MSDscript

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Chapter 1

Hierarchical Index

1.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 2

Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

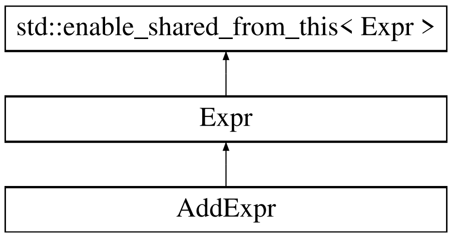
Chapter 3

Class Documentation

3.1 AddExpr Class Reference

```
#include <Expr.hpp>
```

Inheritance diagram for AddExpr:



Public Member Functions

- AddExpr (std::shared_ptr< Expr > lhs, std::shared_ptr< Expr > rhs)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- std::shared_ptr< Expr > **lhs**
- std::shared_ptr< Expr > **rhs**

3.1.1 Detailed Description

The `AddExpr` class is used to represent the addition of two separate Expr's.

3.1.2 Constructor & Destructor Documentation

3.1.2.1 AddExpr()

```
AddExpr::AddExpr (
            std::shared_ptr< Expr > lhs,
            std::shared_ptr< Expr > rhs )
```

Construct an AddExpr from two Expr's.

Parameters

lhs	left hand side Expr.
rhs	right hand side Expr.

3.1.3 Member Function Documentation

3.1.3.1 contains_var()

```
bool AddExpr::contains_var ( ) [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.1.3.2 equals()

```
bool AddExpr::equals (
            std::shared_ptr< Expr > e ) [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.1.3.3 expr_print()

```
std::string AddExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.1.3.4 interp()

```
std::shared_ptr< Val > AddExpr::interp (
            std::shared_ptr< Env > env )  [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.1.3.5 optimize()

```
std::shared_ptr< Expr > AddExpr::optimize ( )  [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

Implements Expr.

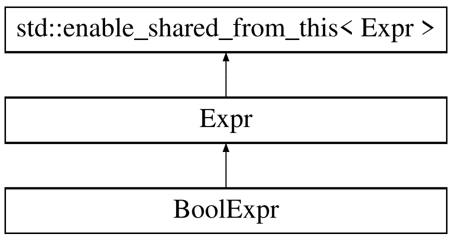
The documentation for this class was generated from the following file:

- Expr.hpp

3.2 BoolExpr Class Reference

`#include <Expr.hpp>`

Inheritance diagram for BoolExpr:



Public Member Functions

- BoolExpr (bool rep)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- bool **rep**

3.2.1 Detailed Description

The `BoolExpr` class is used to represent a boolean as an Expr.

3.2.2 Constructor & Destructor Documentation

3.2.2.1 BoolExpr()

```
BoolExpr::BoolExpr (
            bool rep )
```

Construct a BoolExpr from a bool.

Parameters

rep	bool to be represented by this BoolExpr.

3.2.3 Member Function Documentation

3.2.3.1 contains_var()

```
bool BoolExpr::contains_var ( )  [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.2.3.2 equals()

```
bool BoolExpr::equals (
            std::shared_ptr< Expr > e )  [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.2.3.3 expr_print()

```
std::string BoolExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.2.3.4 interp()

```
std::shared_ptr< Val > BoolExpr::interp (
            std::shared_ptr< Env > env )  [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.2.3.5 optimize()

```
std::shared_ptr< Expr > BoolExpr::optimize ( )  [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

Implements Expr.

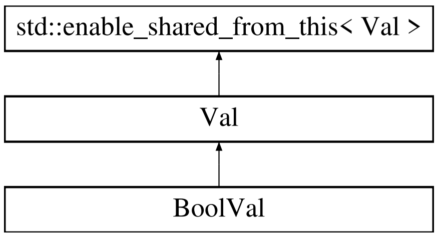
The documentation for this class was generated from the following file:

- Expr.hpp

3.3 BoolVal Class Reference

```
#include <value.hpp>
```

Inheritance diagram for BoolVal:



Public Member Functions

- BoolVal (bool rep)

Public Attributes

- bool **rep**

3.3.1 Detailed Description

Stores a bool. Can be returned from the `interp()` method of an Expr. The actual bool can be accessed via the `rep` member variable.

3.3.2 Constructor & Destructor Documentation

3.3.2.1 BoolVal()

```
BoolVal::BoolVal (
            bool rep )
```

Constructs a BoolVal with the provided bool.

Parameters

rep	bool to be stored in BoolVal.

