Composition

In this lesson, we'll learn how can we achieve composition in C++.

WE'LL COVER THE FOLLOWING

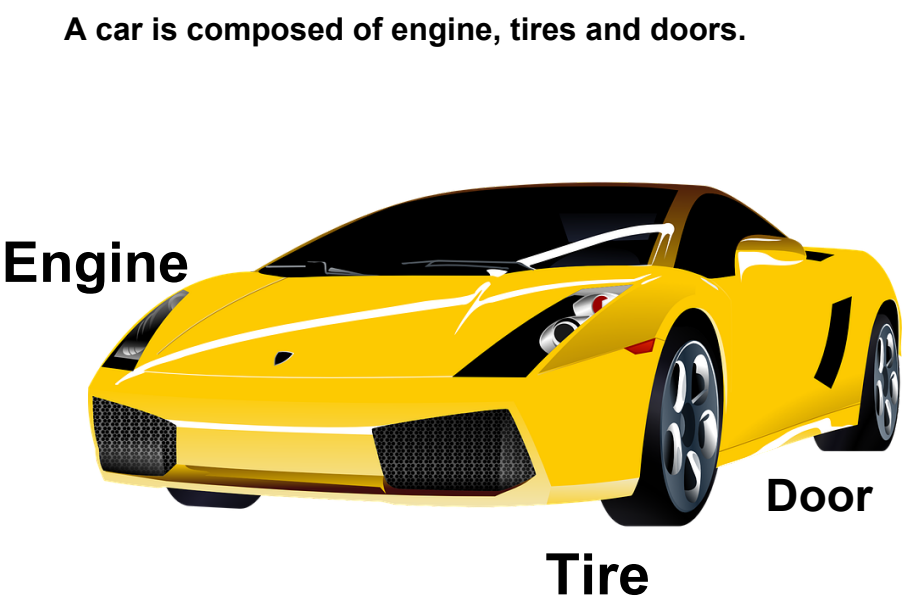
`Composition` is accessing other classes objects in your class and *owner* class owns the object and is responsible for its lifetime. Composition relationships are **Part-of** relationships where the part must constitute part of the whole object. We can achieve composition by adding smaller parts of other classes to make a complex unit.

So, what makes composition unique?

> In composition, the lifetime of the owned object depends on the lifetime of the owner.

Example

A `car` is composed of an *engine*, *tires*, and *doors*. In this case, a `Car` owned these objects so a `Car` is an *Owner* class and `tires`, `doors` and `engine` classes are *Owned* classes.

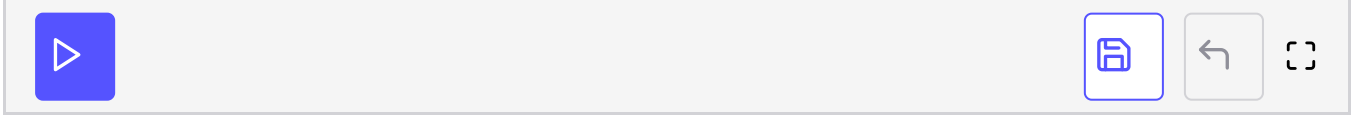


Implementation

Let's look at the implementation of `Car` class for better understanding:

```
#include <iostream>
using namespace std;

class Engine{
  int capacity;

  public:
  Engine(){
    capacity = 0;
  }

  Engine(int cap) {
    capacity = cap;
  }

  void Engine_details() {
    cout << "Engine details: " << capacity << endl;
  }
};

class Tires{
  int No_of_tires;

  public:
  Tires(){
    No_of_tires = 0;
  }
```

```
  Tires(int nt) {
    No_of_tires = nt;
  }

  void Tire_details() {
    cout << "Number of tyres: " << No_of_tires << endl;
  }
};

class Doors{
  int No_of_doors;

  public:
  Doors(){
    No_of_doors = 0;
  }

  Doors(int nod) {
    No_of_doors = nod;
  }

  void Door_details() {
    cout << "Number of Doors: " << No_of_doors << endl;
  }
};

class Car{
  Engine Eobj;
  Tires Tobj;
  Doors Dobj;
  string color;

  public:
  Car(Engine eng, Tires tr, int dr, string col)
    : Eobj(eng), Tobj(tr), Dobj(dr){

    color = col;
  }

  void Car_detail(){
    Eobj.Engine_details();
    Tobj.Tire_details();
    Dobj.Door_details();
    cout << "Car color: " << color << endl;
  }
};

int main(){
  Engine Eobj(1600);
  Tires Tobj(4);
  Doors Dobj(4);
  Car Cobj(Eobj, Tobj, 4, "Black");
  Cobj.Car_detail();
}
```



We have created a `Car` class which contains the objects of `Engine`, `Tires` and

`Doors` classes. `Car` class owns the objects and is responsible for their lifetime. When Car dies, so does *tire*, *engine* and *doors* too.

In the next lesson, we'll learn about **Aggregation**, the very important concept in C++.