MSDScript

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Chapter 1

MSDScript

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Chapter 2

Hierarchical Index

2.1 Class Hierarchy

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

Chapter 3

Class Index

3.1 Class List

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

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

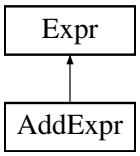
Chapter 5

Class Documentation

5.1 AddExpr Class Reference

`#include <expr.h>`

Inheritance diagram for AddExpr:



Public Member Functions

- AddExpr (Expr *lhs, Expr *rhs)
- bool equals (Expr *e)
- int interp ()
- bool has_variable ()
- Expr * subst (std::string s, Expr *e)
- void print (std::ostream &ot)
- void pretty_print (std::ostream &ot)

Public Member Functions inherited from Expr

- virtual bool equals (Expr *e)=0
- virtual int interp ()=0
- virtual bool has_variable ()=0
- virtual Expr * subst (std::string s, Expr *e)=0
- virtual void print (std::ostream &ot)=0
- std::string to_string ()
- virtual void pretty_print (std::ostream &ot)=0
- std::string pretty_to_string ()
- std::string pretty_print_at (precedence_t p)

Public Attributes

- Expr * lhs
- Expr * rhs

Additional Inherited Members

Public Types inherited from Expr

- enum precedence_t { prec_none , prec_add , prec_mult }

5.1.1 Constructor & Destructor Documentation

5.1.1.1 AddExpr()

```
AddExpr::AddExpr (
            Expr * lhs,
            Expr * rhs )
```

constructor

Parameters

lhs	left hand side expression
rhs	right hand side expression

5.1.2 Member Function Documentation

5.1.2.1 equals()

```
bool AddExpr::equals (
            Expr * e )  [virtual]
```

if input Expr is a Add and the lhs and rhs equal

Parameters

e	input expression for comparing

Returns

true if e is AddExpr and e->lhs equals to this->lhs and e->rhs equals this->rhs, otherwise false

Implements Expr.

5.1.2.2 has_variable()

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

the add expression may contains a variable

Returns

true if AddExpr contains a variable, otherwise false

Implements Expr.

5.1.2.3 interp()

```
int AddExpr::interp ( )  [virtual]
```

returns an int for the value of an addition expression is the sum of the subexpression values

Returns

int

Implements Expr.

5.1.2.4 pretty_print()

```
void AddExpr::pretty_print (
            std::ostream & ot )  [virtual]
```

includes a space around + or ∗, and it avoids unnecessary parentheses by relying the usual precedence rules for multiplication and addition by assuming that operators associate to the right

Parameters

ot	ostream

Implements Expr.

5.1.2.5 print()

```
void AddExpr::print (
            std::ostream & ot )  [virtual]
```

addition expressions with an infix +

Parameters

ot	ostream

Implements Expr.

5.1.2.6 subst()

```
Expr * AddExpr::subst (
            std::string s,
            Expr * e )  [virtual]
```

everywhere that the expression (whose subst method is called) contains a variable matching the string, the result Expr∗ should have the given replacement, instead.

Parameters

s	a std::string is substituted
e	a new expression

Returns

Expr

Implements Expr.

5.1.3 Member Data Documentation

5.1.3.1 lhs

```
Expr* AddExpr::lhs
```

5.1.3.2 rhs

```
Expr* AddExpr::rhs
```

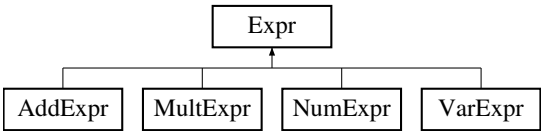
The documentation for this class was generated from the following files:

- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.h
- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.cpp

5.2 Expr Class Reference

```
#include <expr.h>
```

Inheritance diagram for Expr:



Public Types

- enum precedence_t { prec_none , prec_add , prec_mult }

Public Member Functions

- virtual bool equals (Expr *e)=0
- virtual int interp ()=0
- virtual bool has_variable ()=0
- virtual Expr * subst (std::string s, Expr *e)=0
- virtual void print (std::ostream &ot)=0
- std::string to_string ()
- virtual void pretty_print (std::ostream &ot)=0
- std::string pretty_to_string ()
- std::string pretty_print_at (precedence_t p)

5.2.1 Member Enumeration Documentation

5.2.1.1 precedence_t

```
enum Expr::precedence_t
```

Enumerator

prec_none	
prec_add	
prec_mult	

5.2.2 Member Function Documentation

5.2.2.1 equals()

```
virtual bool Expr::equals (
            Expr * e )  [pure virtual]
```

compare two expressions for equality

Parameters

e	input expression for comparing

Returns

true if two expressions equal, false otherwise

Implemented in NumExpr, AddExpr, MultExpr, and VarExpr.

5.2.2.2 has_variable()

```
virtual bool Expr::has_variable ( )  [pure virtual]
```

is the expression a variable or contains a variable

Returns

true if the expression is a variable or contains a variable, false otherwise

Implemented in NumExpr, AddExpr, MultExpr, and VarExpr.

5.2.2.3 interp()

```
virtual int Expr::interp ( )  [pure virtual]
```

returns an integer for the value of an expression

Returns

int

Implemented in NumExpr, AddExpr, MultExpr, and VarExpr.

5.2.2.4 pretty_print()

```
virtual void Expr::pretty_print (
            std::ostream & ot )  [pure virtual]
```

virtual pretty_print: likes print, print the expression. unlike print, pretty_print includes a space around + or $*$, and it avoids unnecessary parentheses by relying the usual precedence rules for multiplication and addition. It can also avoid parentheses by assuming that operators associate to the right

Parameters

ot	ostream

Implemented in NumExpr, AddExpr, MultExpr, and VarExpr.

5.2.2.5 pretty_print_at()

```
std::string Expr::pretty_print_at (
            precedence_t p )
```

helper function for pretty print

Parameters

p	precedence type

Returns

string, how the expression print

5.2.2.6 pretty_to_string()

```
std::string Expr::pretty_to_string ( )
```

for pretty_print, should be implemented in all sub classes and should call the print method

Returns

st.str() string gonna be printed

5.2.2.7 print()

```
virtual void Expr::print (
            std::ostream & ot )  [pure virtual]
```

print the expression

Parameters

ot	ostream

Implemented in NumExpr, AddExpr, MultExpr, and VarExpr.

5.2.2.8 subst()

```
virtual Expr * Expr::subst (
            std::string s,
            Expr * e )  [pure virtual]
```

everywhere that the expression (whose subst method is called) contains a variable matching the string, the result Expr* should have the given replacement, instead.

Parameters

s	a std::string is substituted
e	a new expression

Returns

Expr

Implemented in NumExpr, AddExpr, MultExpr, and VarExpr.

5.2.2.9 to_string()

```
std::string Expr::to_string ( )
```

should be implemented in all sub classes and should call the print method

Returns

st.str(), the string gonna be printed

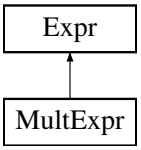
The documentation for this class was generated from the following files:

- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.h
- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.cpp

5.3 MultExpr Class Reference

```
#include <expr.h>
```

Inheritance diagram for MultExpr:



Public Member Functions

- MultExpr (Expr *lhs, Expr *rhs)
- bool equals (Expr *e)
- int interp ()
- bool has_variable ()
- Expr * subst (std::string s, Expr *e)
- void print (std::ostream &ot)
- void pretty_print (std::ostream &ot)

Public Member Functions inherited from Expr

- virtual bool equals (Expr *e)=0
- virtual int interp ()=0
- virtual bool has_variable ()=0
- virtual Expr * subst (std::string s, Expr *e)=0
- virtual void print (std::ostream &ot)=0
- std::string to_string ()
- virtual void pretty_print (std::ostream &ot)=0
- std::string pretty_to_string ()
- std::string pretty_print_at (precedence_t p)