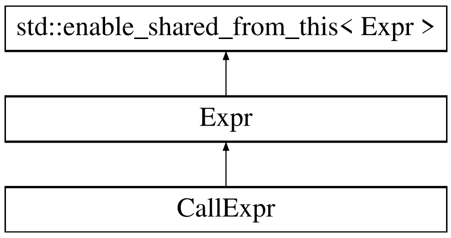
The documentation for this class was generated from the following file:

- value.hpp

3.4 CallExpr Class Reference

```
#include <Expr.hpp>
```

Inheritance diagram for CallExpr:



Public Member Functions

- CallExpr (std::shared_ptr< Expr > to_be_called, std::shared_ptr< Expr > actual_argument)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- std::shared_ptr< Expr > **to_be_called**
- std::shared_ptr< Expr > **actual_argument**

3.4.1 Detailed Description

The `CallExpr` class is used to represent the calling of one Expr and passing in another Expr. This class is useful when paired with the `FunExpr` class.

3.4.2 Constructor & Destructor Documentation

3.4.2.1 CallExpr()

```
CallExpr::CallExpr (
            std::shared_ptr< Expr > to_be_called,
            std::shared_ptr< Expr > actual_argument )
```

Construct a CallExpr with two Expr's.

Parameters

to_be_called	Expr
actual_argument	Expr

3.4.3 Member Function Documentation

3.4.3.1 contains_var()

```
bool CallExpr::contains_var ( )  [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.4.3.2 equals()

```
bool CallExpr::equals (
            std::shared_ptr< Expr > e )  [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.4.3.3 expr_print()

```
std::string CallExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.4.3.4 interp()

```
std::shared_ptr< Val > CallExpr::interp (
             std::shared_ptr< Env > env )  [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.4.3.5 optimize()

```
std::shared_ptr< Expr > CallExpr::optimize ( )  [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

Implements Expr.

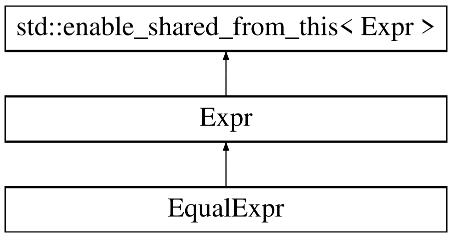
The documentation for this class was generated from the following file:

- Expr.hpp

3.5 EqualExpr Class Reference

```
#include <Expr.hpp>
```

Inheritance diagram for EqualExpr:



Public Member Functions

- EqualExpr (std::shared_ptr< Expr > lhs, std::shared_ptr< Expr > rhs)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- std::shared_ptr< Expr > **rhs**
- std::shared_ptr< Expr > **lhs**

3.5.1 Detailed Description

The `EqualExpr` class is used to represent a comparison of two Expr's to determine equality.

3.5.2 Constructor & Destructor Documentation

3.5.2.1 EqualExpr()

```
EqualExpr::EqualExpr (
            std::shared_ptr< Expr > lhs,
            std::shared_ptr< Expr > rhs )
```

Construct an EqualExpr with two Expr's.

Parameters

lhs	left hand side Expr.
rhs	right hand side Expr.

3.5.3 Member Function Documentation

3.5.3.1 contains_var()

```
bool EqualExpr::contains_var ( )  [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.5.3.2 equals()

```
bool EqualExpr::equals (
            std::shared_ptr< Expr > e )  [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.5.3.3 expr_print()

```
std::string EqualExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.5.3.4 interp()

```
std::shared_ptr< Val > EqualExpr::interp (
            std::shared_ptr< Env > env ) [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.5.3.5 optimize()

```
std::shared_ptr< Expr > EqualExpr::optimize ( ) [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

