Ask a Question

SOLID: Liskov Substitution Principle

Explore the Liskov Substitution Principle and how it guides the use of inheritance.

We'll cover the following ∧

- Introduction
- The Vehicle class
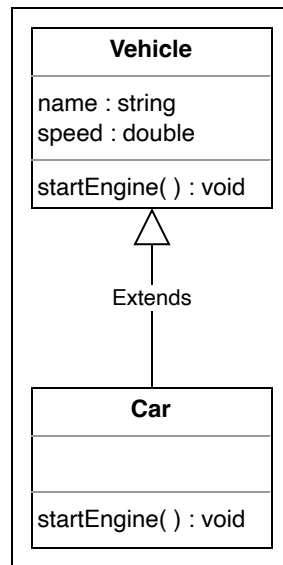 - Violation
  - Solution
- Conclusion

Introduction

The **Liskov Substitution Principle (LSP)** is one of the fundamental design principles of object-oriented design. The LSP helps guide the use of inheritance in design so that the application does not break. It states that the objects of a subclass should behave the same way as the objects of the superclass, such that they are replaceable. This rule generally applies to abstraction concepts like inheritance and polymorphism.

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The Vehicle class

Let's construct a simple class called `Vehicle` that has some attributes and methods and a subclass `Car` that extends it as shown below:
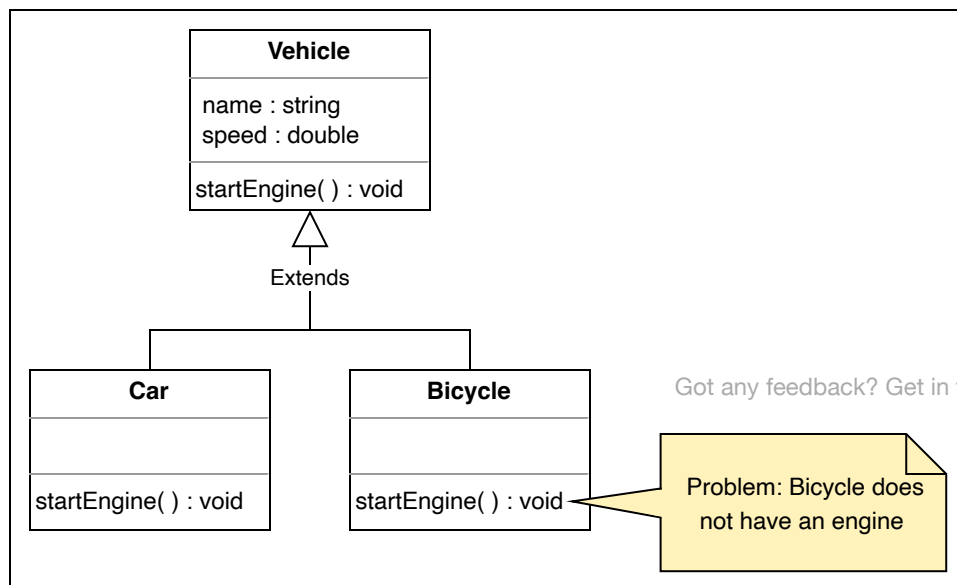
![educative logo]

So far, this implementation seems right since a car IS A vehicle, and the `startEngine()` method will override the superclass method. However, it's not as simple as it looks.

Violation

Let's add a `Bicycle` subclass in this system and see what happens:

Violation of the LSP

This results in a problem. A bicycle is a vehicle, but it does not have an engine. Therefore, the `Bicycle` class should not be allowed to override the `startEngine()` method.

Solution

A possible fix to this issue would be to add two subclasses of `Vehicle` that classify the vehicles as motorized vehicles and manual vehicles as follows:
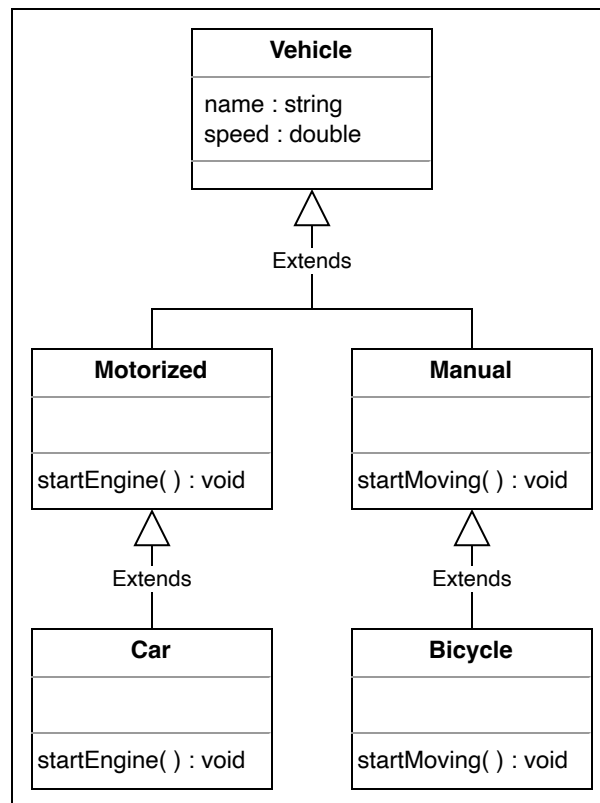
An example of the LSP implementation

With this implementation, we have satisfied the LSP.

- `Car` is substitutable with its superclass, `Motorized`, and `Bicycle` is substitutable with its superclass, `Manual`, without breaking the functionality
- Their methods can also override the methods of the superclass.

Conclusion

The LSP is an important principle that should be extended to the level of system architecture. A small violation of the substitutability of classes can cause the system to break down, which is why we should always be on the lookout for violations. A few benefits of the LSP are provided below:

- It avoids the generalization of concepts that may not be needed in the future.

- It makes the code maintainable and easier to upgrade.

Now that we have learned about the Liskov Substitution Principle, let's look at the Interface Segregation Principle in the next lesson.

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