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Design Patterns: Elements of Reusable Object-Oriented Software (1994) is a software engineering book describing software design patterns. The book was

Design Patterns: Elements of Reusable Object-Oriented Software (1994) is a software engineering book describing software design patterns. The book was written by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, with a foreword by Grady Booch. The book is divided into two parts, with the first two chapters exploring the capabilities and pitfalls of object-oriented programming, and the remaining chapters describing 23 classic software design patterns. The book includes examples in C++ and Smalltalk.

It has been influential to the field of software engineering and is regarded as an important source for object-oriented design theory and practice. More than 500,000 copies have been sold in English and in 13 other languages. The authors are often referred to as the Gang of Four (GoF).

Software design pattern

Reusing design patterns can help to prevent such issues, and enhance code readability for those familiar with the patterns. Software design techniques

In software engineering, a software design pattern or design pattern is a general, reusable solution to a commonly occurring problem in many contexts in software design. A design pattern is not a rigid structure to be transplanted directly into source code. Rather, it is a description or a template for solving a particular type of problem that can be deployed in many different situations. Design patterns can be viewed as formalized best practices that the programmer may use to solve common problems when designing a software application or system.

Object-oriented design patterns typically show relationships and interactions between classes or objects, without specifying the final application classes or objects that are involved. Patterns that imply mutable state may be unsuited for functional programming languages. Some patterns can be rendered unnecessary in languages that have built-in support for solving the problem they are trying to solve, and object-oriented patterns are not necessarily suitable for non-object-oriented languages.

Design patterns may be viewed as a structured approach to computer programming intermediate between the levels of a programming paradigm and a concrete algorithm.

Design pattern

interaction design / human–computer interaction Pedagogical patterns, in teaching Pattern gardening, in gardening Business models also have design patterns. See

A design pattern is the re-usable form of a solution to a design problem. The idea was introduced by the architect Christopher Alexander and has been adapted for various other disciplines, particularly software engineering.

Visitor pattern

Visitor design pattern is one of the twenty-three well-known Gang of Four design patterns that describe how to solve recurring design problems to design flexible

A visitor pattern is a software design pattern that separates the algorithm from the object structure. Because of this separation, new operations can be added to existing object structures without modifying the structures. It is one way to follow the open/closed principle in object-oriented programming and software engineering.

In essence, the visitor allows adding new virtual functions to a family of classes, without modifying the classes. Instead, a visitor class is created that implements all of the appropriate specializations of the virtual function. The visitor takes the instance reference as input, and implements the goal through double dispatch.

Programming languages with sum types and pattern matching obviate many of the benefits of the visitor pattern, as the visitor class is able to both easily branch on the type of the object and generate a compiler error if a new object type is defined which the visitor does not yet handle.

Strategy pattern

26, 2002). *"Strategy for success"*. *Java Design Patterns*. *JavaWorld*. Retrieved 2020-07-20. *Strategy Pattern for C article Refactoring: Replace Type Code*

In computer programming, the strategy pattern (also known as the policy pattern) is a behavioral software design pattern that enables selecting an algorithm at runtime. Instead of implementing a single algorithm directly, code receives runtime instructions as to which in a family of algorithms to use.

Strategy lets the algorithm vary independently from clients that use it. Strategy is one of the patterns included in the influential book *Design Patterns* by Gamma et al. that popularized the concept of using design patterns to describe how to design flexible and reusable object-oriented software. Deferring the decision about which algorithm to use until runtime allows the calling code to be more flexible and reusable.

For instance, a class that performs validation on incoming data may use the strategy pattern to select a validation algorithm depending on the type of data, the source of the data, user choice, or other discriminating factors. These factors are not known until runtime and may require radically different validation to be performed. The validation algorithms (strategies), encapsulated separately from the validating object, may be used by other validating objects in different areas of the system (or even different systems) without code duplication.

Typically, the strategy pattern stores a reference to code in a data structure and retrieves it. This can be achieved by mechanisms such as the native function pointer, the first-class function, classes or class instances in object-oriented programming languages, or accessing the language implementation's internal storage of code via reflection.