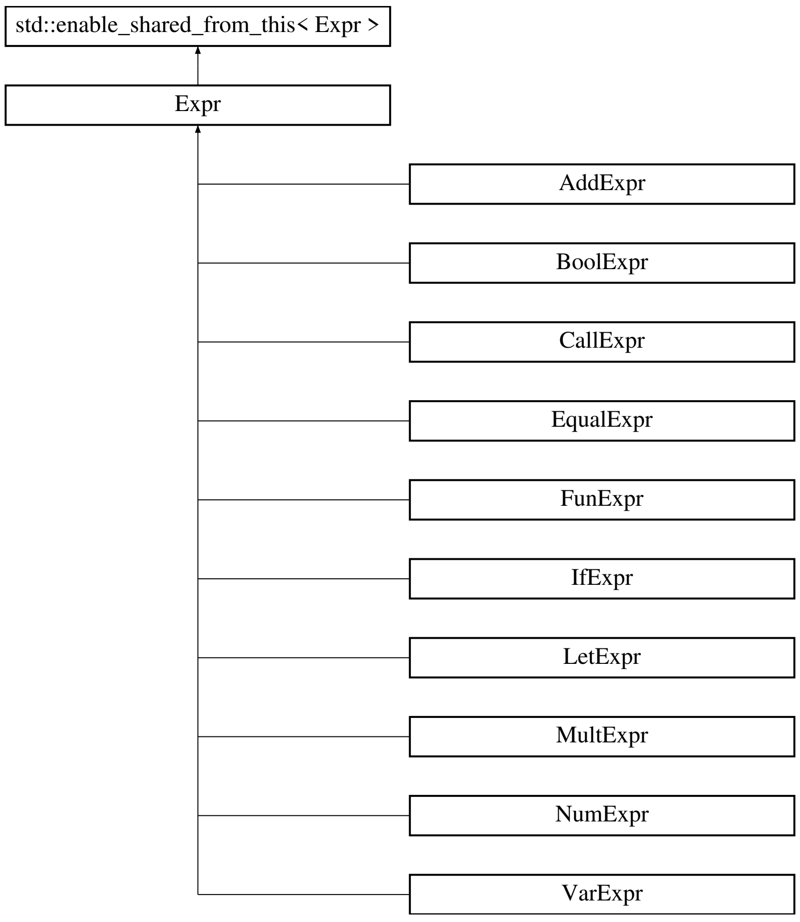
Implements Expr.

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

- Expr.hpp

3.6 Expr Class Reference

Inheritance diagram for Expr:



Public Member Functions

- virtual bool **equals** (std::shared_ptr< Expr > e)=0
- virtual std::shared_ptr< Val > **interp** (std::shared_ptr< Env > env)=0
- virtual bool **contains_var** ()=0
- virtual std::shared_ptr< Expr > **optimize** ()=0
- virtual std::string **expr_print** ()=0

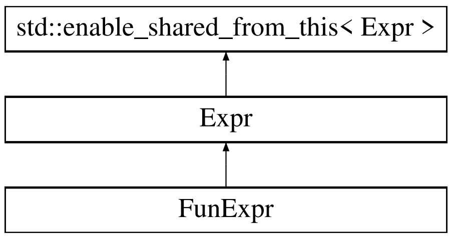
The documentation for this class was generated from the following file:

- Expr.hpp

3.7 FunExpr Class Reference

```
#include <Expr.hpp>
```

Inheritance diagram for FunExpr:



Public Member Functions

- FunExpr (std::string formal_arg, std::shared_ptr< Expr > actual_arg)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- std::string **formal_arg**
- std::shared_ptr< Expr > **actual_arg**

3.7.1 Detailed Description

The `FunExpr` class is used to represent user defined functions. This class can be used in conjunction with the `CallExpr` class to implement function calls.

3.7.2 Constructor & Destructor Documentation

3.7.2.1 FunExpr()

```
FunExpr::FunExpr (
             std::string formal_arg,
             std::shared_ptr< Expr > actual_arg )
```

Construct a FunExpr with the formal_arg represented by a string and the actual_arg represented by an Expr.

Parameters

formal_arg	string
actual_arg	Expr representing the body of the FunExpr.

3.7.3 Member Function Documentation

3.7.3.1 contains_var()

```
bool FunExpr::contains_var ( ) [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.7.3.2 equals()

```
bool FunExpr::equals (
            std::shared_ptr< Expr > e )  [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.7.3.3 expr_print()

```
std::string FunExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.7.3.4 interp()

```
std::shared_ptr< Val > FunExpr::interp (
            std::shared_ptr< Env > env )  [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.7.3.5 optimize()

```
std::shared_ptr< Expr > FunExpr::optimize ( )  [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

Implements Expr.

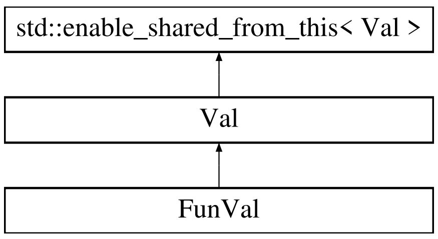
The documentation for this class was generated from the following file:

- Expr.hpp

3.8 FunVal Class Reference

