

FINEL

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Chapter 1

Modules Index

1.1 Modules List

Here is a list of all modules with brief descriptions:

mscalar	Contains variables and subroutine related to a general scalar problem	7
mshapefunctions	Module for shape functions computations and relate operations	8
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scalarstruture	Module that contains the data structure of a general scalar problem	13

Chapter 2

Data Type Index

2.1 Data Types List

Here are the data types with brief descriptions:

scalarstruture::scalarstructuresystem	
Variables and characteristic data for a scalar problem	15

Chapter 3

File Index

3.1 File List

Here is a list of all files with brief descriptions:

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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

<code>x1</code>	Lower bound coordinate of element
<code>x2</code>	Upper bound coordinate of element
<code>n</code>	Nodal points number of element
<code>ni</code>	Order of integration rule
<code>mat</code>	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

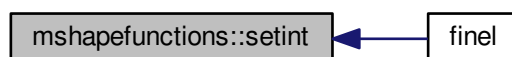
4.2.2 Function/Subroutine Documentation

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()

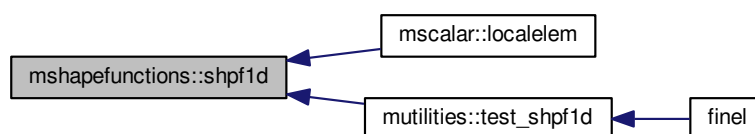
```
subroutine mshapefunctions::shpf1d (
    real*8 xl,
    integer n,
    real*8, dimension(n) psi,
    real*8, dimension(n) dpsi )
```

Calculates the values of the shape functions and their derivatives.

Parameters

<i>xl</i>	[in] specified value of master element coord
<i>n</i>	[in] number of element nodes
<i>psi</i>	[out] shape function values
<i>dpsi</i>	[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

<i>x</i>	input coordinate
----------	------------------

Here is the caller graph for this function:



4.3.2.2 linspace()

```

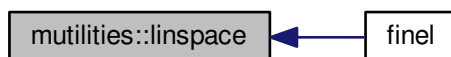
subroutine mutilities::linspace (
    real*8 x1,
    real*8 x2,
    integer nintv,
    real*8, dimension(:), allocatable x )
  
```

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

Parameters

<i>x1</i>	interval lower bound
<i>x2</i>	interval upper bound
<i>nintv</i>	num of intervals
<i>x</i>	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

<i>n</i>	quadrature order
<i>x1</i>	integral lower bound
<i>x2</i>	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.

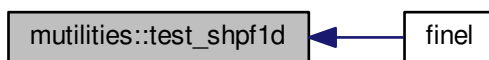
Parameters

<i>n</i>	element node numbers
<i>nelem</i>	num of discrete intervals
<i>x</i>	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:

scalarstruture::scalarstructuresystem
+ u + lhsys + rhsys + numat

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.

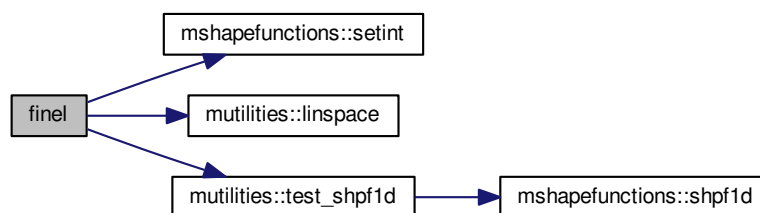
Due to the evolution of Fortran programming language, the code developed here incorporate several changes comparing to the original given in the book cited before. Modular paradigm was employed, as well a little of derived data structure.

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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