File
Edit
View
Help

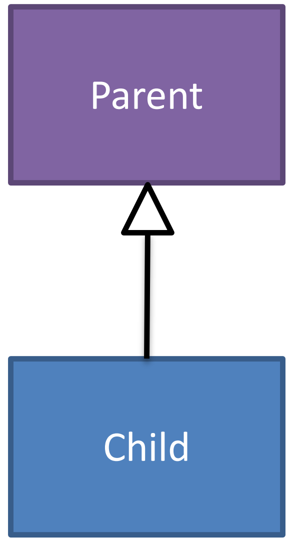
Inheritance and Polymorphism Part 02

File Edit View Help

Inheritance

- Inheritance allows Data and Methods to be *inherited / absorbed* from one class into another
- In Java, this occurs between two classes
  - Subclass (Child): The class inheriting from another
  - Superclass (Parent): The class that is being inherited
- This is great for *extending* the properties and functionality of one class into another
  - The subclass becomes a more specific version of the superclass
  - The superclass is a more general version of the subclass
  - Creates an "is a" relationship

Inheritance Concept

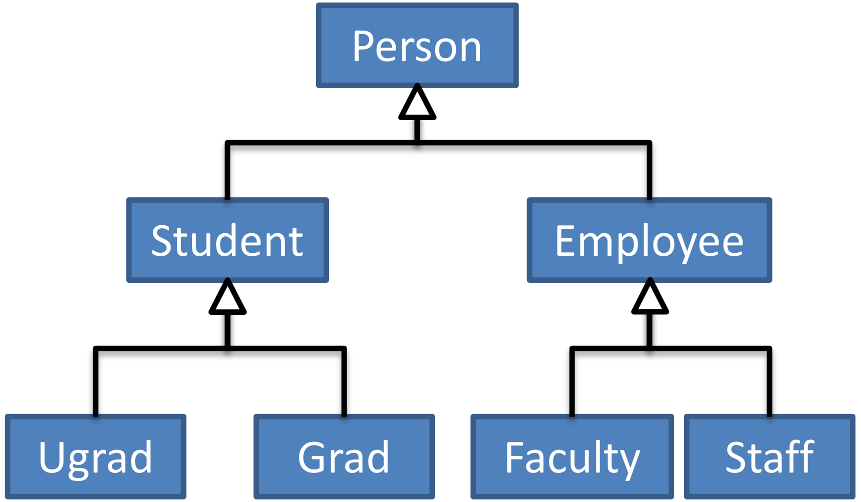


File Edit View Help

Polymorphism

- “One becomes many”
- A superclass can be extended or implemented in many different ways
- A change to a superclass is reflected across all subclasses
- Allows substitution of one class for another as long as the class *is an* extension
  - This is how the “equals()” methods works for different types
- Made possible by *dynamic binding* aka *late binding*

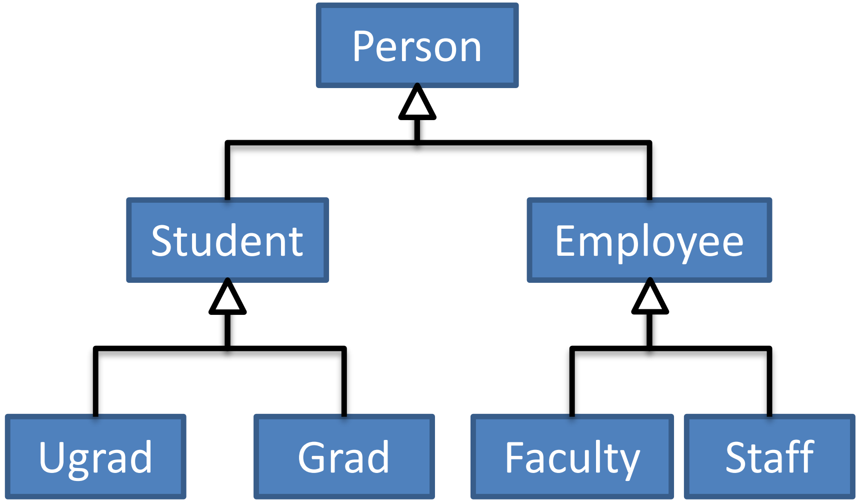
Polymorphism Concept



Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

<u>Polymorphism Concept</u>



File Edit View Help

Polymorphism

- “Many Forms”
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

File Edit View Help

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

File Edit View Help

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

Polymorphism

- “Many Forms”
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

File Edit View Help

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

File Edit View Help

Polymorphism

- “Many Forms”
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

File Edit View Help

Polymorphism

- “Many Forms”
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - – equals method
  - – toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
public String toString()
{
    return "Name: "+this.name;
}
```

Console

File Edit View Help

Polymorphism

- “Many Forms”
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

```
Name:  asdf
```

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
public String toString()
{
    return super.toString()+" ID: "+this.id;
}
```

Console

```
Name:  asdf
```

File Edit View Help

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```java
public String toString()
{
    return "Name: "+this.name;
}
```

Console

```
Name: asdf
```

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
public String toString()
{
    return super.toString()+" ID: "+this.id;
}
```

Console

```
Name: asdf
```

File Edit View Help

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```java
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

```
Name: asdf
Name: asdf2 ID: 4
```

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
public String toString()
{
    return super.toString()+" Level: "+this.level;
}
```

Console

```
Name: asdf
Name: asdf2 ID: 4
```

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
public String toString()
{
    return super.toString()+" ID: "+this.id;
}
```

Console

```
Name: asdf
Name: asdf2 ID: 4
```

File Edit View Help

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```java
public String toString()
{
    return "Name: "+this.name;
}
```

Console

```
Name: asdf
Name: asdf2 ID: 4
```

File Edit View Help

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
public String toString()
{
    return super.toString()+" ID: "+this.id;
}
```

Console

```
Name: asdf
Name: asdf2 ID: 4
```

File Edit View Help

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
public String toString()
{
    return super.toString()+" Level: "+this.level;
}
```

Console

```
Name: asdf
Name: asdf2 ID: 4
```

File Edit View Help

Polymorphism

- "Many Forms"
- Actions / Functionality (methods) can be *implemented* in many different ways
  - equals method
  - toString method
- Allows changes in subclass methods to be applied to the inherited superclass

Polymorphism Example

```
Person[] people = new Person[3];
people[0] = new Person("asdf");
people[1] = new Student("asdf2",4);
people[2] = new Ugrad("asdf3",5,2);

for(int i=0;i<people.length;i++)
    System.out.println(people[i]);
```

Console

```
Name: asdf
Name: asdf2 ID: 4
Name: asdf3 ID: 5 Level: 2
```

File Edit View Help

Interfaces

- Similar to a Class
  - Creates a Type
  - The identifier of an interface MUST match the filename
- Defines the functionality (methods) a class MUST *implement*
- Creates a non-constructible Type
  - Can only construct Classes that *implement* an interface
  - Classes that *implement* an interface can be assigned to variables of that interface type
- Only Contains method signatures
  - No method body or functionality
  - No instance variables
- “Blueprints for Classes”

Creating an Interface Syntax

```
public interface <<id>>
{
      <<method signatures>>;
}
```

Example

```
public interface Shape
{
      public void setHSpace(int aH);
      public int getHSpace();
      public void drawShape();
      public void drawShapeAt(int lineNumber);
}
```

File Edit View Help

Interfaces

- Reserved word “implements” is used between a class and an interface
- If a method is not defined in a class that *implements* an interface then the class will have a syntax error
- Useful for when the functionality of a class can be done in a variety of ways

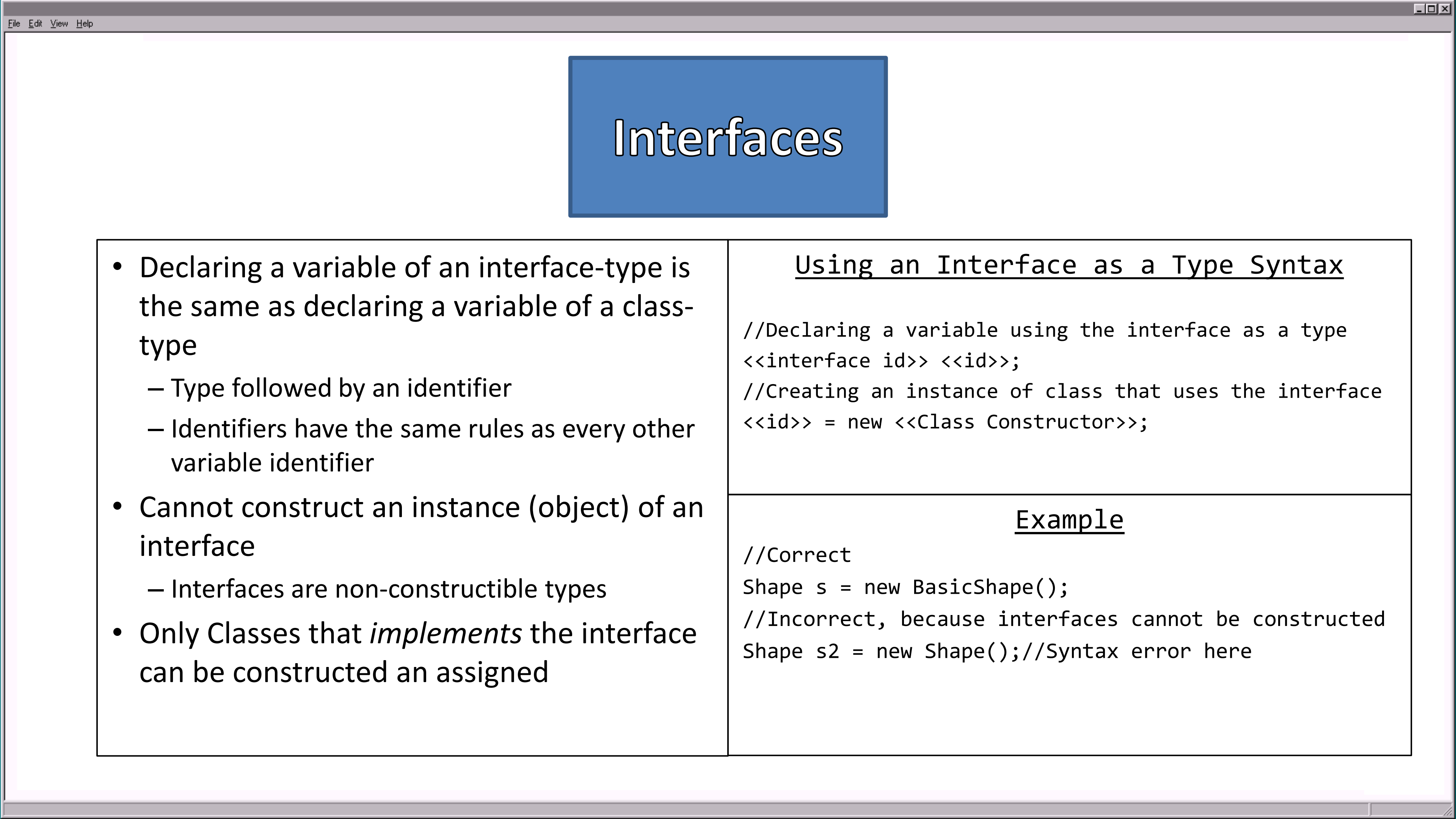
Class using an Interface Syntax

```
public class <<class id>> implements <<interface id>>
{
        <<methods from the interface must be defined in this class>>
}
```

Example

```
public class BasicShape implements Shape
{
     //Methods setHSpace, getHSpace, drawShape,
     //and drawShapeAt must be defined in here