```
#include <value.hpp>
```

Inheritance diagram for FunVal:



Public Member Functions

- FunVal (std::string formal_arg, std::shared_ptr< Expr > body, std::shared_ptr< Env > env)

Public Attributes

- std::string **formal_arg**
- std::shared_ptr< Expr > **body**
- std::shared_ptr< Env > **env**

3.8.1 Detailed Description

Stores the components of a function. Can be returned from the `interp()` method of an Expr.

3.8.2 Constructor & Destructor Documentation

3.8.2.1 FunVal()

```
FunVal::FunVal (
            std::string formal_arg,
            std::shared_ptr< Expr > body,
            std::shared_ptr< Env > env )
```

Constructs a FunVal from a string formal_arg, Expr body, and Env env.

Parameters

formal_arg	string representing the formal_arg.
body	Expr representing the actual function.
env	Env to pass along into the FunVal.

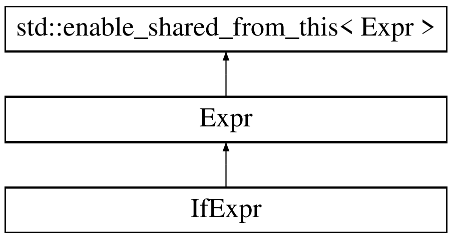
The documentation for this class was generated from the following file:

- value.hpp

3.9 IfExpr Class Reference

`#include <Expr.hpp>`

Inheritance diagram for IfExpr:



Public Member Functions

- IfExpr (std::shared_ptr< Expr > test_part, std::shared_ptr< Expr > then_part, std::shared_ptr< Expr > else_part)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- std::shared_ptr< Expr > **test_part**
- std::shared_ptr< Expr > **then_part**
- std::shared_ptr< Expr > **else_part**

3.9.1 Detailed Description

The `IfExpr` class is used to represent an if else then statement.

3.9.2 Constructor & Destructor Documentation

3.9.2.1 IfExpr()

```
IfExpr::IfExpr (
            std::shared_ptr< Expr > test_part,
            std::shared_ptr< Expr > then_part,
            std::shared_ptr< Expr > else_part )
```

Construct an IfExpr consisting of three Expr's: test_part, then_part, and else_part.

Parameters

test_part	Expr that when evaluated determines if then_part or else_part is evaluated.
then_part	Expr that can be evaluated if test_part is true.
else_part	Expr that can be evaluated if else_part is true.

3.9.3 Member Function Documentation

3.9.3.1 contains_var()

```
bool IfExpr::contains_var ( )  [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.9.3.2 equals()

```
bool IfExpr::equals (
            std::shared_ptr< Expr > e )  [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.9.3.3 expr_print()

```
std::string IfExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.9.3.4 interp()

```
std::shared_ptr< Val > IfExpr::interp (
            std::shared_ptr< Env > env )  [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.9.3.5 optimize()

```
std::shared_ptr< Expr > IfExpr::optimize ( )  [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

Implements Expr.

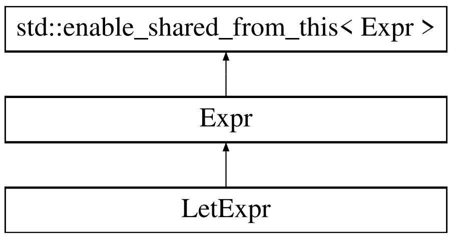
The documentation for this class was generated from the following file:

- Expr.hpp

3.10 LetExpr Class Reference

```
#include <Expr.hpp>
```

Inheritance diagram for LetExpr:



Public Member Functions

- LetExpr (std::string name, std::shared_ptr< Expr > var_val, std::shared_ptr< Expr > in_expr)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- std::string **name**
- std::shared_ptr< Expr > **var_val**
- std::shared_ptr< Expr > **in_expr**

3.10.1 Detailed Description

The `LetExpr` class is used to assign an Expr to a variable within another Expr. For example, _let x = 5 _in x + 1

3.10.2 Constructor & Destructor Documentation

3.10.2.1 LetExpr()

```
LetExpr::LetExpr (
            std::string name,
            std::shared_ptr< Expr > var_val,
            std::shared_ptr< Expr > in_expr )
```

Construct an LetExpr using a string to represent the variable, an Expr representing the value of that variable, and another Expr representing the body of the LetExpr.

Parameters

name	string representing the variable.
var_val	Expr representing the value of variable.
in_expr	Expr representing the body of the LetExpr.