Public Attributes

- Expr * lhs
- Expr * rhs

Additional Inherited Members

Public Types inherited from Expr

- enum precedence_t { prec_none , prec_add , prec_mult }

5.3.1 Constructor & Destructor Documentation

5.3.1.1 MultExpr()

```
MultExpr::MultExpr (
            Expr * lhs,
            Expr * rhs )
```

constructor

Parameters

lhs	left hand side expression
rhs	right hand side expression

5.3.2 Member Function Documentation

5.3.2.1 equals()

```
bool MultExpr::equals (
            Expr * e )  [virtual]
```

if input Expr is a Mult and the lhs and rhs equal

Parameters

e	input expression for comparing

Returns

true if e is MultExpr and e->lhs equals to this->lhs and e->rhs equals this->rhs, otherwise false

Implements Expr.

5.3.2.2 has_variable()

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

the mult expression may contains a variable

Returns

ture if MultExpr contains a variable, otherwise flase

Implements Expr.

5.3.2.3 interp()

```
int MultExpr::interp ( )  [virtual]
```

returns an int for the value of a multiplication expression is the product of the subexpression values

Returns

int

Implements Expr.

5.3.2.4 pretty_print()

```
void MultExpr::pretty_print (
            std::ostream & ot )  [virtual]
```

includes a space around + or $*$, and it avoids unnecessary parentheses, by relying the usual precedence rules for multiplication and addition, by assuming that operators associate to the right

Parameters

ot	ostream

Implements Expr.

5.3.2.5 print()

```
void MultExpr::print (
            std::ostream & ot )  [virtual]
```

multiplication expressions with an infix ∗

Parameters

ot	ostream

Implements Expr.

5.3.2.6 subst()

```
Expr * MultExpr::subst (
            std::string s,
            Expr * e )  [virtual]
```

MultExpr subst: everywhere that the expression (whose subst method is called) contains a variable matching the string, the result Expr∗ should have the given replacement, instead.

Parameters

s	a std::string is substituted
e	a new expression

Returns

Expr

Implements Expr.

5.3.3 Member Data Documentation

5.3.3.1 lhs

```
Expr* MultExpr::lhs
```

5.3.3.2 rhs

```
Expr* MultExpr::rhs
```

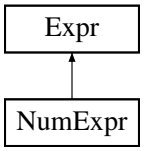
The documentation for this class was generated from the following files:

- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.h
- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.cpp

5.4 NumExpr Class Reference

```
#include <expr.h>
```

Inheritance diagram for NumExpr:



Public Member Functions

- NumExpr (int val)
- bool equals (Expr *e)
- int interp ()
- bool has_variable ()
- Expr * subst (std::string s, Expr *e)
- void print (std::ostream &ot)
- void pretty_print (std::ostream &ot)

Public Member Functions inherited from Expr

- virtual bool equals (Expr *e)=0
- virtual int interp ()=0
- virtual bool has_variable ()=0
- virtual Expr * subst (std::string s, Expr *e)=0
- virtual void print (std::ostream &ot)=0
- std::string to_string ()
- virtual void pretty_print (std::ostream &ot)=0
- std::string pretty_to_string ()
- std::string pretty_print_at (precedence_t p)

Public Attributes

- int val

Additional Inherited Members

Public Types inherited from Expr

- enum precedence_t { prec_none , prec_add , prec_mult }

5.4.1 Constructor & Destructor Documentation

5.4.1.1 NumExpr()

```
NumExpr::NumExpr (
            int val )
```

constructor

Parameters

val	int val

5.4.2 Member Function Documentation

5.4.2.1 equals()

```
bool NumExpr::equals (
            Expr * e )  [virtual]
```

if input Expr is a Num and the val equal

Parameters

e	input expression for comparing

Returns

true if e is NumExpr and e->val equals to this->val, false otherwise

Implements Expr.