}
```



Interfaces

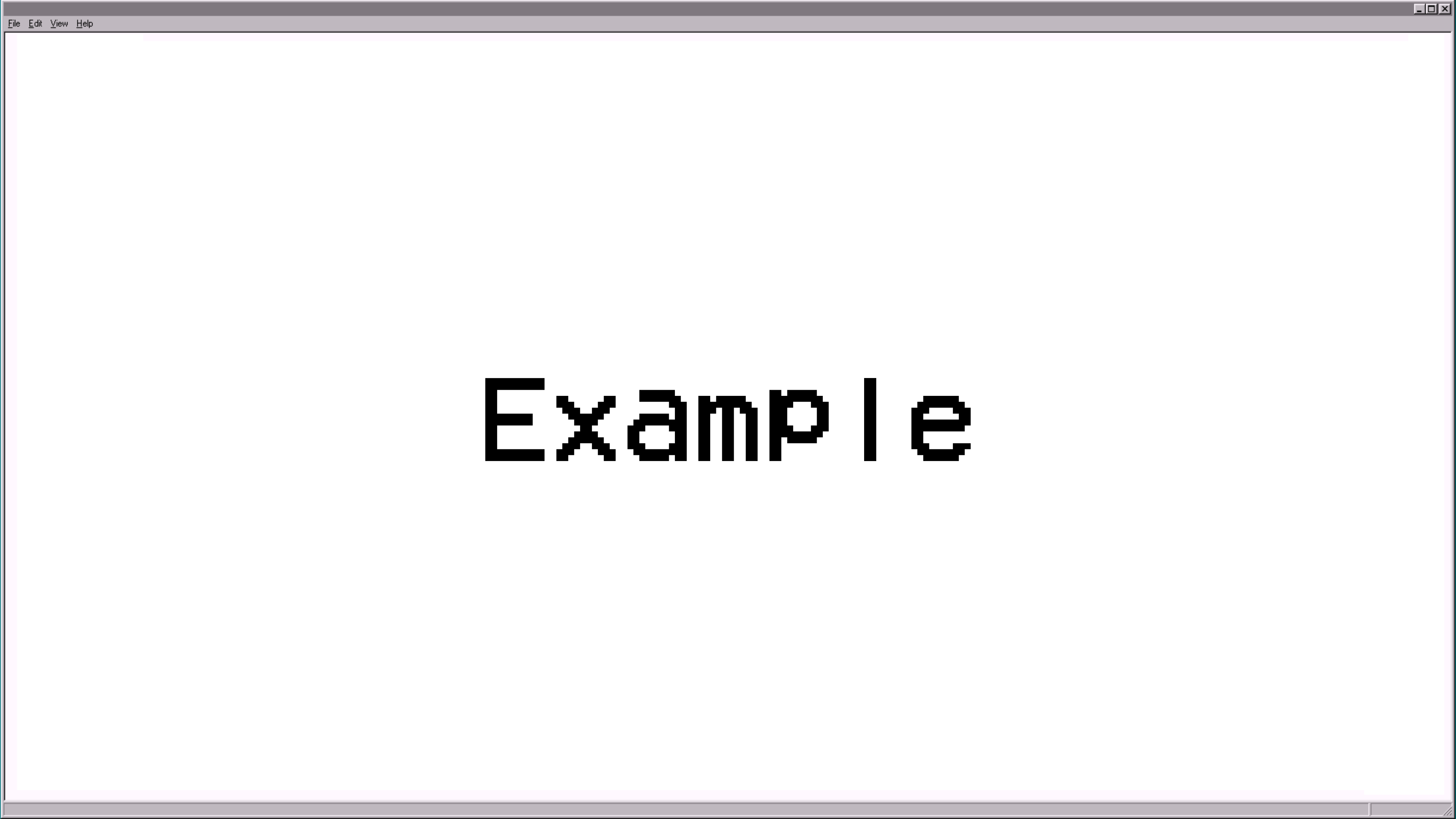
- Declaring a variable of an interface-type is the same as declaring a variable of a class-type
  - Type followed by an identifier
  - Identifiers have the same rules as every other variable identifier
- Cannot construct an instance (object) of an interface
  - Interfaces are non-constructible types
- Only Classes that *implements* the interface can be constructed an assigned

Using an Interface as a Type Syntax

```
//Declaring a variable using the interface as a type
<<interface id>> <<id>>;
//Creating an instance of class that uses the interface
<<id>> = new <<Class Constructor>>;
```

Example