3.10.3 Member Function Documentation

3.10.3.1 contains_var()

```
bool LetExpr::contains_var ( )  [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.10.3.2 equals()

```
bool LetExpr::equals (
            std::shared_ptr< Expr > e )  [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.10.3.3 expr_print()

```
std::string LetExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.10.3.4 interp()

```
std::shared_ptr< Val > LetExpr::interp (
            std::shared_ptr< Env > env )  [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.10.3.5 optimize()

```
std::shared_ptr< Expr > LetExpr::optimize ( ) [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

Implements Expr.

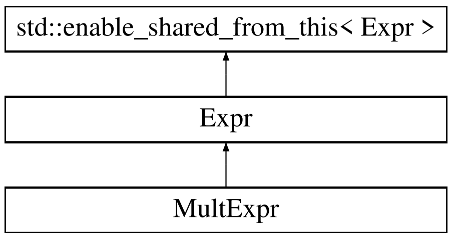
The documentation for this class was generated from the following file:

- Expr.hpp

3.11 MultExpr Class Reference

```
#include <Expr.hpp>
```

Inheritance diagram for MultExpr:



Public Member Functions

- MultExpr (std::shared_ptr< Expr > lhs, std::shared_ptr< Expr > rhs)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- std::shared_ptr< Expr > **lhs**
- std::shared_ptr< Expr > **rhs**

3.11.1 Detailed Description

The `MultExpr` class is used to represent the multiplication of two separate Expr's.

3.11.2 Constructor & Destructor Documentation

3.11.2.1 MultExpr()

```
MultExpr::MultExpr (
            std::shared_ptr< Expr > lhs,
            std::shared_ptr< Expr > rhs )
```

Construct an MultExpr from two Expr's.

Parameters

lhs	left hand side Expr.
rhs	right hand side Expr.

3.11.3 Member Function Documentation

3.11.3.1 contains_var()

```
bool MultExpr::contains_var ( ) [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.11.3.2 equals()

```
bool MultExpr::equals (
            std::shared_ptr< Expr > e ) [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.11.3.3 expr_print()

```
std::string MultExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.11.3.4 interp()

```
std::shared_ptr< Val > MultExpr::interp (
             std::shared_ptr< Env > env )  [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.11.3.5 optimize()

```
std::shared_ptr< Expr > MultExpr::optimize ( ) [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

Implements Expr.

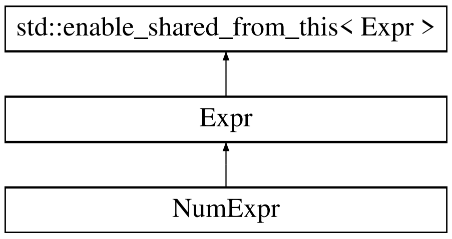
The documentation for this class was generated from the following file:

- Expr.hpp

3.12 NumExpr Class Reference

`#include <Expr.hpp>`

Inheritance diagram for NumExpr:



Public Member Functions

- NumExpr (int rep)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- int **rep**
- std::shared_ptr< Val > **val**

3.12.1 Detailed Description

The `NumExpr` class represents an integer as an Expr.

3.12.2 Constructor & Destructor Documentation

3.12.2.1 NumExpr()

```
NumExpr::NumExpr (
             int rep )
```

Construct a NumExpr from an int.

Parameters

rep	int to be represented by this NumExpr.

3.12.3 Member Function Documentation

3.12.3.1 contains_var()

```
bool NumExpr::contains_var ( ) [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.12.3.2 equals()

```
bool NumExpr::equals (
             std::shared_ptr< Expr > e ) [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.12.3.3 expr_print()

```
std::string NumExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.12.3.4 interp()

```
std::shared_ptr< Val > NumExpr::interp (
            std::shared_ptr< Env > env )  [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.12.3.5 optimize()

```
std::shared_ptr< Expr > NumExpr::optimize ( )  [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

Implements Expr.

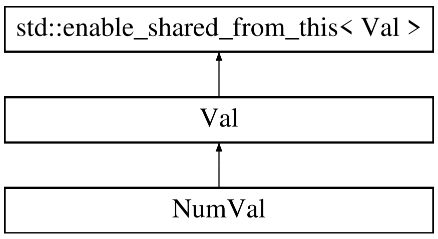
The documentation for this class was generated from the following file:

- Expr.hpp

3.13 NumVal Class Reference

`#include <value.hpp>`

Inheritance diagram for NumVal:



Public Member Functions

- NumVal (int rep)

Public Attributes

- int **rep**

3.13.1 Detailed Description

Stores an int. Can be returned from the `interp()` method of an Expr. The actual int can be accessed via the `rep` member variable.

3.13.2 Constructor & Destructor Documentation

3.13.2.1 NumVal()