Pattern

type of pattern formed of repeating geometric shapes and typically repeated like a wallpaper design. Any of the senses may directly observe patterns. Conversely

A pattern is a regularity in the world, in human-made design, or in abstract ideas. As such, the elements of a pattern repeat in a predictable and logical manner. There exists countless kinds of unclassified patterns, present in everyday nature, fashion, many artistic areas, as well as a connection with mathematics. A geometric pattern is a type of pattern formed of repeating geometric shapes and typically repeated like a wallpaper design.

Any of the senses may directly observe patterns. Conversely, abstract patterns in science, mathematics, or language may be observable only by analysis. Direct observation in practice means seeing visual patterns, which are widespread in nature and in art. Visual patterns in nature are often chaotic, rarely exactly repeating, and often involve fractals. Natural patterns include spirals, meanders, waves, foams, tilings, cracks, and those created by symmetries of rotation and reflection. Patterns have an underlying mathematical structure; indeed,

mathematics can be seen as the search for regularities, and the output of any function is a mathematical pattern. Similarly in the sciences, theories explain and predict regularities in the world.

In many areas of the decorative arts, from ceramics and textiles to wallpaper, "pattern" is used for an ornamental design that is manufactured, perhaps for many different shapes of object. In art and architecture, decorations or visual motifs may be combined and repeated to form patterns designed to have a chosen effect on the viewer.

Builder pattern

23 classic design patterns described in the book Design Patterns and is sub-categorized as a creational pattern. The builder design pattern solves problems

The builder pattern is a design pattern that provides a flexible solution to various object creation problems in object-oriented programming. The builder pattern separates the construction of a complex object from its representation. It is one of the 23 classic design patterns described in the book Design Patterns and is sub-categorized as a creational pattern.

Factory method pattern

overridden by subclasses. It is one of the 23 classic design patterns described in the book Design Patterns (often referred to as the "Gang of Four" or simply

In object-oriented programming, the factory method pattern is a design pattern that uses factory methods to deal with the problem of creating objects without having to specify their exact classes. Rather than by calling a constructor, this is accomplished by invoking a factory method to create an object. Factory methods can be specified in an interface and implemented by subclasses or implemented in a base class and optionally overridden by subclasses. It is one of the 23 classic design patterns described in the book Design Patterns (often referred to as the "Gang of Four" or simply "GoF") and is subcategorized as a creational pattern.

Dark pattern

created a tip line to collect information about dark patterns from the public. Bait-and-switch patterns advertise a free (or at a greatly reduced price) product

A dark pattern (also known as a "deceptive design pattern") is a user interface that has been carefully crafted to trick users into doing things, such as buying overpriced insurance with their purchase or signing up for recurring bills. User experience designer Harry Brignull coined the neologism on 28 July 2010 with the registration of darkpatterns.org, a "pattern library with the specific goal of naming and shaming deceptive user interfaces". In 2023, he released the book Deceptive Patterns.

In 2021, the Electronic Frontier Foundation and Consumer Reports created a tip line to collect information about dark patterns from the public.

Structural pattern

In software engineering, structural design patterns are design patterns that ease the design by identifying a simple way to realize relationships among

In software engineering, structural design patterns are design patterns that ease the design by identifying a simple way to realize relationships among entities.

Examples of Structural Patterns include:

Adapter pattern: 'adapts' one interface for a class into one that a client expects

Adapter pipeline: Use multiple adapters for debugging purposes.

Retrofit Interface Pattern: An adapter used as a new interface for multiple classes at the same time.

Aggregate pattern: a version of the Composite pattern with methods for aggregation of children

Bridge pattern: decouple an abstraction from its implementation so that the two can vary independently

Tombstone: An intermediate "lookup" object contains the real location of an object.

Composite pattern: a tree structure of objects where every object has the same interface

Decorator pattern: add additional functionality to an object at runtime where subclassing would result in an exponential rise of new classes

Extensibility pattern: a.k.a. Framework - hide complex code behind a simple interface

Facade pattern: create a simplified interface of an existing interface to ease usage for common tasks

Flyweight pattern: a large quantity of objects share a common properties object to save space

Marker pattern: an empty interface to associate metadata with a class.

Pipes and filters: a chain of processes where the output of each process is the input of the next

Opaque pointer: a pointer to an undeclared or private type, to hide implementation details

Proxy pattern: a class functioning as an interface to another thing

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