Cbject

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1. Overview

Cbject makes it easier to write object oriented code in C.

1.1. Features

- Classes
- Traits
- Polymorphism

1.2. Usage

Example 1. How to add it to a project

Include the following header file:

```
#include "Cbject.h"
```

Example 2. How to create an object

```
Object * object = initObject_(Object, alloc_(Object));
printf("%d\n", hashCode_(object));
dealloc_(object);
```

1.3. Object model

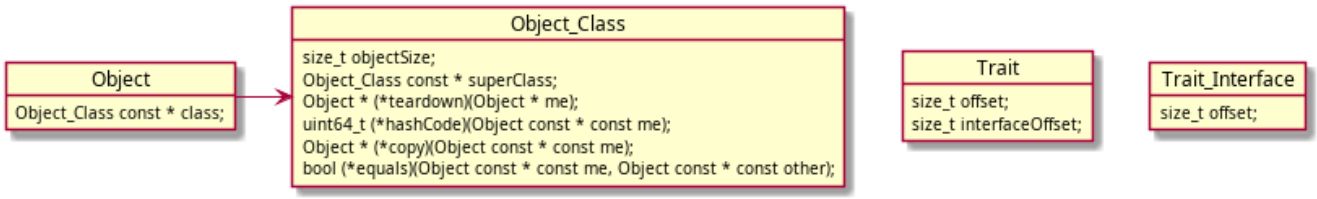

Figure 1. Building blocks

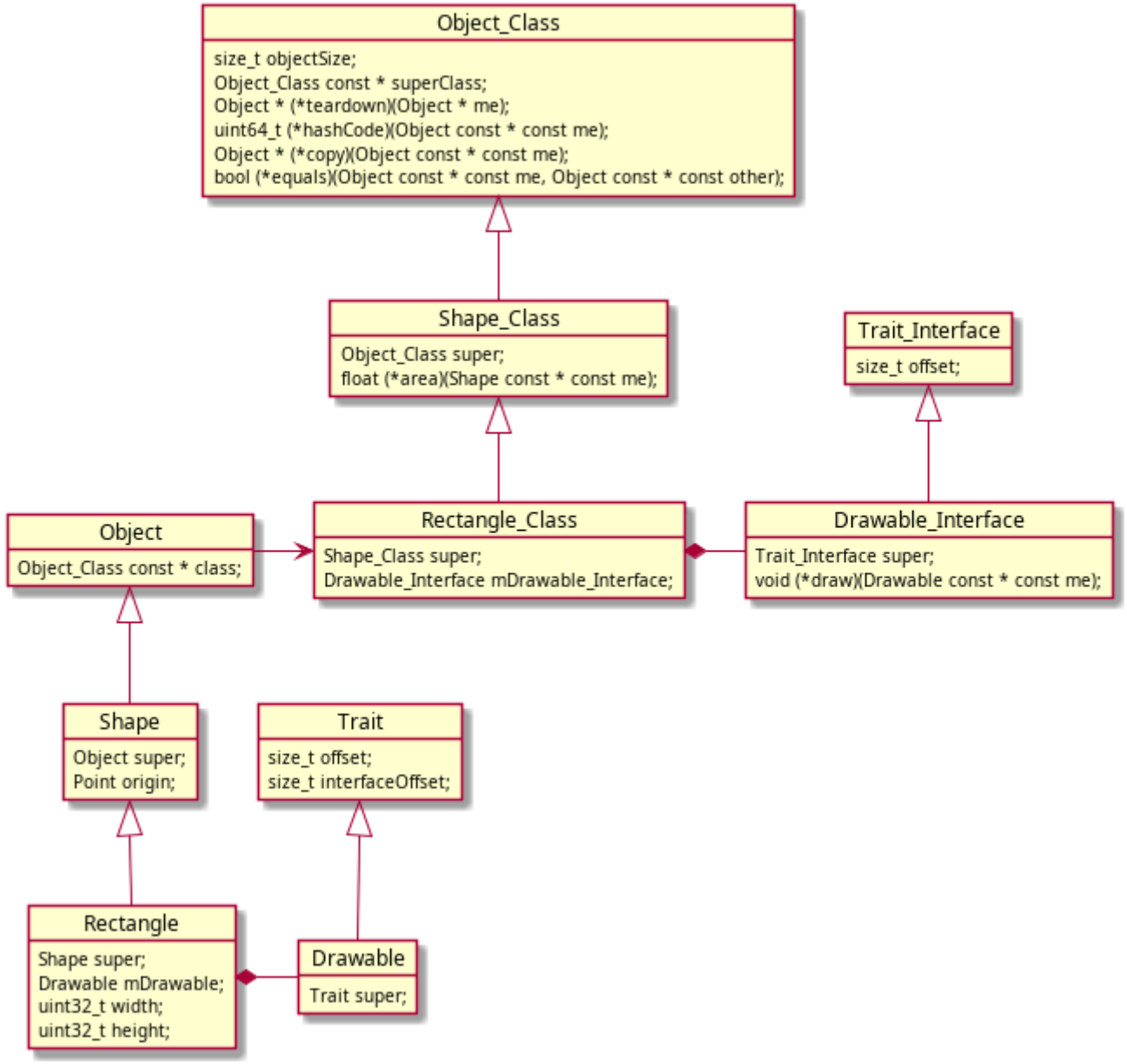

Figure 2. Rectangle class example

2. API

2.1. Object

2.1.1. Overview

The building block. All objects defined in Cbject need to extend Object.

2.1.2. Types

Object_Class

```
typedef struct Object_Class Object_Class;
```

Typedef for struct Object_Class

Object

```
typedef struct Object Object;
```

Typedef for struct Object

struct Object_Class

```
struct Object_Class {
    size_t objectSize;
    Object_Class const * superClass;
    Object * (*teardown)(Object * me);
    uint64_t (*hashCode)(Object const * const me);
    Object * (*copy)(Object const * const me, Object * const object);
    bool (*equals)(Object const * const me, Object const * const other);
};
```

Definition of struct Object_Class

Members

- objectSize - Size in memory of object
- superClass - Super class of object
- teardown - Function pointer for the teardown method
- hashCode - Function pointer for the hash code method
- copy - Function pointer for the copy method
- equals - Function pointer for the equals method

struct Object

```
struct Object {
    Object_Class const * class;
};
```

Definition of struct Object

Members

