# FINEL

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## 2.1 File List

Here is a list of all files with brief descriptions:

# Chapter 3

# Module Documentation

## 3.1 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.*

### 3.1.1 Detailed Description

Module for shape functions computations and relate operations.

**Author**

Diego T. Volpatto

### 3.1.2 Function/Subroutine Documentation

#### 3.1.2.1 setint()

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

Gauss quadrature data set routine.

Here is the caller graph for this function:


#### 3.1.2.2 shpf1d()

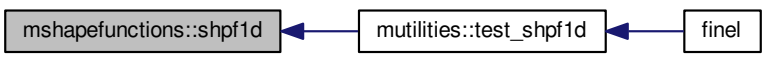
```
subroutine mshapefunctions::shpf1d (
             real*8 xl,
             integer n,
             real*8, dimension(n) psi,
             real*8, dimension(n) dpsi )
```

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:




### 3.1.3 Variable Documentation

#### 3.1.3.1 w

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

Gauss weights.

#### 3.1.3.2 xi

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

Gauss point integration.

## 3.2 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.*

### 3.2.1 Detailed Description

Module for auxiliar routines.

**Author**

Diego T. Volpatto

### 3.2.2 Function/Subroutine Documentation

#### 3.2.2.1 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:


#### 3.2.2.2 linspace()

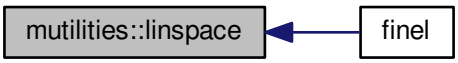
```
subroutine mutilities::linspace (
             real*8 x1,
             real*8 x2,
             integer nintv,
             real*8, dimension(:), allocatable x )
```

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:




#### 3.2.2.3 quad1()

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

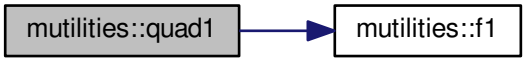
```
            real*8 x1,
            real*8 x2 )
```

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:




#### 3.2.2.4 test_shpf1d()

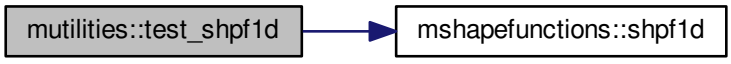
```
subroutine mutilities::test_shpf1d (
            integer n,
            integer nelem,
            real*8, dimension(nelem+1) x )
```

Check if shpf1d works properly.

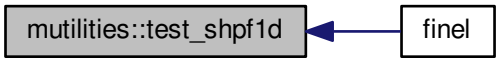
**Parameters**

| | |
|---|---|
| *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:



# Chapter 4

# File Documentation

## 4.1 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.*

### 4.1.1 Function/Subroutine Documentation

#### 4.1.1.1 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.

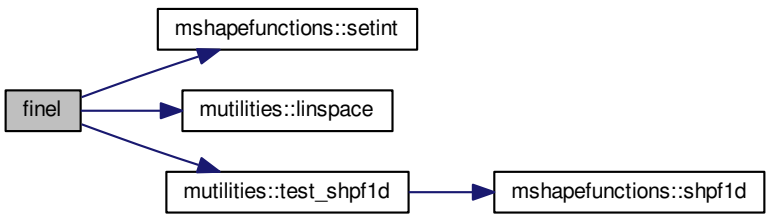
Due to the evolution of Fortran programming language, the code developed here incorporate several changes comparing to the original given in the book cited before. Modular paradigm was employed, as well a little of derived data structure.

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:



## 4.2 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.*

## 4.3 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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