National University of San Agustin
System Engineer School

TO - Lab 05 - Composition vs Inheritance

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1 Composition

Commonly is defined as the generation of objects through the composition of one or more objects to achieve more functionality, some other ideas tell us that:

- Black box reuse: we don't know how an object perform its task, only we are interested in using it. e.g. The String Java Class is class that we use to perform some string task, but the algorithms and internal code it use is totally hide for us, also we use it to compose another objects, and don't forget that in the java documentation for String this is final, so none inheritances is permitted.
- Requires well defined interfaces.
- Dynamic: Defined on execution time. e.g We can't extend String class so the only way to use it is through objects or instances on execution time.

2 Inheritance

Throughout the course we have dealing with inheritance, remember that in C++ language all the OOP designs are performed by inheritance but in Java or Python we use some keywords to perform that like extends, ABC or implements. We must describe that:

- White box reuse: we know all the implementation of the class we are trying to extend, this breaks encapsulation exposing all the code to the subclasses.

- Static: It is performed at compilation time, this way the compiler builds the inheritance and checking all the requirements of encapsulation and protection.

3 Warm up

Try to extend QString class from Qt, String class from Java and string class from std c++, what is the behavior?. See the next code:

```
public class Person{
   public void work(){

   }
   public void study(){

   }
}


public class Worker extends Person{


}

public class Student extends Person{

}
```

We observe that Person encapsulates more than one behavior, now see the next code:

```
public interface Worker{
   void work();
}

public interface Student{
   void study();
}


public class Teacher implements Worker{

}

public class CollegeStudent implements Student{

}
```

Which is better? Why? What principles of OOP (see the practice 04) it accomplish? Which one correspond to inheritance and which other to composition? Why?

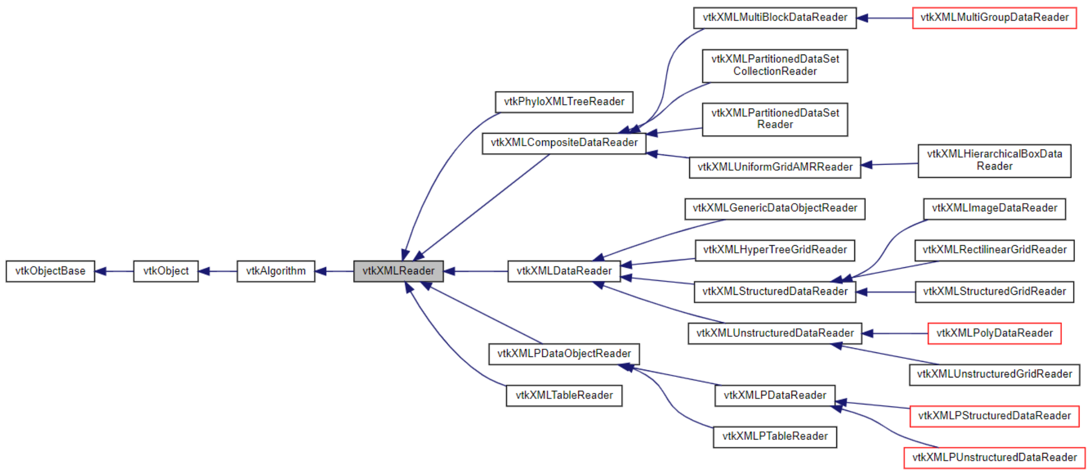
vtkObjectBase
vtkObject
vtkAlgorithm
vtkXMLReader
vtkPhyloXMLTreeReader
vtkXMLCompositeDataReader
vtkXMLDataReader
vtkXMLPDataObjectReader
vtkXMLTableReader
vtkXMLMultiBlockDataReader
vtkXMLMultiGroupDataReader
vtkXMLPartitionedDataSet CollectionReader
vtkXMLPartitionedDataSet Reader
vtkXMLUniformGridAMRReader
vtkXMLHierarchicalBoxData Reader
vtkXMLGenericDataObjectReader
vtkXMLHyperTreeGridReader
vtkXMLStructuredDataReader
vtkXMLUnstructuredDataReader
vtkXMLImageDataReader
vtkXMLRectilinearGridReader
vtkXMLStructuredGridReader
vtkXMLPolyDataReader
vtkXMLUnstructuredGridReader
vtkXMLPDataReader
vtkXMLPTableReader
vtkXMLPStructuredDataReader
vtkXMLPUnstructuredDataReader

Figure 4.1: Inheritance diagram for the data format from VTK

4 To do

Try to implement all the code suggested here, show the program for both codes and analyze which one give you more flexibility and show more OO principles. Now for this task you will need to use all your skills, we will using the Visualization Toolkit library, the only think you have to do is read and visualize a data file from the different formats that VTK brings, you can start running some of these examples VTK Samples, VTK is a native C++ library so there are more examples in this languages, you can start with VtkXMLImageDataReader from the schema showed on Figure 4.1.

5 Deep inside

This section is just for anyone who wants to make a deep inside into the theory and like challenges[1], you will have to prepare a presentation of just 5 minutes to explain and run the code, then you will have to defend yourself another five minutes of questions. I want that all students benefit from your presentation, remember that we are here to learn. If you want to do this please email to cportugalz@unsa.edu.pe

6 Deadline

This report will be qualified in the next class. Remember that plagiarism will be punished. All question and doubts must be done to the email.

[1]This must not be included into the report