- class - Pointer to the class structure

2.1.3. Functions

Object_Class_()

```
Object_Class const * Object_Class_(void);
```

Get Object_Class instance

Return

Reference of the class instance

Object_alloc()

```
Object * Object_alloc(Object_Class const * const class);
```

Allocate an object in heap memory

Params

- class - Class reference

Return

Reference of the allocated object

Object_dealloc()

```
Object * Object_dealloc(Object * const me);
```

Free memory allocated for an object

Params

- me - Object reference

Return

Always returns NULL

Object_init()

```
Object * Object_init(Object * const me);
```

Initialize an object

Params

- me - Object reference

Return

Initialized object

Object_teardown()

```
Object * Object_teardown(Object * me);
```

Teardown an object.

Params

- me - Object reference

Return

Always returns NULL

Object_copy()

```
Object * Object_copy(Object const * const me, Object * const object);
```

Make a copy of an object.

Params

- me - Object reference
- object - Reference of a new allocated object in which to copy the original one

Return

Pointer to a new object (copy of the original one)

Object_equals()

```
bool Object_equals(Object const * const me, Object const * const other);
```

Compare two objects

Params

- me - Object reference
- other - Reference for the compared object

Return

- true - If the objects are equal
- false - If the objects are different

Object_hashCode()

```
uint64_t Object_hashCode(Object const * const me);
```

Get hash code of object

Params

- me - Object reference

Return

Object hash code

Object_isOfClass()

```
bool Object_isOfClass(Object const * const me, Object_Class const * const class);
```

