BTH001
Object Oriented Programming
Lesson 01
Classes and Objects

Object orientation

Modeling the real world

Things (concrete and abstract) in reality are objects in our system

- Bank account
- Book
- Student
- Library
- Game
- Hospital
- …

Object orientation (cont.)

Modeling the real world

Object often relates to other objects

- A person has bank accounts
- A library handles books
- A soccer player kicks a ball
- A shark hunts fishes
- A student is a person
- …

Relationships will be covered soon.

Object oriented programming

Central:

- Objects encapsulate data and functions
- Objects hide their internal data from the outside world
- Only the functions that the object provides should be able manipulate the data (the objects ”control” the way data can be manipulated)
- An object is of a specific class – the class is the type of the object (a specific car is of the type (class) Car, the C++ cource is of the type (class) Course,…)

Example (1): use the class Dot

- ”A circular stamp” that has a window where it can stamp
- It is possible to create Dot-objects
  - *Dot(sf::RenderWindow *window)*
- For all Dot objects it is possible to
  - Change the color
    - *void setColor(sf::Color color)*
  - Move
    - *void moveRight(float step)*
    - *void moveLeft(float step)*
    - *…*
  - Stamp (draw a filled colored circle in the window)
    - void stamp()
  - ...

Let’s try it!

Example (2): create the class Book

In a book store system

Information of books:

- Title
- Author
- ISBN
- Nr of pages
- Publishing year
- Edition
- Price
- …

Book - simplified

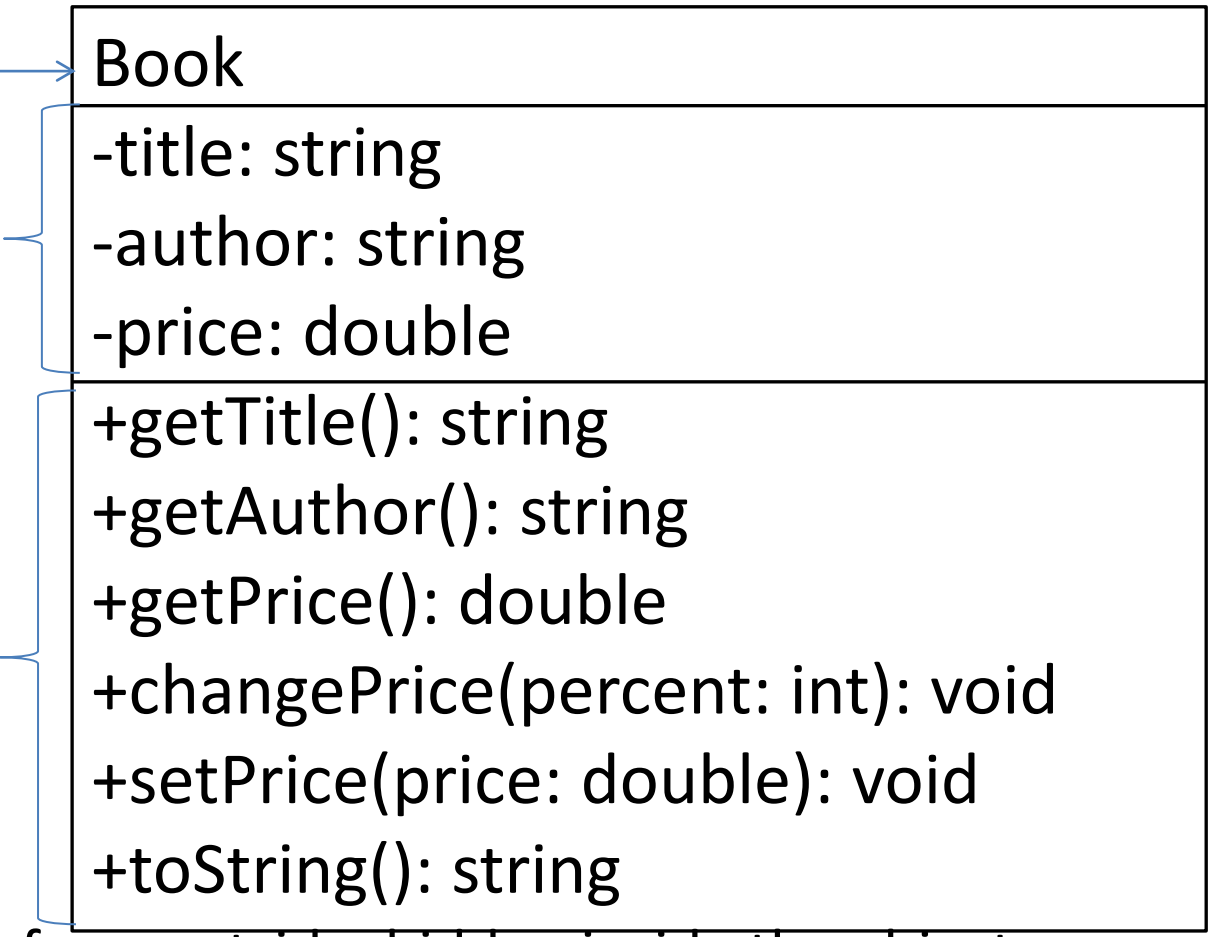
Internal data:

- Title - text
- Author - text
- Price – real number

Functions

- Get the title
- Get the author
- Get the price
- Change the price based on percentage
- Set the price
- Get a string describing the Book object

The class Book



Name of the class

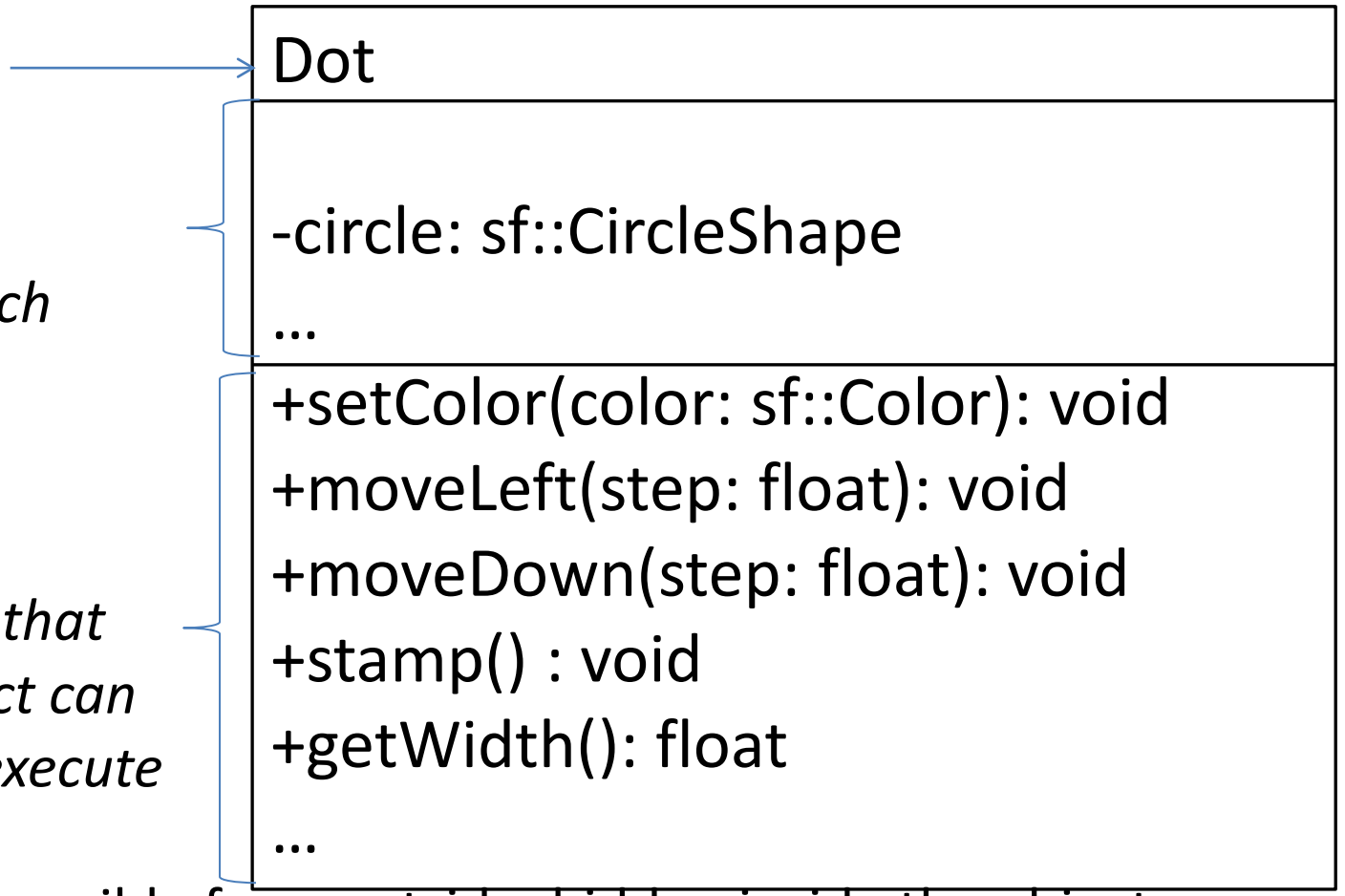
Data of each object

Functions that each object can perform

- not accessible from outside, hidden inside the object

+ accessible from outside

The class Dot



Name of the class

Data of each object

Functions that each object can perform/execute

- not accessible from outside, hidden inside the object

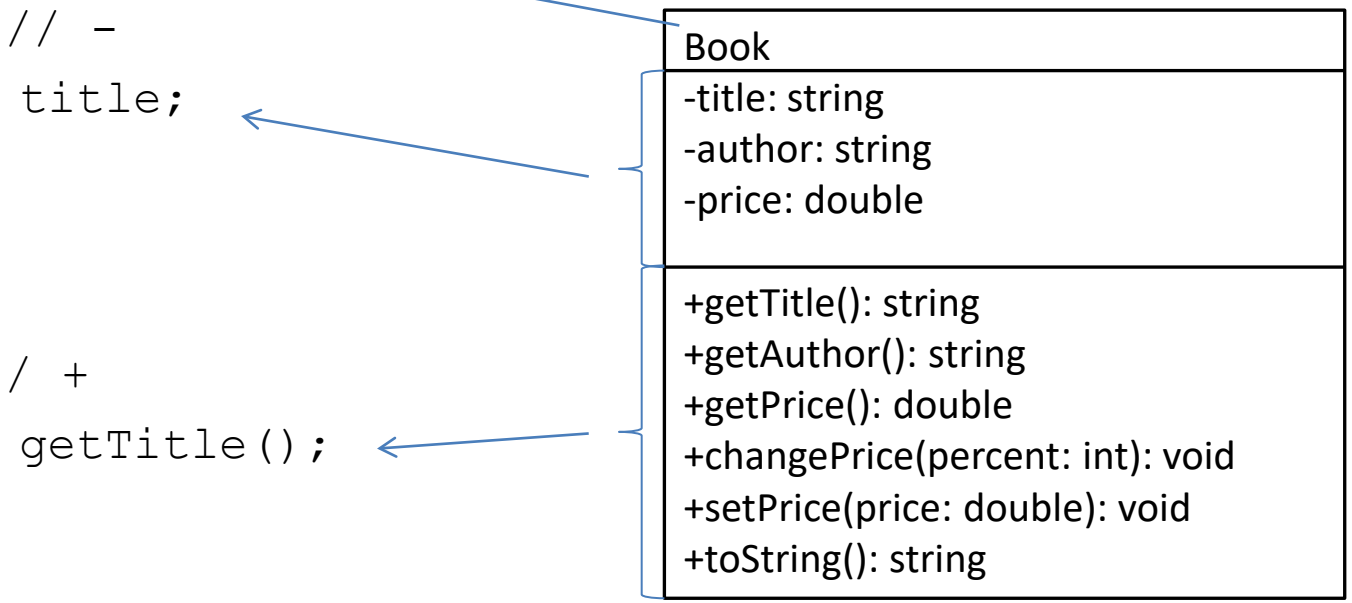
+ accessible from outside

Implemented in C++

```
class Book
{
private: // -
   string title;
   …


public: // +
   string getTitle();
   …

};
```



How to construct and destruct an object?

- To construct an object a *constructor* is needed
  - The same name as the class, can be overloaded
    - Ex: Book(string title, string author, double price)
    - Ex: Book() //Default constructor
  - Default argument can be used
    - Ex: Book(string title, string author="?", double price = 0.0)

- To destruct an object a *destructor* is needed
  - ~the same name as the class
    - Ex: ~Book() //No parameters

How to compare objects of the same type?

It is possible to overload comparison operators (==, <, >, !=, <=, >=)

```
Book b1(…, …, …);
Book b2(…, …, …);
 …
 if(b2 < b1)
 {
        …;
  }
```

```
class Book
{
public:
  ...
  bool operator<(Book &otherBook);
  …
};
```