```
//Correct
Shape s = new BasicShape();
//Incorrect, because interfaces cannot be constructed
Shape s2 = new Shape();//Syntax error here
```



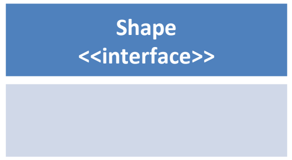
Example

Shape Drawing Program

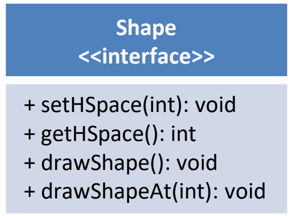
- Problem: We must create a program that can draw a variety of shapes in the console
- Draw Shapes in the console at set locations
  - Horizontal Spacing
  - Vertical Spacing
- Some Shapes mentioned were:
  - Rectangle
  - Triangle
  - Maybe more?

- Shapes could be drawn in a variety of ways
  - Filled
  - Hollow
  - Upside Down Triangle
  - Checkered Rectangle
  - Horizontal Striped Rectangle
  - Vertical Striped Rectangle
  - Etc.

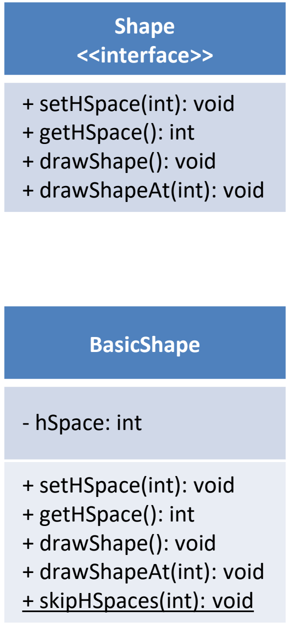
File
Edit
View
Help

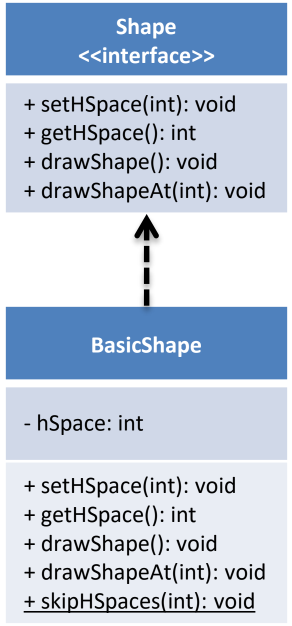

Shape
<<interface>>

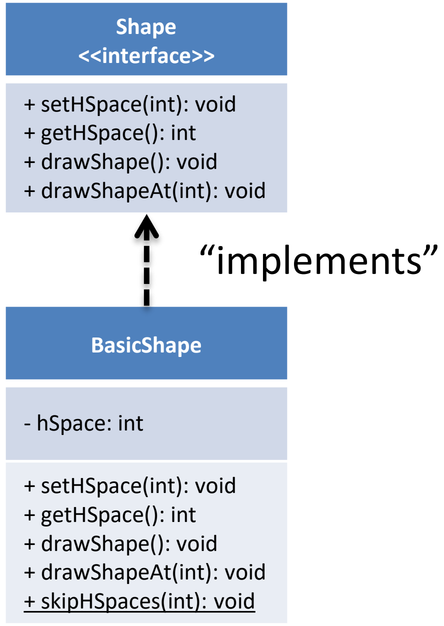
File Edit View Help



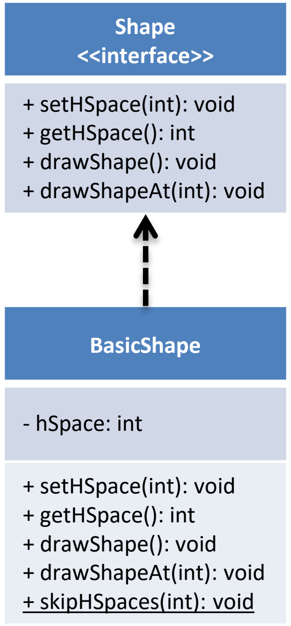
File Edit View Help

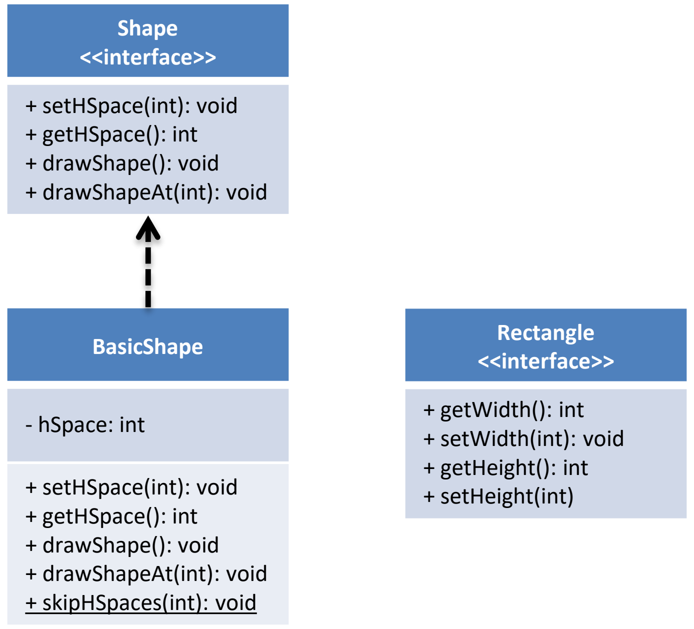


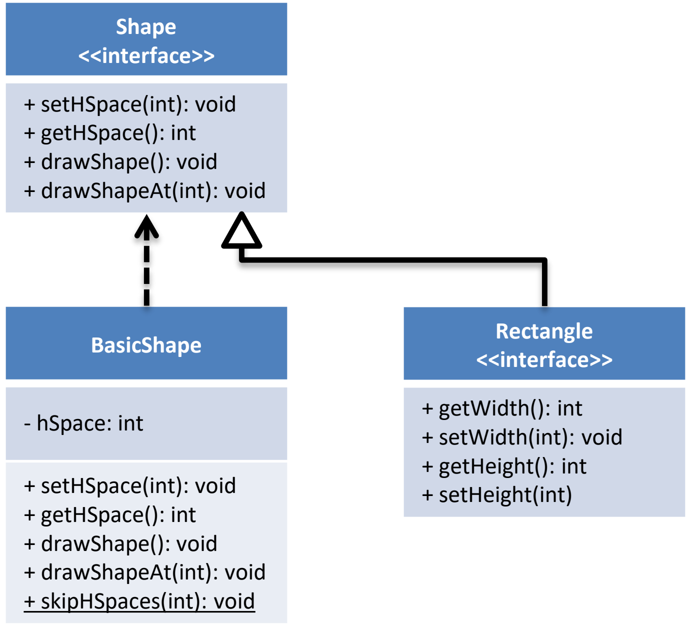

Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void

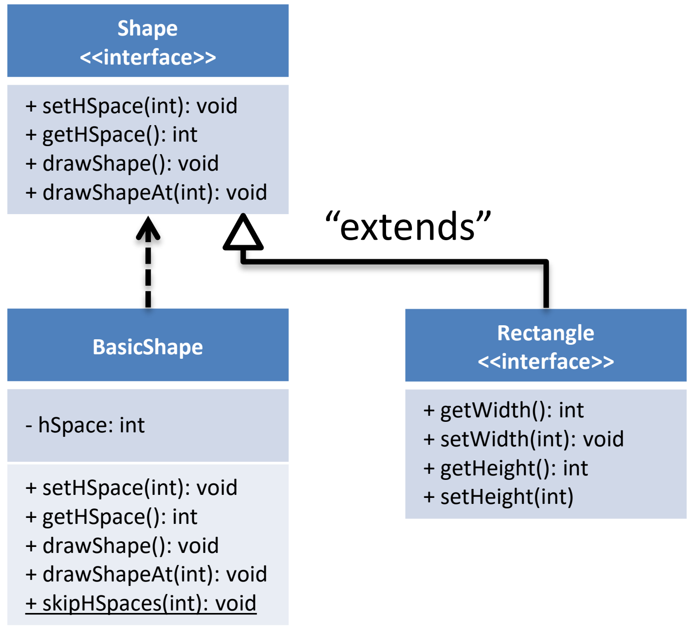

Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
“implements”
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void

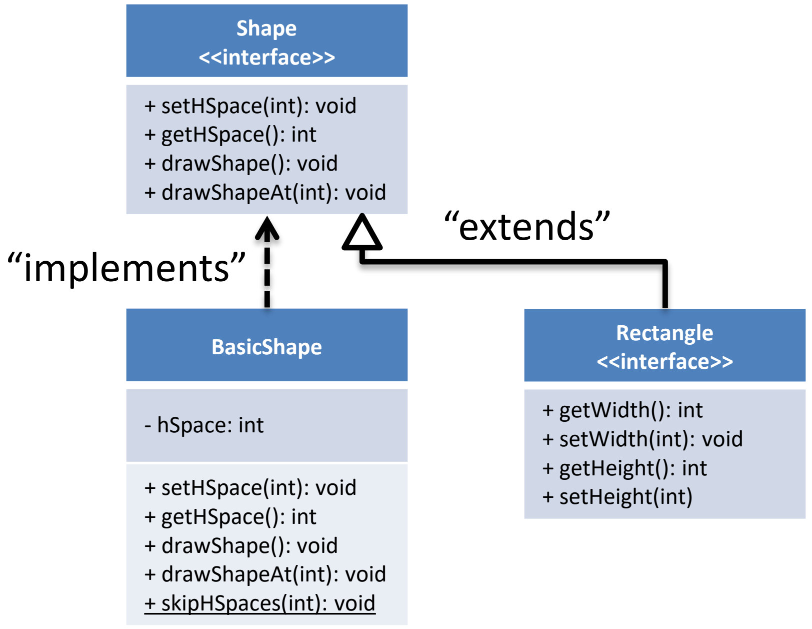
File
Edit
View
Help

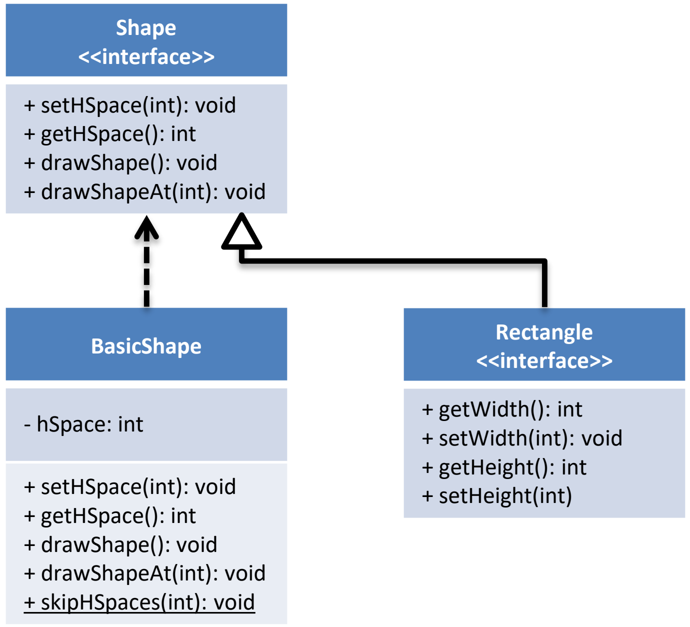