Check if an object is of a given class

Params

- me - Object reference
- class - Class reference

Return

- true - If the object is of the provided class
- false - If the object is of a different class

hashCode_()

```
#define hashCode_(me)
```

Syntactic sugar to get hash code of object

Params

- me - Object reference

Return

Object hash code

2.1.4. Macros

class_()

```
#define class_(className)
```

Syntactic sugar to get class reference

Params

- className - Name of the class

Return

Class reference

initClass_()

```
#define initClass_(className, me)
```

Initialize a class

Params

- className - Name of the class
- me - Class reference

setUpClass_()

```
#define setUpClass_(className, superClassName, me)
```

Class setup (initialize, set the object size and super class)

Params

- className - Name of the class
- superClassName - Name of the super class
- me - Class reference

overrideClassMethod_()

```
#define overrideClassMethod_(className, class, methodName)
```

Override a method of a class

Params

- className - Name of the class
- class - Class reference
- methodName - Name of the method

initObject_()

```
#define initObject_(className, ...)
```

Syntactic sugar for object initialization

Params

- className - Name of the class
- ...
  - me - Object reference
  - ... - Init params

Return

Initialized object

classOf_()

```
#define classOf_(me)
```

Get the class of an object

Params

- me - Object reference

Return

Class reference

setUpObject_()

```
#define setUpObject_(className, superClassName, ...)
```

Object setup (initialize, set the object class)

Params

- className - Name of the class
- superClassName - Name of the super class
- ...
  - me - Object reference
  - ... - Init params

objectSizeOf_()

```
#define objectSizeOf_(me)
```

Get the size in memory of an object

Params

- me - Object reference

Return

Object size

traitOf_()

```
#define traitOf_(me, className, interfaceName)
```

Get trait of an object

Params

- me - Object reference
- className - Name of the class
- interfaceName - Name of the interface

Return

Trait reference

objectMethodCall_()

```
#define objectMethodCall_(className, methodName, ...)
```

Call a method through an object

Params

- className - Name of the class
- methodName - Name of the method
- ...
  - me - Object reference
  - ... - Method params

Return

Depends on the called method

classMethodCall_()

```
#define classMethodCall_(className, methodName, ...)
```

Call a method through a class

Params

- className - Class name
- methodName - Name of the method
- ...
  - me - Object reference
  - ... - Method params

Return

Depends on the called method

alloc_()

```
#define alloc_(className)
```

Syntactic sugar to allocate an object in heap memory

Params

- className - Name of class

Return

Reference of the allocated object

dealloc_()

```
#define dealloc_(me)
```

Syntactic sugar to free memory allocated for an object

Params

- me - Object reference

Return

Always returns NULL

teardown_()

```
#define teardown_(me)
```

Syntactic sugar to teardown an object.

Params

- me - Object reference

Return

Always returns NULL

copy_()

```
#define copy_(className, me, object)
```

Syntactic sugar to make a copy of an object.

Params

- className - Name of class
- me - Object reference
- object - Reference of a new allocated object in which to copy the original one

Return

Pointer to a new object (copy of the original one)

equals_()

```
#define equals_(me, other)
```

Syntactic sugar to compare two objects

Params

- me - Object reference
- other - Reference for the compared object

Return

- true - If the objects are equal
- false - If the objects are different

isOfClass_()

```
#define isOfClass_(me, className)
```

Syntactic sugar to check if an object is of a given class

Params

- me - Object reference
- className - Class name

Return

- true - If the object is of the provided class
- false - If the object is of a different class