```
NumVal::NumVal (
            int rep )
```

Constructs a NumVal with the provided int.

Parameters

rep	int to be stored in NumVal.

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

- value.hpp

3.14 Step Class Reference

```
#include <Step.hpp>
```

Static Public Member Functions

- static std::shared_ptr< Val > interp_by_steps (std::shared_ptr< Expr > e)

3.14.1 Detailed Description

The `Step` introduces the static method `interp_by_steps`.

3.14.2 Member Function Documentation

3.14.2.1 interp_by_steps()

```
static std::shared_ptr< Val > Step::interp_by_steps (
            std::shared_ptr< Expr > e ) [static]
```

Evaluates the Expr and returns a Val. Differs from the standard interp as this method allows the solving of deeply recursive functions without causing a stack overflow. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

e	Expr to be evaluated.

Returns

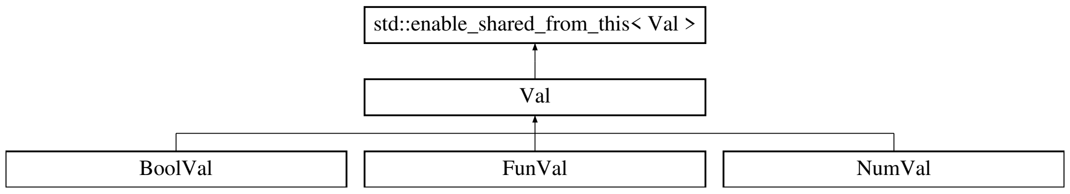
Val representing the Expr solution or a semantically equivalent value.

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

- Step.hpp

3.15 Val Class Reference

Inheritance diagram for Val:



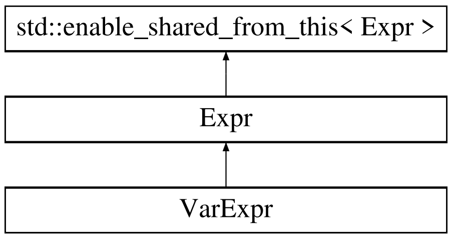
The documentation for this class was generated from the following file:

- value.hpp

3.16 VarExpr Class Reference

```
#include <Expr.hpp>
```

Inheritance diagram for VarExpr:



Public Member Functions

- VarExpr (std::string val)
- bool equals (std::shared_ptr< Expr > e)
- std::shared_ptr< Val > interp (std::shared_ptr< Env > env)
- bool contains_var ()
- std::shared_ptr< Expr > optimize ()
- std::string expr_print ()

Public Attributes

- std::string **name**

3.16.1 Detailed Description

The `VarExpr` class represents a variable as an Expr.

3.16.2 Constructor & Destructor Documentation

3.16.2.1 VarExpr()

```
VarExpr::VarExpr (
             std::string val )
```

Construct a VarExpr from an string.

Parameters

val	string variable.

3.16.3 Member Function Documentation

3.16.3.1 contains_var()

```
bool VarExpr::contains_var ( )  [virtual]
```

Determines if this Expr contains a variable and returns a boolean.

Returns

true if Expr contains variable, false otherwise.

Implements Expr.

3.16.3.2 equals()

```
bool VarExpr::equals (
             std::shared_ptr< Expr > e )  [virtual]
```

Return boolean specifying if this Expr is equal to the Expr passed in as parameter e.

Parameters

e	Expr to compare.

Returns

true if expressions are equal, false otherwise.

Implements Expr.

3.16.3.3 expr_print()

```
std::string VarExpr::expr_print ( )  [virtual]
```

Returns the Expr in a human readable string.

Returns

String of the Expr.

Implements Expr.

3.16.3.4 interp()

```
std::shared_ptr< Val > VarExpr::interp (
            std::shared_ptr< Env > env )  [virtual]
```

Evaluates the Expr and returns a Val. Takes an Env as parameter e. /exception If the evaluation reaches a free variable, an error will be thrown.

Parameters

env	

Returns

Val representing the Expr solution or a semantically equivalent value.

Implements Expr.

3.16.3.5 optimize()

```
std::shared_ptr< Expr > VarExpr::optimize ( )  [virtual]
```

Evaluates the Expr and returns a semantically equivalent Expr that is no larger than the input Expr. Unlike the `interp` method, `optimize` will not throw an error if the evaluations reaches a free variable.

Returns

Expr representing the most optimized solution or a semantically equivalent Expr.

Implements Expr.

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

- Expr.hpp

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