File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void

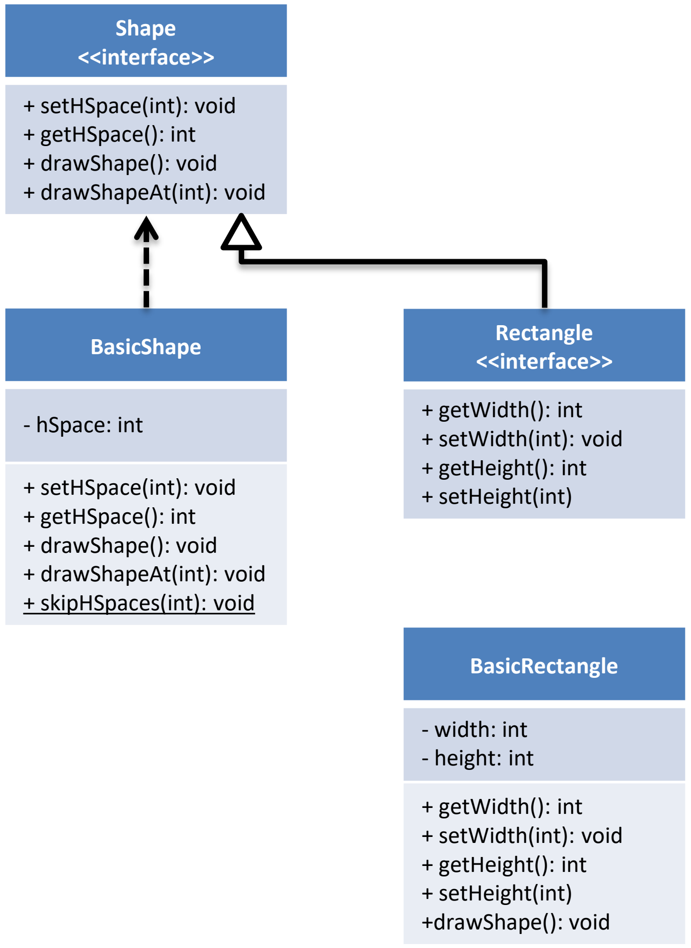

Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)

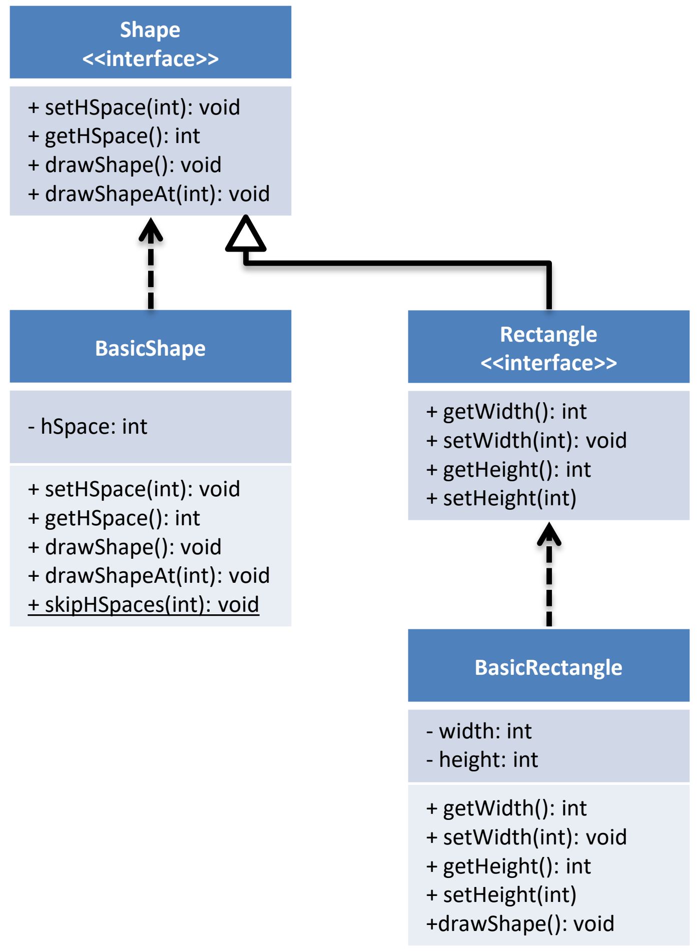

File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)

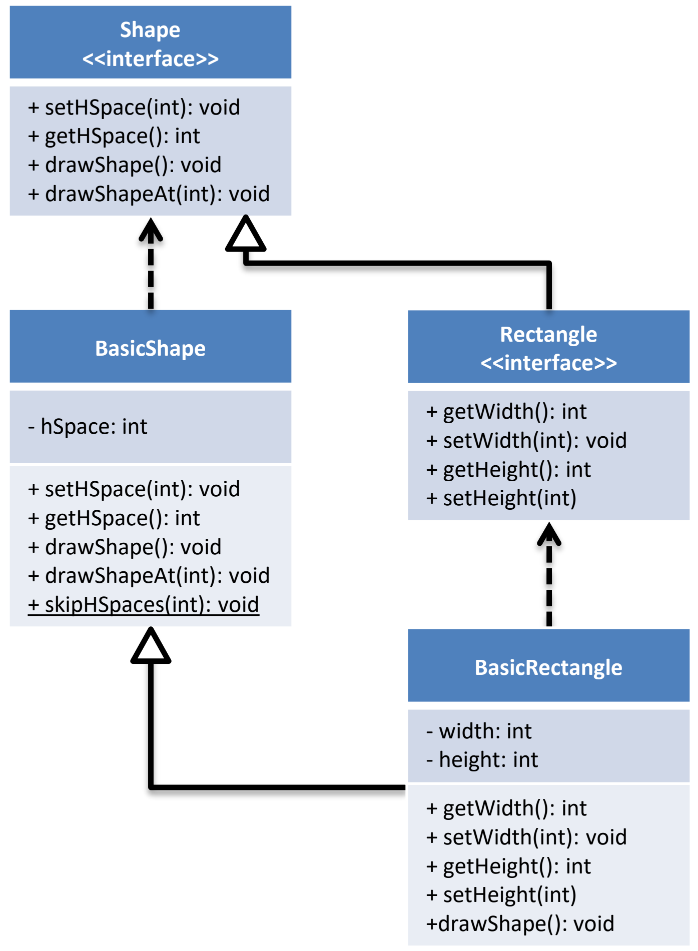

Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
"extends"
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)

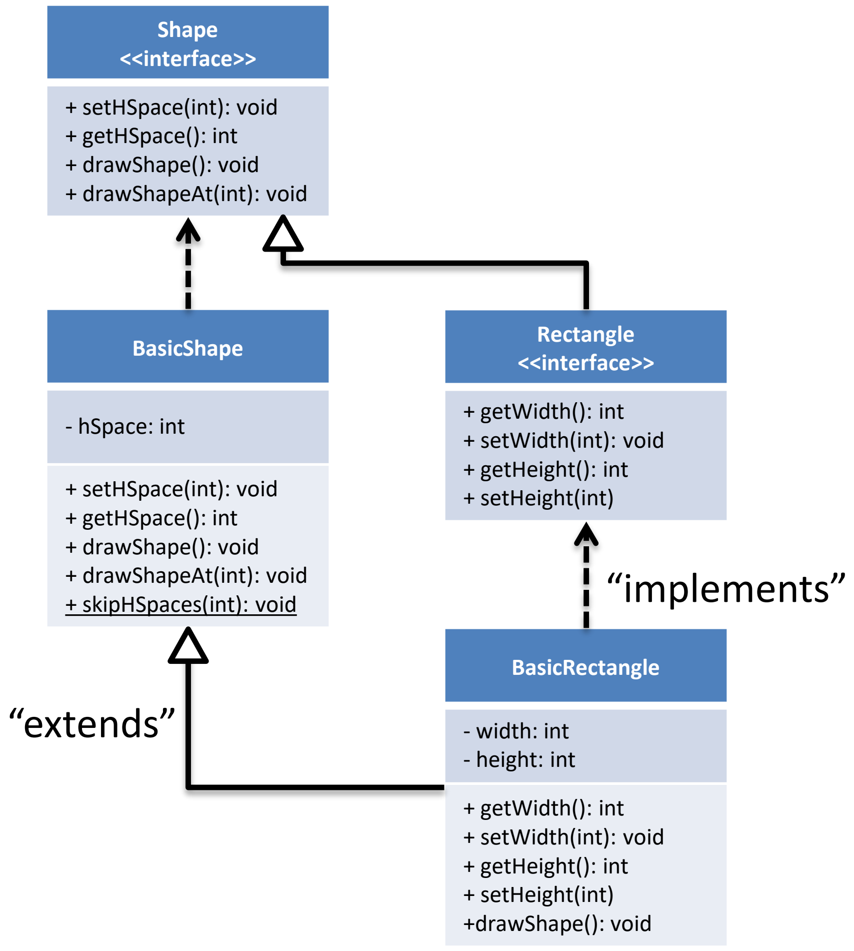

Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
"implements"
"extends"
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)


File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)

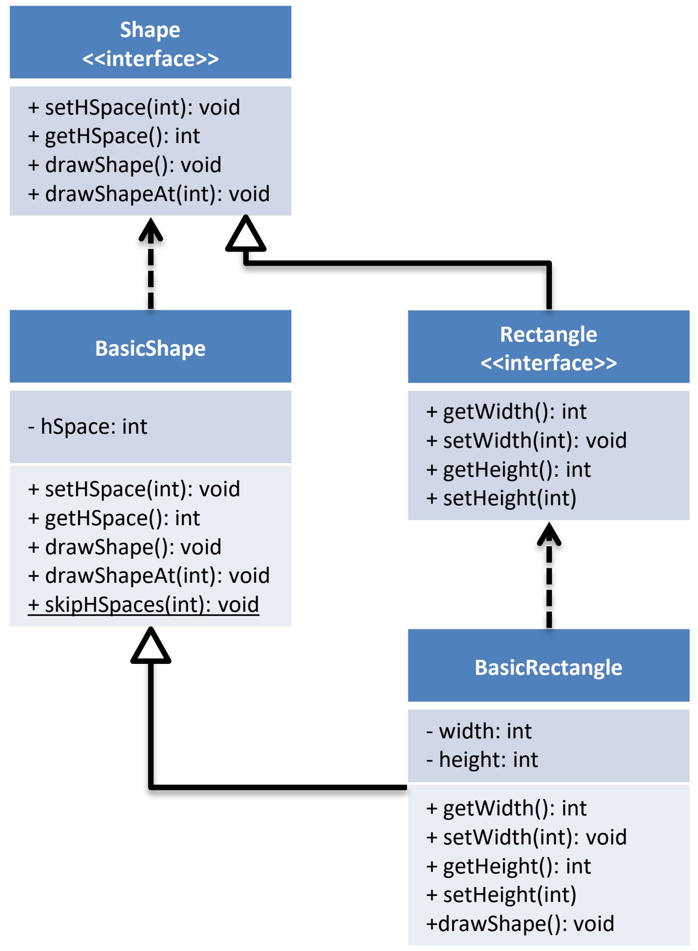

File
Edit
View
Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void

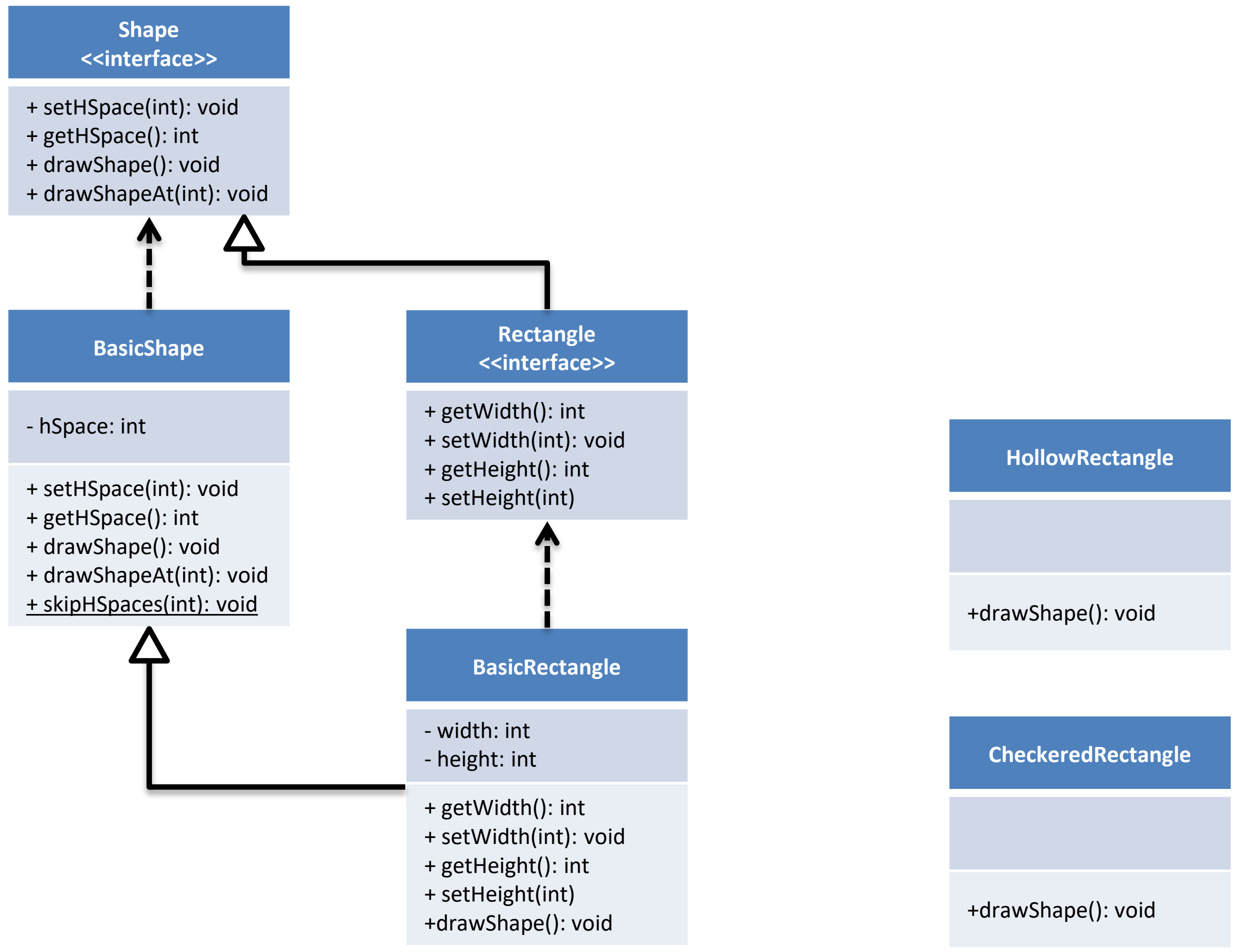

File
Edit
View
Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void

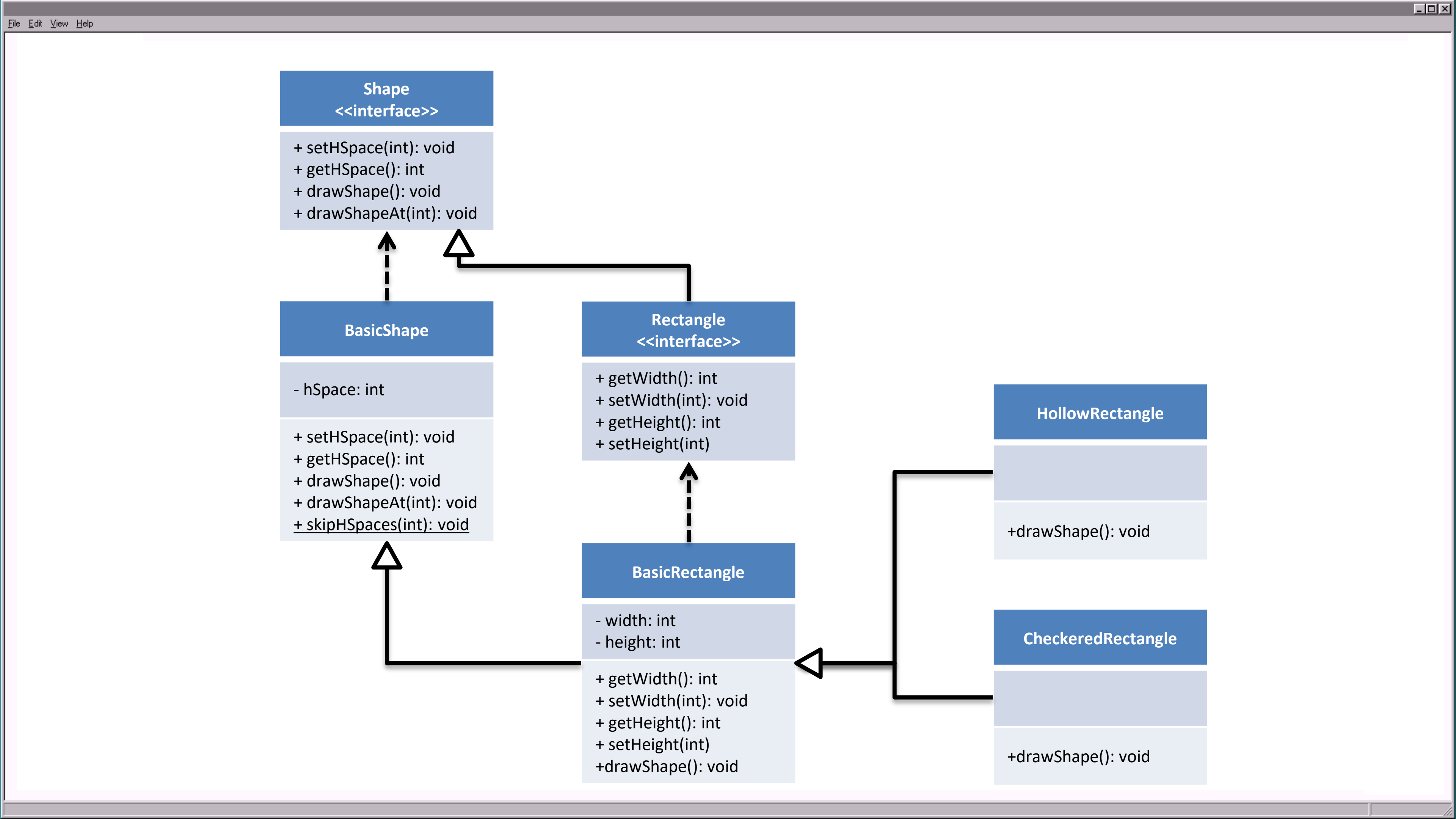

File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void


File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
"implements"
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
"extends"

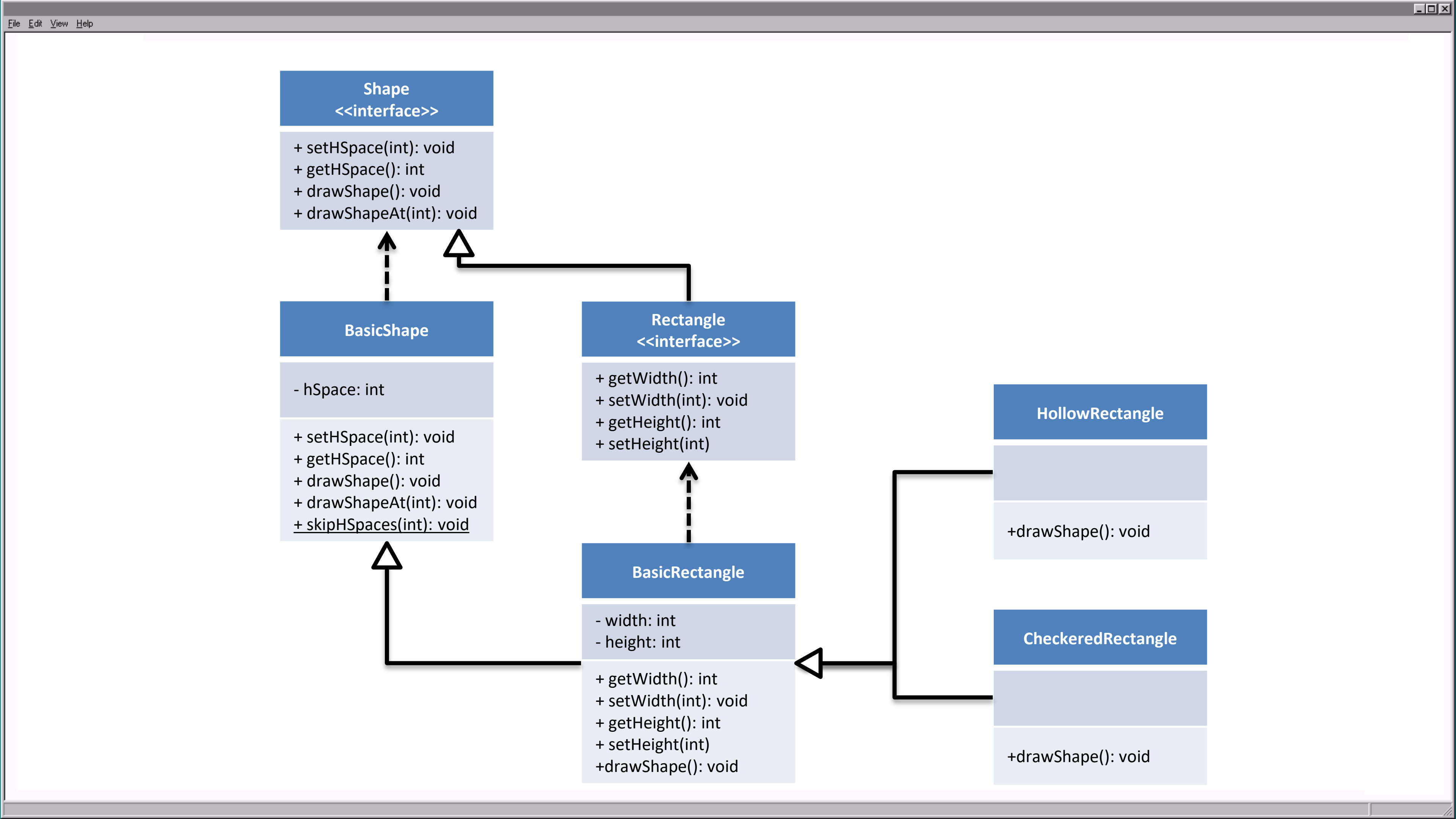
File
Edit
View
Help

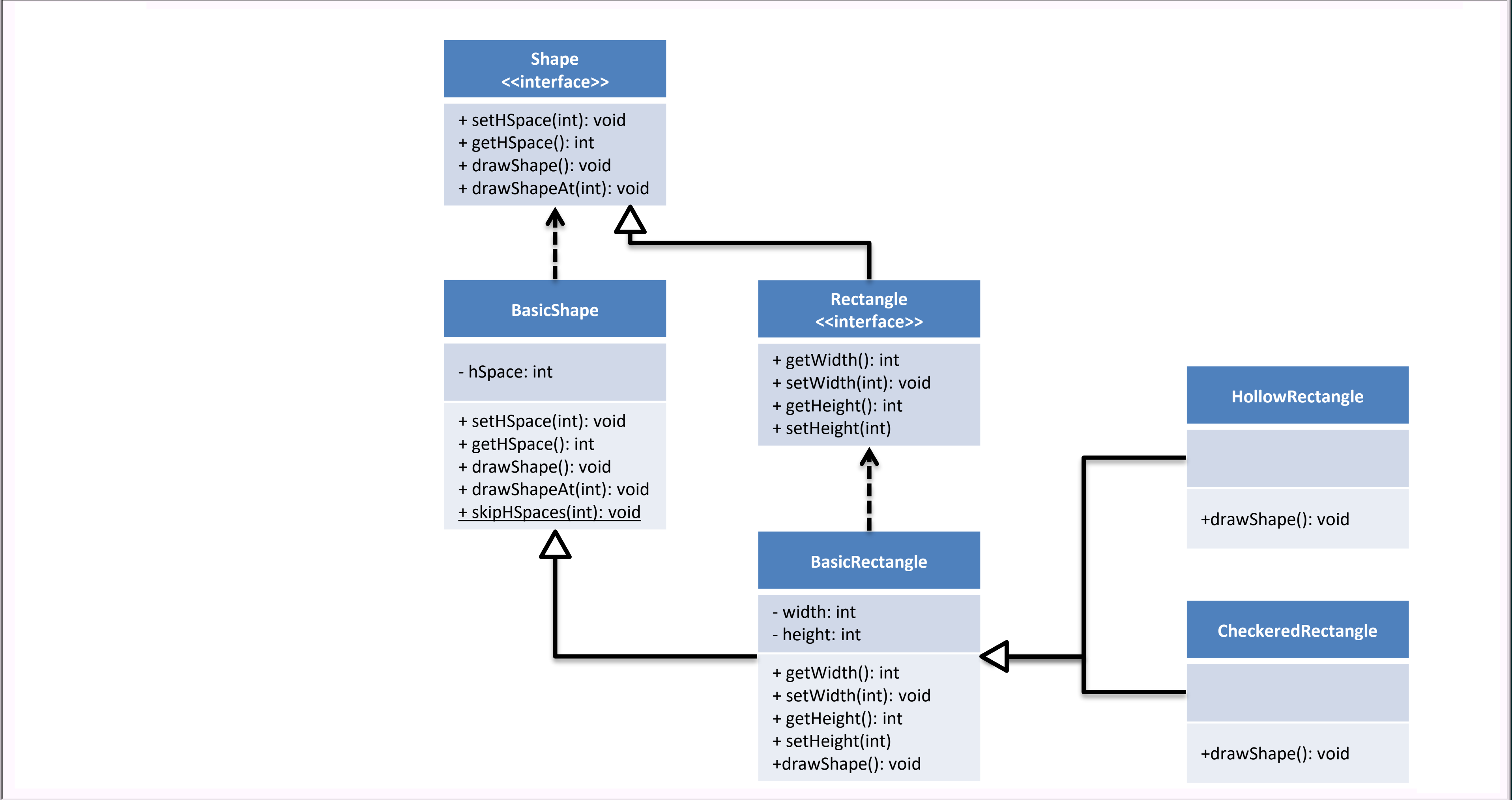

File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void

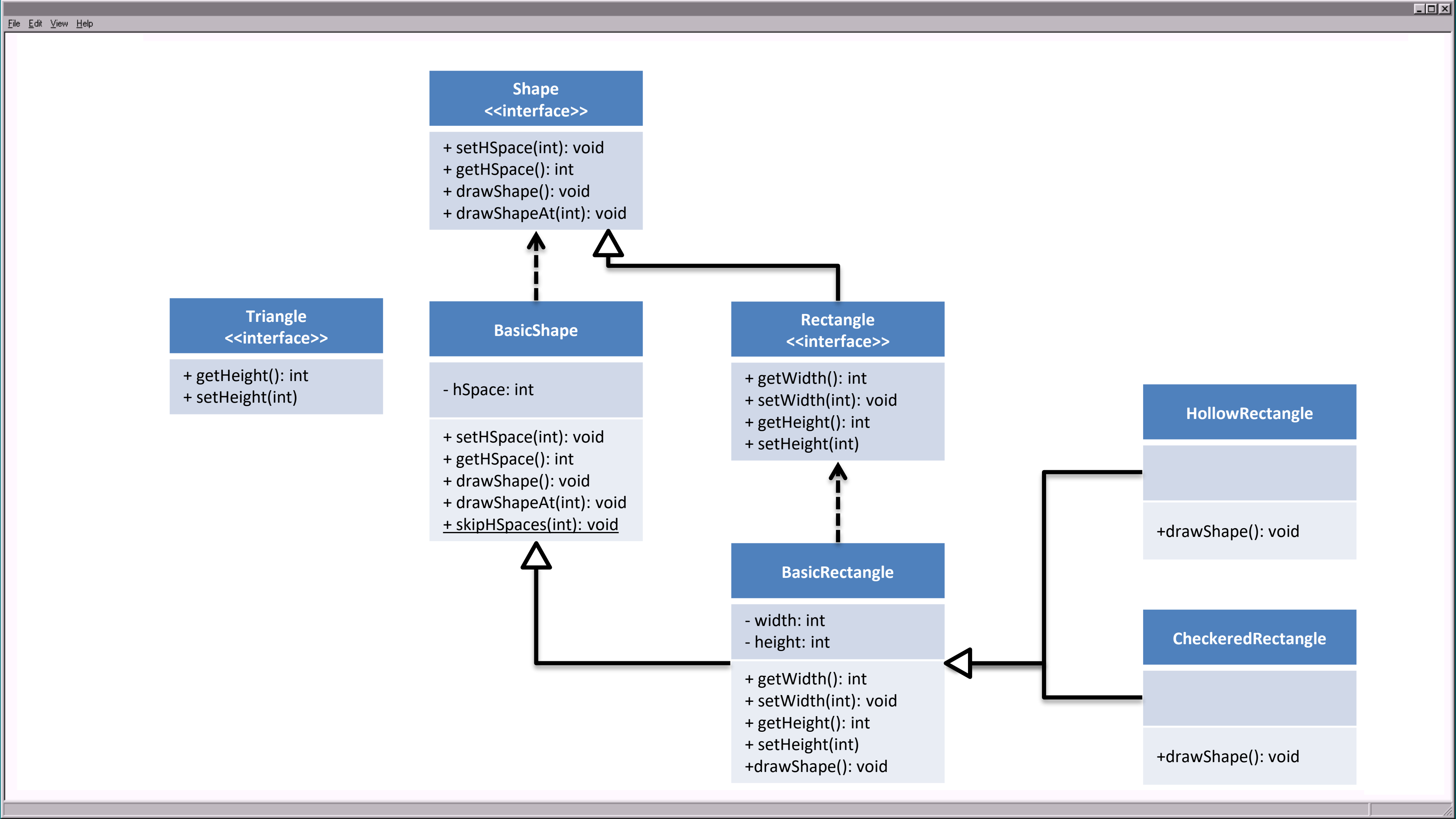

File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
