mutilities::f1 (
            real*8 x )
```

A function to test purpose.

Parameters

x	input coordinate

Here is the caller graph for this function:

4.3.2.2 linspace()

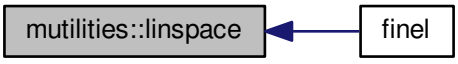
```
subroutine mutilities::linspace (
             real*8 x1,
             real*8 x2,
             integer nintv,
             real*8, dimension(:), allocatable x )
```

Generate points between x1 and x2 equally spaced in x(i). Same idea of numpy subroutine.

Parameters

x1	interval lower bound
x2	interval upper bound
nintv	num of intervals
x	vector to assemble the values

Here is the caller graph for this function:



4.3.2.3 quad1()

```
subroutine mutilities::quad1 (
             integer n,
```

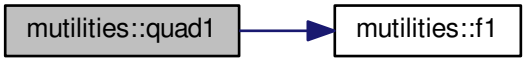
```
            real*8 x1,
            real*8 x2 )
```

Subroutine that computes gaussian quadrature of f1.

Parameters

n	quadrature order
x1	integral lower bound
x2	integral upper bound

Here is the call graph for this function:



4.3.2.4 test_shpf1d()

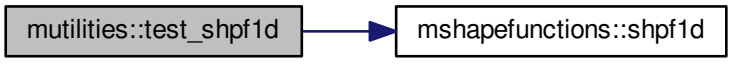
```
subroutine mutilities::test_shpf1d (
            integer n,
            integer nelem,
            real*8, dimension(nelem+1) x )
```

Check if shpf1d works properly.

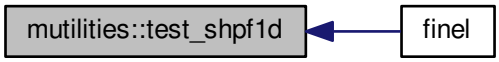
Parameters

n	element node numbers
nelem	num of discrete intervals
x	master element's coordinates

Here is the call graph for this function:



Here is the caller graph for this function:



4.4 scalarstruture Module Reference

Module that contains the data structure of a general scalar problem.

Data Types

- type scalarstructuresystem

  Variables and characteristic data for a scalar problem.

4.4.1 Detailed Description

Module that contains the data structure of a general scalar problem.

Author

Diego T. Volpatto

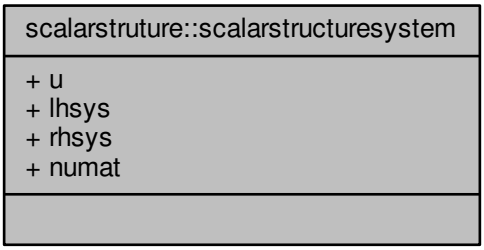
Chapter 5

Data Type Documentation

5.1 scalarstruture::scalarstructuresystem Type Reference

Variables and characteristic data for a scalar problem.

Collaboration diagram for scalarstruture::scalarstructuresystem:



Public Attributes

- real ∗8, dimension(:), allocatable u

  Solution vector.
- real ∗8, dimension(:,:), pointer lhsys =>null()

  Global left-hand system.
- real ∗8, dimension(:), pointer rhsys =>null()

  Global right-hand system.
- integer numat

  Number of materials.

5.1.1 Detailed Description

Variables and characteristic data for a scalar problem.

5.1.2 Member Data Documentation

5.1.2.1 lhsys

```
real*8, dimension(:,:), pointer scalarstruture::scalarstructuresystem::lhsys =>null()
```

Global left-hand system.

5.1.2.2 numat

```
integer scalarstruture::scalarstructuresystem::numat
```

Number of materials.

5.1.2.3 rhsys

```
real*8, dimension(:), pointer scalarstruture::scalarstructuresystem::rhsys =>null()
```

Global right-hand system.

5.1.2.4 u

```
real*8, dimension(:), allocatable scalarstruture::scalarstructuresystem::u
```

Solution vector.

The documentation for this type was generated from the following file:

- src/scalarStructure.F90

Chapter 6

File Documentation

6.1 src/driver.F90 File Reference

Functions/Subroutines

- program finel

  A FIN ELement program for general purpose problems. The present is based in the book "Finite Elements: An Introduction" wrote by Eric Becker, Graham Carey and Tinsley Oden.

6.1.1 Function/Subroutine Documentation

6.1.1.1 finel()

```
program finel ( )
```

A FIN ELement program for general purpose problems. The present is based in the book "Finite Elements: An Introduction" wrote by Eric Becker, Graham Carey and Tinsley Oden.

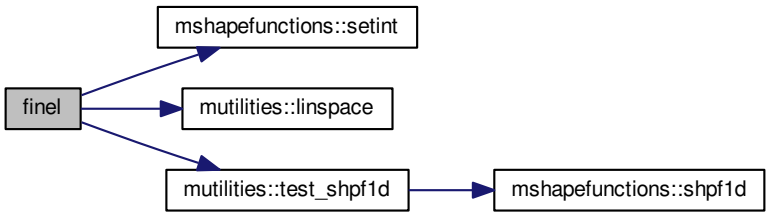
Due to the evolution of Fortran programming language, the code developed here incorporate several changes comparing to the original given in the book cited before. Modular paradigm was employed, as well a little of derived data structure.

Implementations by Diego T. Volpatto. email: volpatto@lncc.br or dtvolpatto@gmail.com

Author

Diego Tavares Volpatto

Here is the call graph for this function:



6.2 src/scalar.F90 File Reference

Modules

- module mscalar

  Contains variables and subroutine related to a general scalar problem.

Functions/Subroutines

- subroutine mscalar::localelem (x1, x2, n, ni, mat)

  Computes a master element contribution.

6.3 src/scalarStructure.F90 File Reference

Data Types

- type scalarstruture::scalarstructuresystem

  Variables and characteristic data for a scalar problem.

Modules

- module scalarstruture

  Module that contains the data structure of a general scalar problem.

6.4 src/shapeFunctions.F90 File Reference

Modules

- module mshapefunctions

  Module for shape functions computations and relate operations.

Functions/Subroutines

- subroutine mshapefunctions::setint

  Gauss quadrature data set routine.
- subroutine mshapefunctions::shpf1d (xl, n, psi, dpsi)

  Calculates the values of the shape functions and their derivatives.

Variables

- real ∗8, dimension(4, 4) mshapefunctions::xi

  Gauss point integration.
- real ∗8, dimension(4, 4) mshapefunctions::w

  Gauss weights.

6.5 src/utilities.F90 File Reference

Modules

- module mutilities

  Module for auxiliar routines.

Functions/Subroutines

- subroutine mutilities::linspace (x1, x2, nintv, x)

  Generate points between x1 and x2 equally spaced in x(i). Same idea of numpy subroutine.
- real ∗8 function mutilities::f1 (x)

  A function to test purpose.
- subroutine mutilities::quad1 (n, x1, x2)

  Subroutine that computes gaussian quadrature of f1.
- subroutine mutilities::test_shpf1d (n, nelem, x)

  Check if shpf1d works properly.

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