5.4.2.2 has_variable()

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

the number expression is not contains a variable

Returns

false

Implements Expr.

5.4.2.3 interp()

```
int NumExpr::interp ( )  [virtual]
```

returns an int for the value of a number is the number

Returns

int

Implements Expr.

5.4.2.4 pretty_print()

```
void NumExpr::pretty_print (
            std::ostream & ot )  [virtual]
```

the val of NumExpr expression

Parameters

ot	ostream

Implements Expr.

5.4.2.5 print()

```
void NumExpr::print (
            std::ostream & ot )  [virtual]
```

the val of NumExpr expression

Parameters

ot	ostream

Implements Expr.

5.4.2.6 subst()

```
Expr * NumExpr::subst (
            std::string s,
            Expr * e )  [virtual]
```

everywhere that the expression (whose subst method is called) contains a variable matching the string, the result Expr∗ should have the given replacement, instead.

Parameters

s	a std::string is substituted
e	a new expression

Returns

Expr

Implements Expr.

5.4.3 Member Data Documentation

5.4.3.1 val

```
int NumExpr::val
```

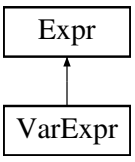
The documentation for this class was generated from the following files:

- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.h
- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.cpp

5.5 VarExpr Class Reference

```
#include <expr.h>
```

Inheritance diagram for VarExpr:



Public Member Functions

- VarExpr (std::string val)
- bool equals (Expr *e)
- int interp ()
- bool has_variable ()
- Expr * subst (std::string s, Expr *e)
- void print (std::ostream &ot)
- void pretty_print (std::ostream &ot)

Public Member Functions inherited from Expr

- virtual bool equals (Expr *e)=0
- virtual int interp ()=0
- virtual bool has_variable ()=0
- virtual Expr * subst (std::string s, Expr *e)=0
- virtual void print (std::ostream &ot)=0
- std::string to_string ()
- virtual void pretty_print (std::ostream &ot)=0
- std::string pretty_to_string ()
- std::string pretty_print_at (precedence_t p)

Public Attributes

- std::string val

Additional Inherited Members

Public Types inherited from Expr

- enum precedence_t { prec_none , prec_add , prec_mult }

5.5.1 Constructor & Destructor Documentation

5.5.1.1 VarExpr()

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

constructor

Parameters

val	string value

5.5.2 Member Function Documentation

5.5.2.1 equals()

```
bool VarExpr::equals (
            Expr * e )  [virtual]
```

if input Expr is a VarExpr and val equal

Parameters

e	input expression for comparing

Returns

true if e is VarExpr and e->val equals to this->val return true, otherwise false

Implements Expr.

5.5.2.2 has_variable()

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

the var expression is a variable

Returns

true

Implements Expr.

5.5.2.3 interp()

```
int VarExpr::interp ( )  [virtual]
```

A variable has no value, so interp for a variable should throw a std::runtime_error exception

Exceptions

std::runtime_error	

Implements Expr.

5.5.2.4 pretty_print()

```
void VarExpr::pretty_print (
            std::ostream & ot )  [virtual]
```

the val of VarExpr expression

Parameters

ot	ostream

Implements Expr.

5.5.2.5 print()

```
void VarExpr::print (
            std::ostream & ot )  [virtual]
```

VarExpr print: the val of VarExpr expression

Parameters

ot	ostream

Implements Expr.

5.5.2.6 subst()

```
Expr * VarExpr::subst (
            std::string s,
            Expr * e )  [virtual]
```

everywhere that the expression (whose subst method is called) contains a variable matching the string, the result Expr∗ should have the given replacement, instead.

Parameters

s	a std::string is substituted
e	a new expression

Returns

Expr

Implements Expr.