HollowRectangle
+drawShape(): void
CheckeredRectangle
+drawShape(): void


File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
HollowRectangle
+drawShape(): void
CheckeredRectangle
+drawShape(): void

File
Edit
View
Help


File
Edit
View
Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
HollowRectangle
+drawShape(): void
CheckeredRectangle
+drawShape(): void


File
Edit
View
Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
HollowRectangle
+drawShape(): void
CheckeredRectangle
+drawShape(): void



Shape
<<interface>>

+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void

Triangle
<<interface>>

+ getHeight(): int
+ setHeight(int)

BasicShape

- hSpace: int

+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
<u>+ skipHSpaces(int): void</u>

Rectangle
<<interface>>

+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)

BasicRectangle

- width: int
- height: int

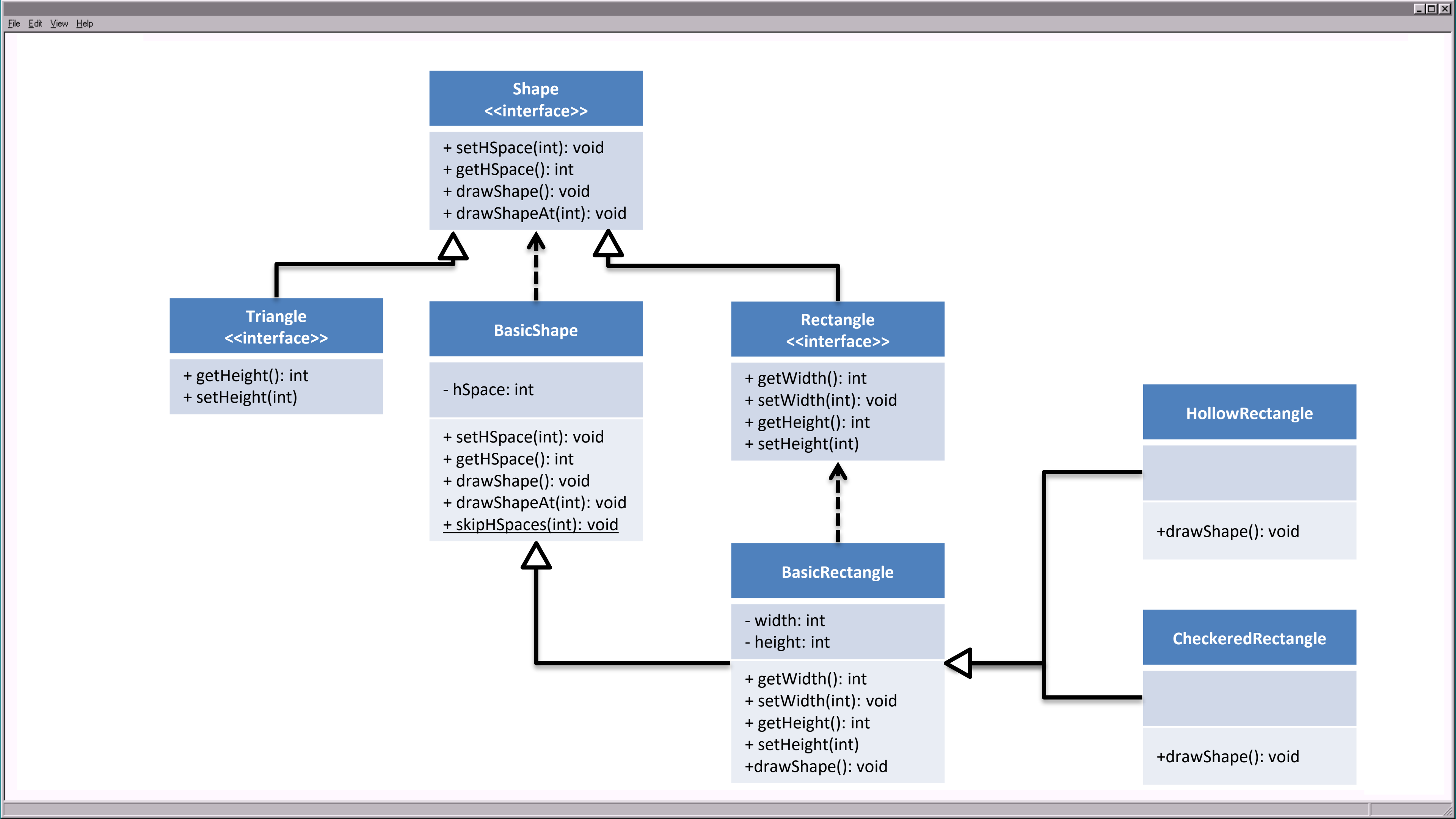
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void

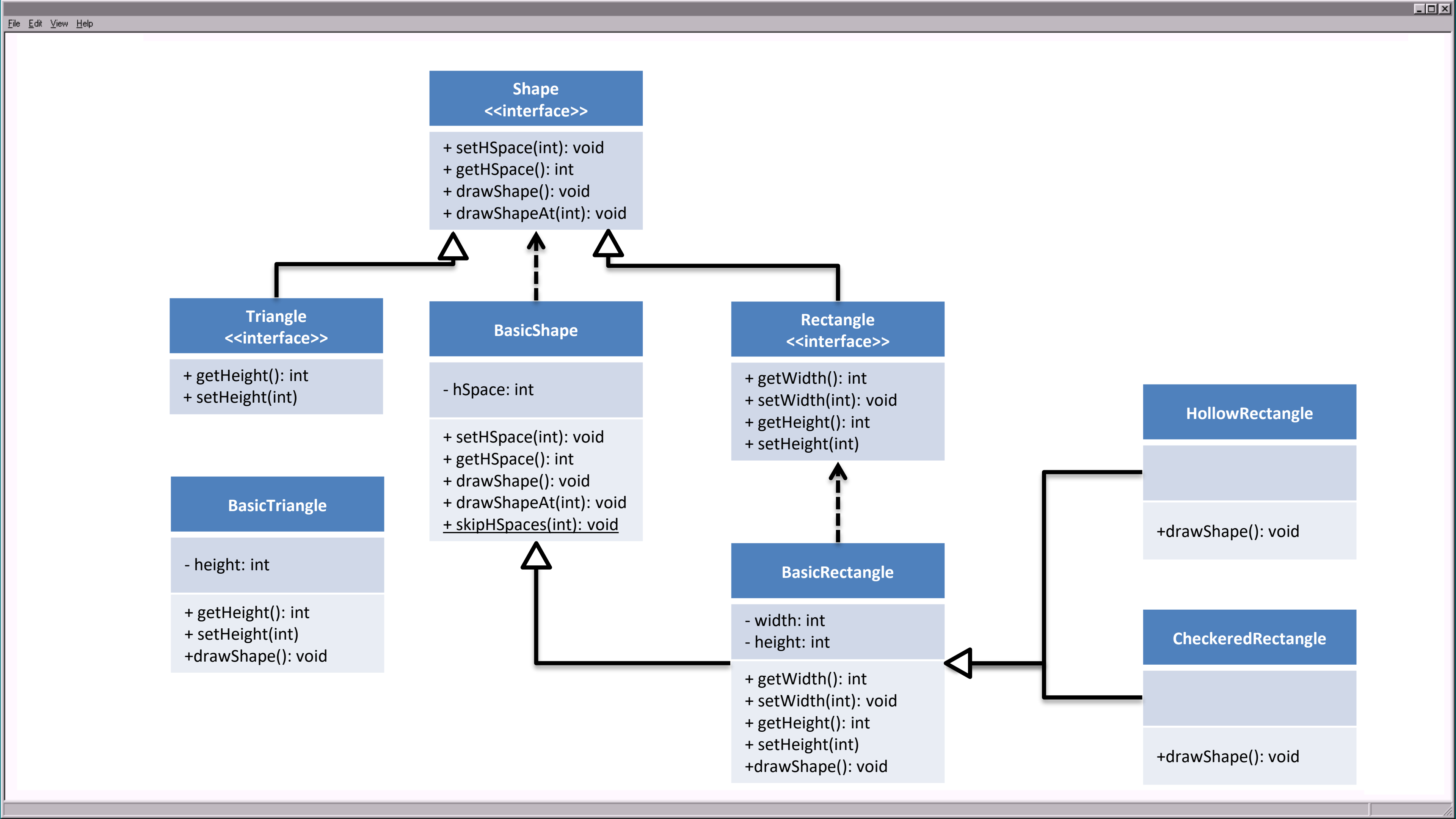
HollowRectangle

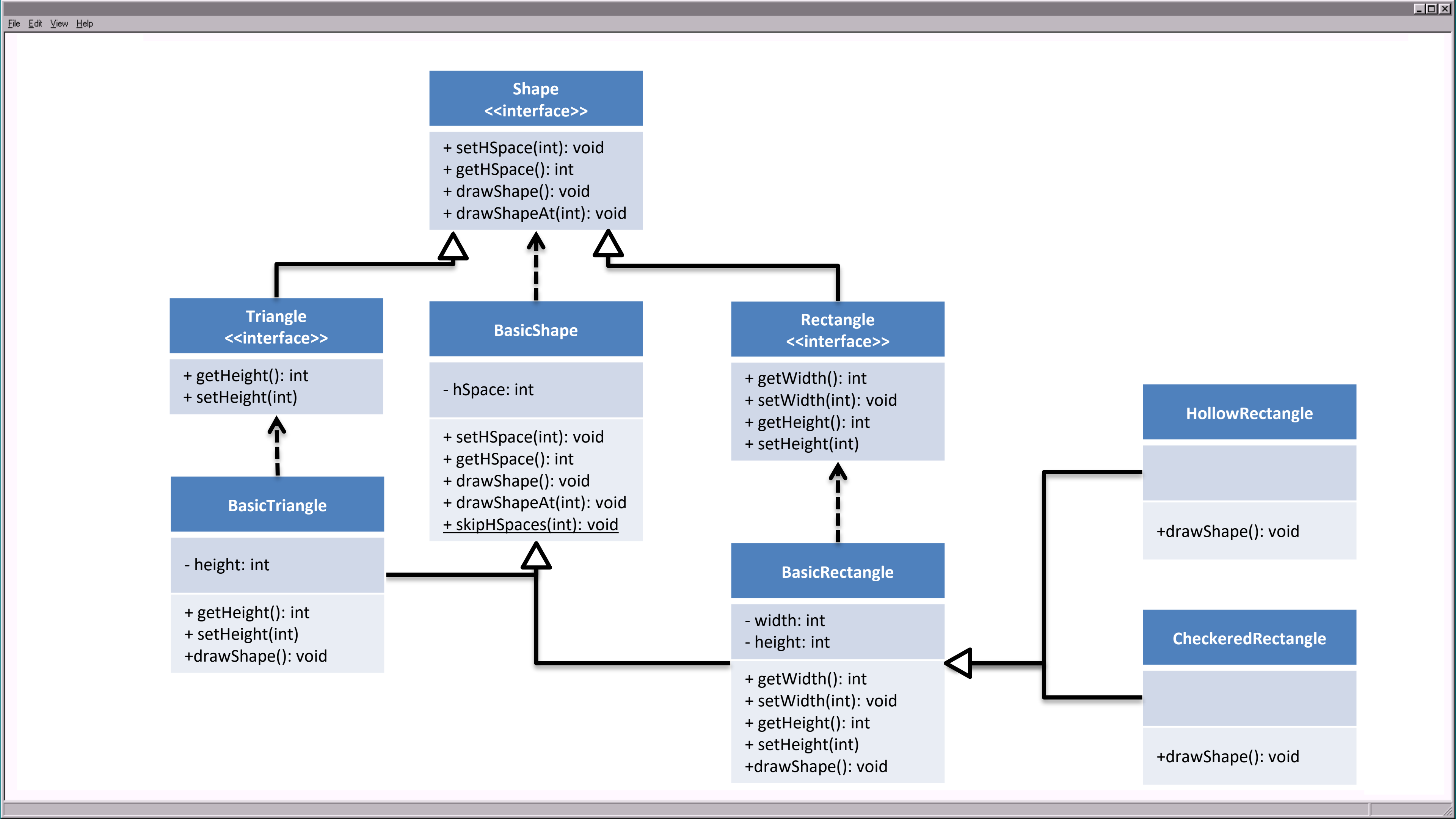
+drawShape(): void

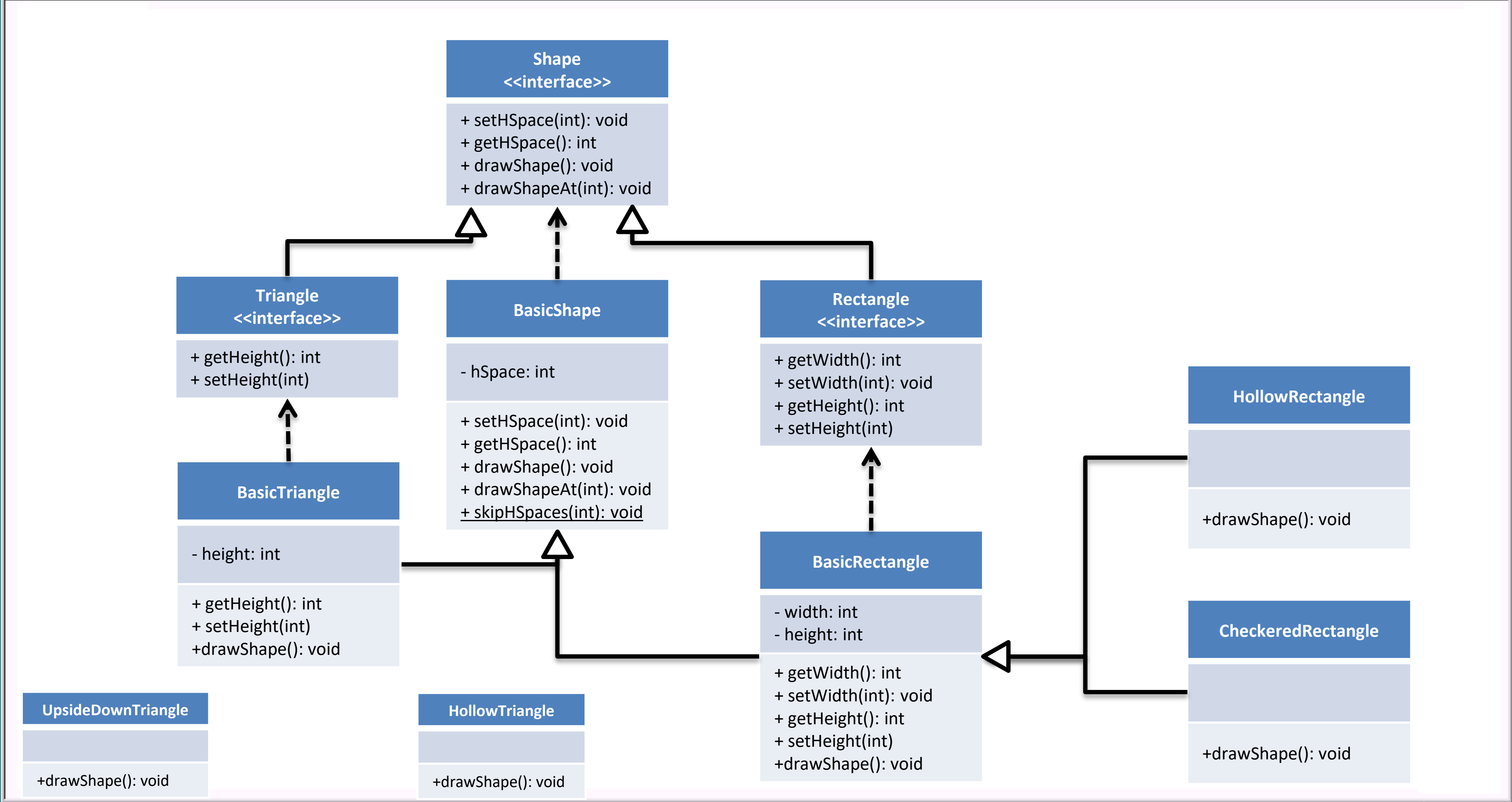
CheckeredRectangle

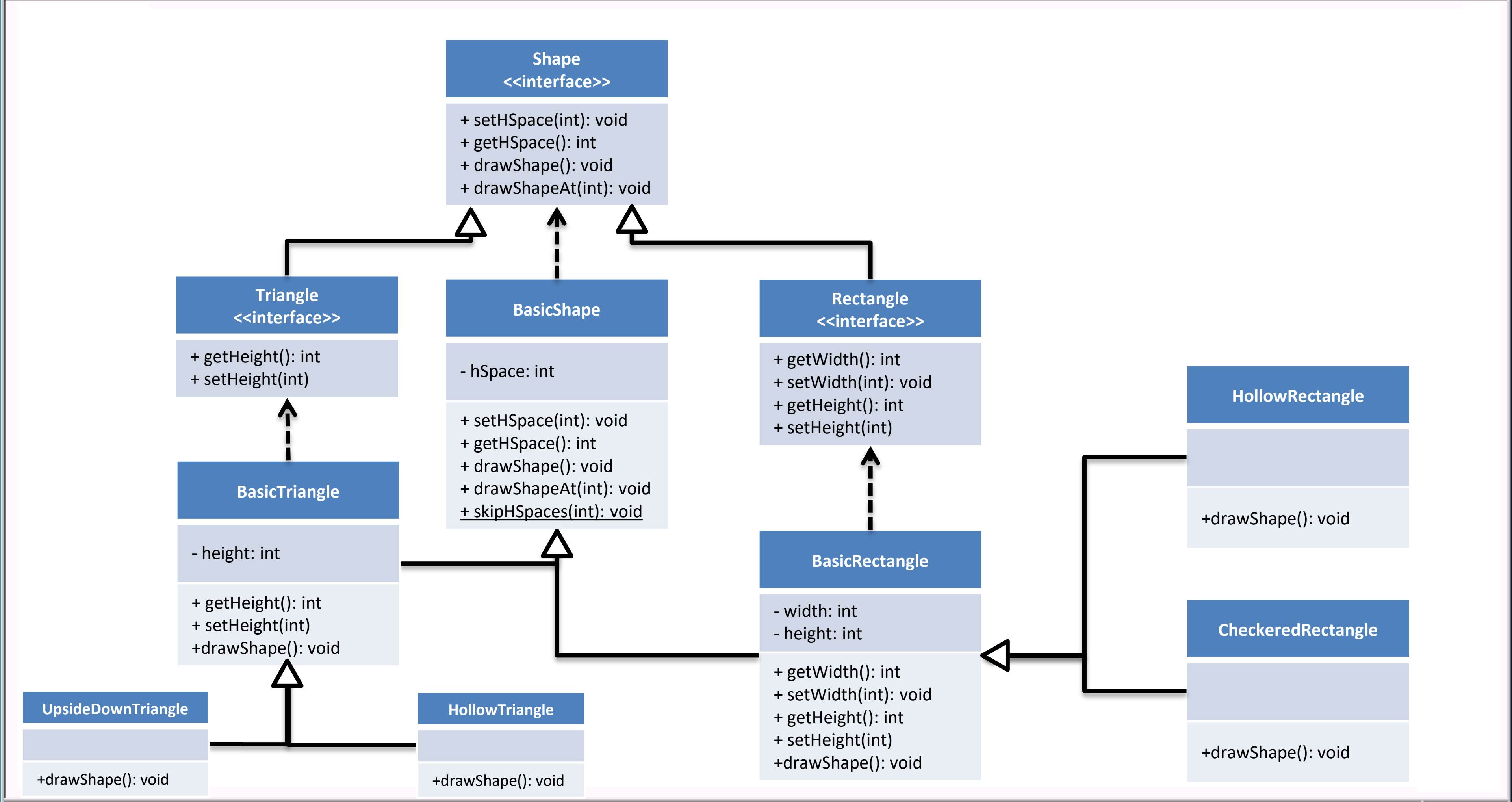
+drawShape(): void


File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
Triangle
<<interface>>
+ getHeight(): int
+ setHeight(int)
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