2.1.5. Tests

test_Object_class

Test setup of Object_Class

Steps

1. Get Object_Class instance
2. Check if object size stored in class is equal to the actual object size
3. Check that the function pointers in the class are initialized

test_Object_init

Test initialization of Object

Steps

1. Allocate object on stack an initialize it
2. Check if object class points to Object_Class instance

test_Object_equals

Test equals method

Steps

1. Allocate object on stack an initialize it
2. Check if equals method returns true when comparing object to self
3. Allocate another object on stack an initialize it
4. Check if equals method returns false when comparing the two objects

test_Object_hashCode

Test hashCode method

Steps

1. Allocate object on stack an initialize it
2. Check if hashCode method returns the address in memory of the object

test_Object_isOfClass

Test isOfClass method

Preconditions

1. Define a dummy Test_Class which extends Object_Class

Steps

1. Allocate object on stack an initialize it
2. Check if isOfClass method returns true when checked against Object
3. Check if isOfClass method returns false when checked against Test

test_Object_copy

Test copy method

Steps

1. Allocate object on stack an initialize it
2. Allocate another object on stack and copy the first object into it
3. Check if the memory sections occupied by the two objects are equal

2.2. Trait

2.2.1. Overview

TODO

2.2.2. Types

Trait_Interface

```
typedef struct {
    size_t offset;
} Trait_Interface;
```

Typedef and definition of Trait_Interface

Members

- offset - Offset of trait in containing object

Trait

```
typedef struct {
    size_t offset;
    size_t interfaceOffset;
} Trait;
```

Typedef and definition of Trait

Members

- offset - Offset of Trait in container Object
- interfaceOffset - Offset of Trait_Interface in container Object_Class

2.2.3. Functions

Trait_Interface_

```
Trait_Interface const * Trait_Interface_(void);
```

Get Trait_Interface instance

Return

Reference of the trait interface

Trait_init

```
Trait * Trait_init(Trait * const me);
```

Initialize a trait

Params

- me - Trait reference

Return

Initialized trait

2.2.4. Macros

interface_()

```
#define interface_(interfaceName)
```

Syntactic sugar to get interface reference

Params

- interfaceName - Name of the interface

Return

Interface reference

initInterface_()

```
#define initInterface_(interfaceName, me)
```

Initialize an interface

Params

- interfaceName - Name of the interface
- me - Interface reference

setUpInterface_()

```
#define setUpInterface_(className, interfaceName, me)
```

Interface setup (initialize, set the trait offset in container object)

Params

- className - Name of the class
- interfaceName - Name of the interface
- me - Interface reference

overrideInterfaceMethod_()

```
#define overrideInterfaceMethod_(className, interfaceName, interface, methodName)
```

Override a method of an interface

Params

- className - Name of the class
- interfaceName - Name of the interface
- interface - Interface reference
- methodName - Name of the method

offsetOf_()

```
#define offsetOf_(me)
```

Get offset of a trait in container object

Params

- me - Trait reference

Return

Offset of trait in container object

objectOf_()

```
#define objectOf_(me)
```

Get container object from a trait

Params

- me - Trait reference

Return

Reference of the container object

interfaceOffsetOf_()

```
#define interfaceOffsetOf_(me)
```

Get the interface offset in container class

Params

- me - Trait reference

Return

Offset of interface in container class

interfaceOf_()

```
#define interfaceOf_(me)
```

Get the interface of a trait

Params

- me - Trait reference

Return

Interface reference

initTrait_()

```
#define initTrait_(interfaceName, ...)
```

Syntactic sugar for trait initialization

Params

- interfaceName - Name of the interface
- ...
  - me - Trait reference
  - ... - Init params

Return

Initialized trait

setUpTrait_()

```
#define setUpTrait_(className, interfaceName, ...)
```

Trait setup (initialize, set the trait offset and interface offset)

Params

- className - Name of the class
- interfaceName - Name of the interface
- ...
  - me - Trait reference
  - ... - Init params

traitMethodCall_()

```
#define traitMethodCall_(interfaceName, methodName, ...)
```

Call a method through a trait

Params

- interfaceName - Name of the interface
- methodName - Name of the method
- ...
  - me - Trait reference
  - ... - Method params

Return

Depends on the called method

interfaceMethodCall_()

```
#define interfaceMethodCall_(className, interfaceName, methodName, ...)
```

Call a method through an interface

Params

- className - Name of the class
- interfaceName - Name of the interface
- methodName - Name of the method
- ...
  - me - Trait reference
  - ... - Method params

Return

Depends on the called method