5.5.3 Member Data Documentation

5.5.3.1 val

```
std::string VarExpr::val
```

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

- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.h
- /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.cpp

Chapter 6

File Documentation

6.1 /Users/zidongfan/myGithubRepo/CS6015_↩ 2023/assignment/cmdline.cpp File Reference

contains use_arguments function

```
#include "cmdline.h"
```

Functions

- void use_arguments (int argc, const char ∗argv[ ])

6.1.1 Detailed Description

contains use_arguments function

Author

Zidong Fan

Date

01/13/2023

6.1.2 Function Documentation

6.1.2.1 use_arguments()

```
void use_arguments (
            int argc,
            const char * argv[] )
```

6.2 /Users/zidongfan/myGithubRepo/CS6015_↩ 2023/assignment/cmdline.h File Reference

contains use_arguments function

```
#include <stdio.h>
#include <iostream>
#include <string>
```

Functions

- void use_arguments (int argc, const char ∗argv[ ])

6.2.1 Detailed Description

contains use_arguments function

Author

Zidong Fan

Date

01/13/2023

6.2.2 Function Documentation

6.2.2.1 use_arguments()

```
void use_arguments (
            int argc,
            const char * argv[] )
```

6.3 /Users/zidongfan/myGithubRepo/CS6015_↩ 2023/assignment/cmdline.h

Go to the documentation of this file.

```
00001
00009 #ifndef msdscript_h
00010 #define msdscript_h
00011
00012 #include <stdio.h>
00013 #include <iostream>
00014 #include <string>
00015
00016 void use_arguments(int argc, const char * argv[]);
00017
00018 #endif /* msdscript_h */
00019
00020
```

6.4 /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.cpp File Reference

contains all constructions and methods in expr class

```
#include "expr.h"
```

6.4.1 Detailed Description

contains all constructions and methods in expr class

Author

Zidong Fan

Date

01/20/2023

6.5 /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.h File Reference

contains Expr class contains NumExpr, AddExpr, MultExpr, VarExpr subclasses

```
#include <stdio.h>
#include <string>
#include <stdexcept>
#include <sstream>
```

Classes

- class Expr
- class NumExpr
- class AddExpr
- class MultExpr
- class VarExpr

6.5.1 Detailed Description

contains Expr class contains NumExpr, AddExpr, MultExpr, VarExpr subclasses

abstract grammar of expressions is: <expr> = <number> | <expr> + <expr> | <expr> * <expr> | <variable>