HollowRectangle
+drawShape(): void
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
CheckeredRectangle
+drawShape(): void


File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
Triangle
<<interface>>
+ getHeight(): int
+ setHeight(int)
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
HollowRectangle
+drawShape(): void
BasicTriangle
- height: int
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
CheckeredRectangle
+drawShape(): void


File
Edit
View
Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
Triangle
<<interface>>
+ getHeight(): int
+ setHeight(int)
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
HollowRectangle
+drawShape(): void
BasicTriangle
- height: int
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
CheckeredRectangle
+drawShape(): void


File Edit View Help
Shape <<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
Triangle <<interface>>
+ getHeight(): int
+ setHeight(int)
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle <<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
HollowRectangle
+drawShape(): void
BasicTriangle
- height: int
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
CheckeredRectangle
+drawShape(): void
UpsideDownTriangle
+drawShape(): void
HollowTriangle
+drawShape(): void



Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void

Triangle
<<interface>>
+ getHeight(): int
+ setHeight(int)

BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
<u>+ skipHSpaces(int): void</u>

Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)

HollowRectangle
+drawShape(): void

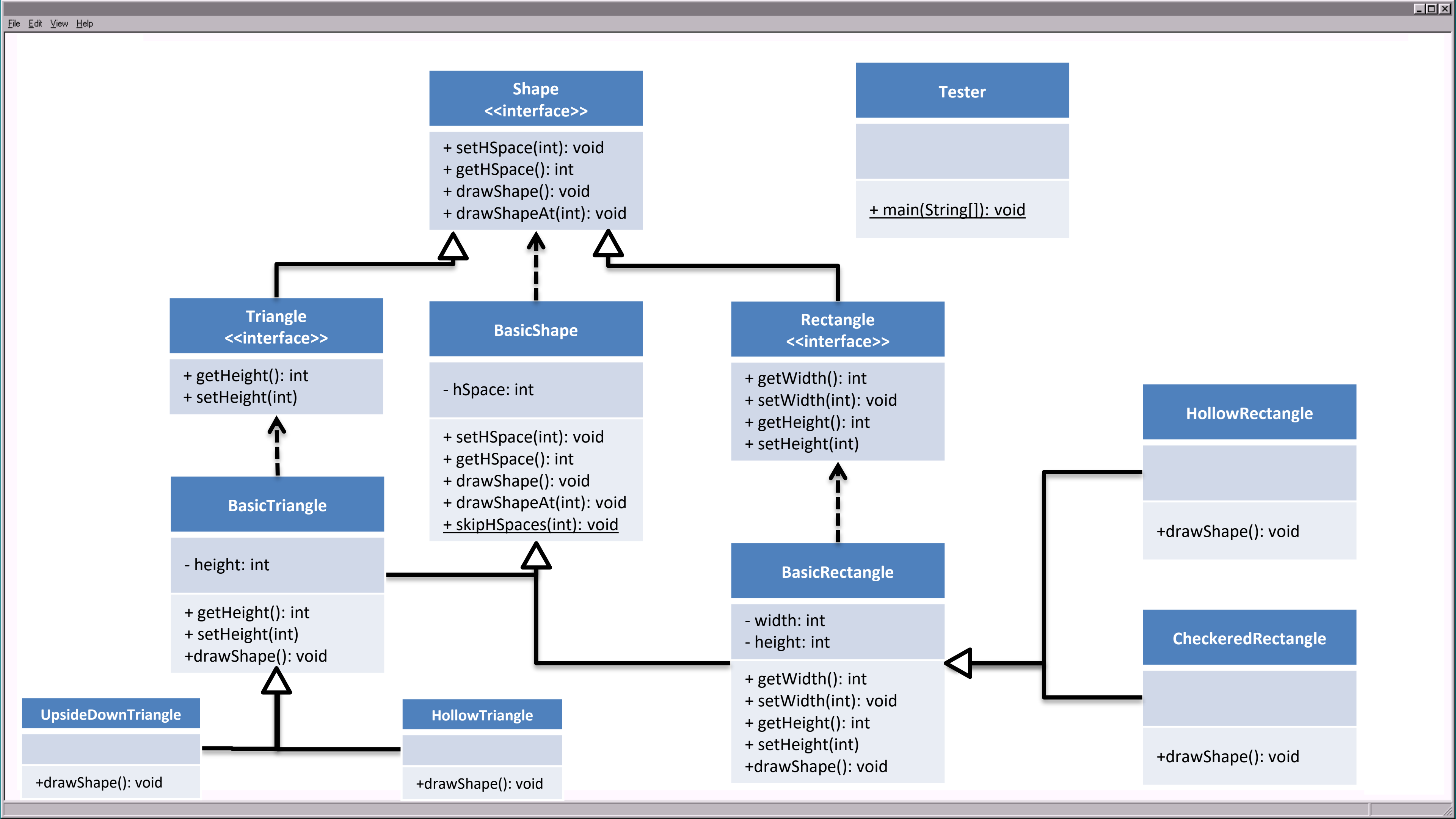
BasicTriangle
- height: int
+ getHeight(): int
+ setHeight(int)
+drawShape(): void

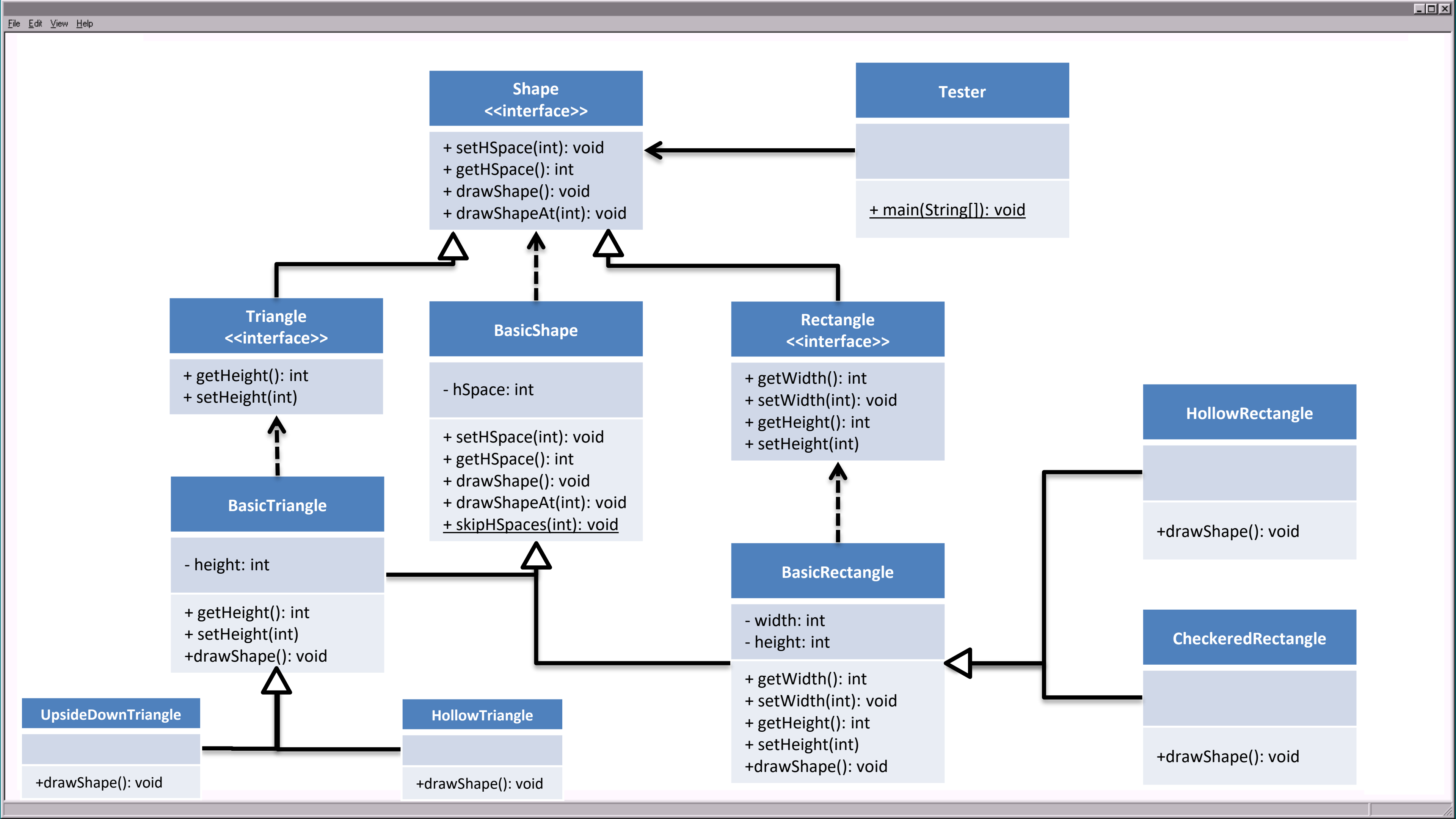
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void

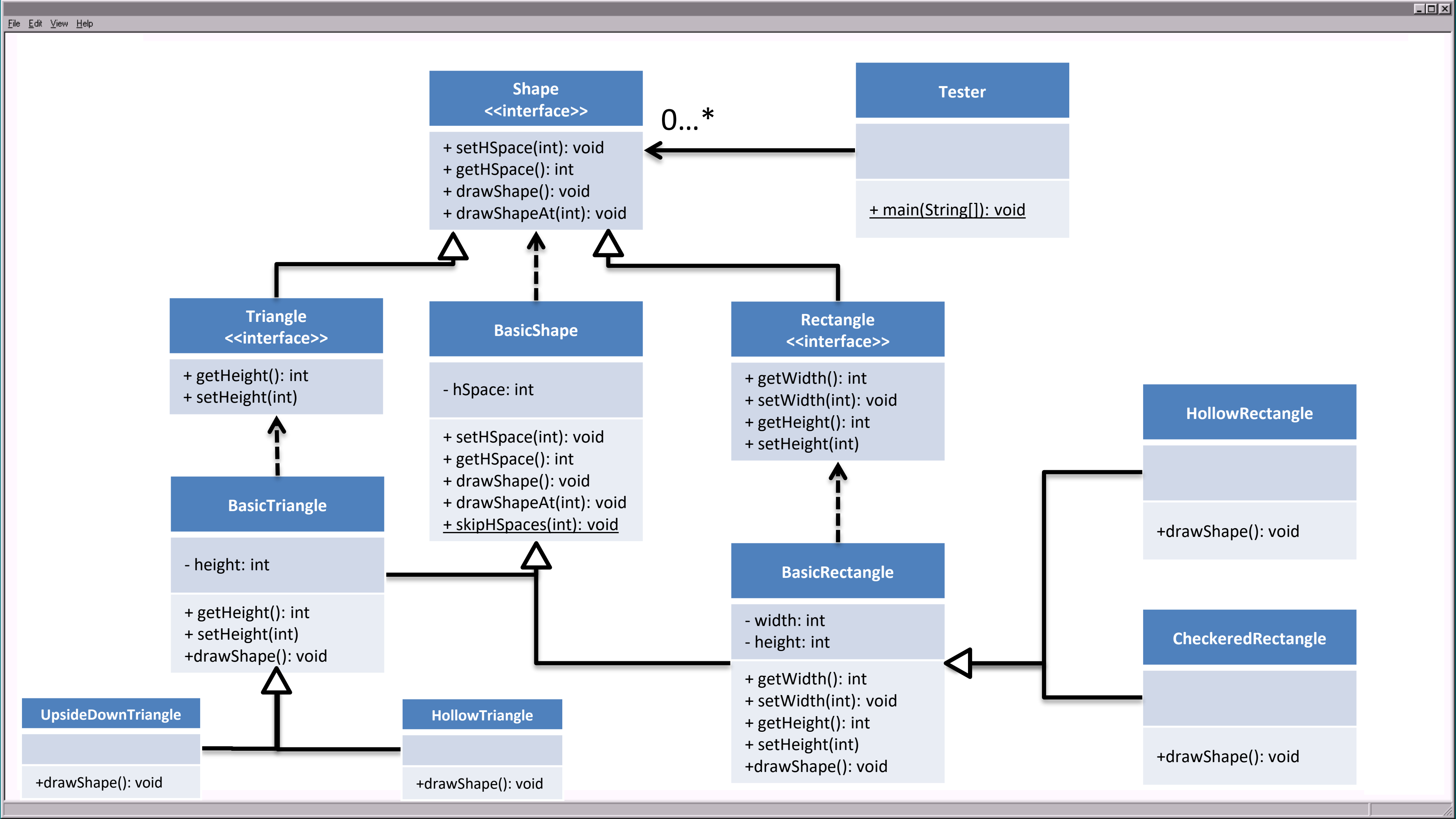
CheckeredRectangle
+drawShape(): void

UpsideDownTriangle
+drawShape(): void

HollowTriangle
+drawShape(): void


File
Edit
View
Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
Tester
+ main(String[]): void
Triangle
<<interface>>
+ getHeight(): int
+ setHeight(int)
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
HollowRectangle
+drawShape(): void
BasicTriangle
- height: int
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
CheckeredRectangle
+drawShape(): void
UpsideDownTriangle
+drawShape(): void
HollowTriangle
+drawShape(): void

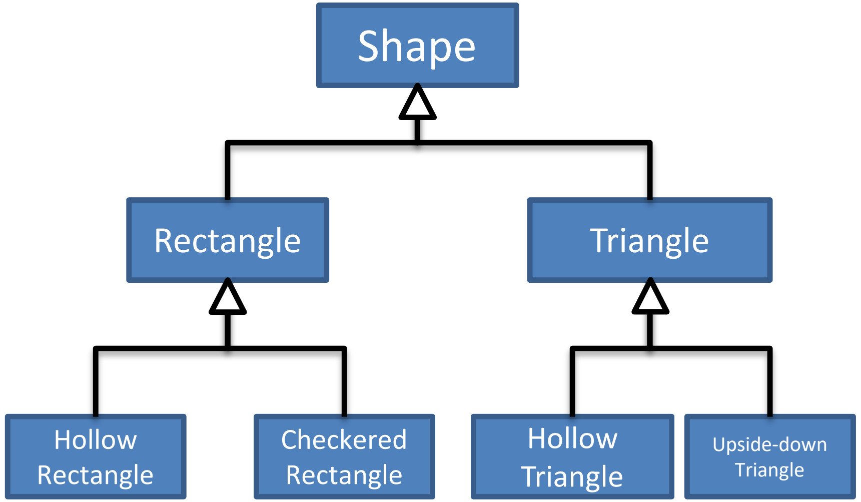

File Edit View Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
Tester
+ main(String[]): void
Triangle
<<interface>>
+ getHeight(): int
+ setHeight(int)
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
HollowRectangle
+drawShape(): void
BasicTriangle
- height: int
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