Author

Zidong Fan

Date

01/20/2023

6.6 /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/expr.h

Go to the documentation of this file.

```
00001
00016 #ifndef expr_h
00017 #define expr_h
00018
00019 #include <stdio.h>
00020 #include <string>
00021 #include <stdexcept>
00022 #include <sstream>
00023
00024 class Expr {
00025 public:
00031     virtual bool equals(Expr *e) = 0;
00032
00037     virtual int interp() = 0;
00038
00043     virtual bool has_variable() = 0;
00044
00051     virtual Expr *subst(std::string s, Expr *e) = 0;
00052
00057     virtual void print(std::ostream &ot) = 0;
00058
00063     std::string to_string();
00064
00071     virtual void pretty_print(std::ostream &ot) = 0;
00072
00077     std::string pretty_to_string();
00078
00079
00080     //Hint 2: Here's the C++ way to declare a type precedence_t that has the possible values
      prec_none, prec_add, and prec_mult, in that order:
00081     typedef enum {
00082         prec_none,      // = 0
00083         prec_add,       // = 1
00084         prec_mult       // = 2
00085     } precedence_t;
00086
00087     //Hint: You will likely find it useful to "accumulate" a precedence level for parentheses as an
      argument to a pretty_print_at helper, where the precedence indicates which operations need
      parentheses: "none," "addition or lower," or "multiplication or lower."
00093     std::string pretty_print_at(precedence_t p);
00094 };
00095
00096 class NumExpr : public Expr {
00097 public:
00098     /* the value of NumExpr*/
00099     int val;
00100
00105     NumExpr(int val);
00106
00112     bool equals(Expr *e);
00113
00118     int interp();
00119
00124     bool has_variable();
00125
00132     Expr *subst(std::string s, Expr *e);
00133
00138     void print(std::ostream &ot);
00139
00144     void pretty_print(std::ostream &ot);
00145 };
00146
00147 class AddExpr : public Expr {
00148 public:
00149     /* left hand side expression of AddExpr */
00150     Expr *lhs;
00151     /* right hand side expression of AddExpr */
00152     Expr *rhs;
00153
00159     AddExpr(Expr *lhs, Expr *rhs);
00160
00166     bool equals(Expr *e);
00167
00172     int interp();
00173
00178     bool has_variable();
00179
00186     Expr *subst(std::string s, Expr *e);
00187
00192     void print(std::ostream &ot);
00193
00200     void pretty_print(std::ostream &ot);
```

```
00201 };
00202
00203 class MultExpr : public Expr {
00204 public:
00205     /* left hand side expression of MultExpr */
00206     Expr *lhs;
00207     /* right hand side expression of MultExpr */
00208     Expr *rhs;
00209
00215     MultExpr(Expr *lhs, Expr *rhs);
00216
00222     bool equals(Expr *e);
00223
00228     int interp();
00229
00234     bool has_variable();
00235
00243     Expr *subst(std::string s, Expr *e);
00244
00249     void print(std::ostream &ot);
00250
00257     void pretty_print(std::ostream &ot);
00258 };
00259
00260 class VarExpr : public Expr {
00261 public:
00262     /* the string value of VarExpr */
00263     std::string val;
00264
00269     VarExpr(std::string val);
00270
00276     bool equals(Expr *e);
00277
00278
00283     int interp();
00284
00289     bool has_variable();
00290
00297     Expr *subst(std::string s, Expr *e);
00298
00304     void print(std::ostream &ot);
00305
00310     void pretty_print(std::ostream &ot);
00311 };
00312
00313 #endif /* expr_h */
```

6.7 /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/main.cpp File Reference

int main() to run the catch tests

```
#include <iostream>
#include "catch.h"
```

Macros

- #define CATCH_CONFIG_RUNNER

Functions

- int main (int argc, const char ∗argv[ ])

6.7.1 Detailed Description

int main() to run the catch tests

6.7.2 Macro Definition Documentation

6.7.2.1 CATCH_CONFIG_RUNNER

```
#define CATCH_CONFIG_RUNNER
```

6.7.3 Function Documentation

6.7.3.1 main()

```
int main (
            int argc,
            const char * argv[] )
```

6.8 /Users/zidongfan/myGithubRepo/CS6015_2023/assignment/test↩ Expr.cpp File Reference

```
#include "expr.h"
#include "catch.h"
```

Functions

- TEST_CASE ("equals")
- TEST_CASE ("interp")
- TEST_CASE ("has_variable")
- TEST_CASE ("subst")
- TEST_CASE ("print")
- TEST_CASE ("pretty_print")

6.8.1 Function Documentation

6.8.1.1 TEST_CASE() [1/6]

```
TEST_CASE (
            "equals"  )
```

6.8.1.2 TEST_CASE() [2/6]

```
TEST_CASE (
            "has_variable"  )
```

6.8.1.3 TEST_CASE() [3/6]

```
TEST_CASE (
            "interp"  )
```

interp Test Examples: CHECK((new MultExpr(new NumExpr(3), new NumExpr(2))) ->interp()==6); CHECK((new AddExpr(new AddExpr(new NumExpr(10), new NumExpr(15)),new AddExpr(new NumExpr(20),new NumExpr(20)))) ->interp()==65);

6.8.1.4 TEST_CASE() [4/6]

```
TEST_CASE (
            "pretty_print"  )
```

6.8.1.5 TEST_CASE() [5/6]

```
TEST_CASE (
            "print"  )
```

6.8.1.6 TEST_CASE() [6/6]

```
TEST_CASE (
            "subst"  )
```

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