CheckeredRectangle
+drawShape(): void
UpsideDownTriangle
+drawShape(): void
HollowTriangle
+drawShape(): void


File
Edit
View
Help
Shape
<<interface>>
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
Tester
+ main(String[]): void
0...*
Triangle
<<interface>>
+ getHeight(): int
+ setHeight(int)
BasicShape
- hSpace: int
+ setHSpace(int): void
+ getHSpace(): int
+ drawShape(): void
+ drawShapeAt(int): void
+ skipHSpaces(int): void
Rectangle
<<interface>>
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
HollowRectangle
+drawShape(): void
BasicTriangle
- height: int
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
BasicRectangle
- width: int
- height: int
+ getWidth(): int
+ setWidth(int): void
+ getHeight(): int
+ setHeight(int)
+drawShape(): void
CheckeredRectangle
+drawShape(): void
UpsideDownTriangle
+drawShape(): void
HollowTriangle
+drawShape(): void

Polymorphism

- Keep in mind
  - Classes *extends* Classes
  - Interfaces *extends* Interfaces
  - Classes *implements* Interfaces
- In Java, classes can implement several interfaces but only extend one other class
  - Extends first followed by Implements
  - Each interface that is implemented is separated by a comma
- Polymorphism allows software to be very *extensible*

Polymorphism Concept


Shape
Rectangle
Triangle
Hollow Rectangle
Checkered Rectangle
Hollow Triangle
Upside-down Triangle