Domain-specific patterns

Efforts have also been made to codify design patterns in particular domains, including use of existing design patterns as well as domain specific design patterns. Examples include user interface design patterns,[11] information visualization,[12] secure design,[13] "secure usability",[14] Web design [15] and business model design.[16]

The annual Pattern Languages of Programming Conference proceedings [17] include many examples of domain specific patterns.

Classification and list

Design patterns were originally grouped into the categories: creational patterns, structural patterns, and behavioral patterns, and described using the concepts of delegation, aggregation, and consultation. For further background on object-oriented design, see coupling and cohesion, inheritance, interface, and polymorphism. Another classification has also introduced the notion of architectural design pattern that may be applied at the architecture level of the software such as the Model–View–Controller pattern.

Creational patterns				
Name	**Description**	**In *Design Patterns***	**In *Code Complete*[18]**	**Other**
Abstract factory	Provide an interface for creating families of related or dependent objects without specifying their concrete classes.	Yes	Yes	N/A
Builder	Separate the construction of a complex object from its representation allowing the same construction process to create various representations.	Yes	No	N/A
Factory method	Define an interface for creating an object, but let subclasses decide which class to instantiate. Factory Method lets a class defer instantiation to subclasses (dependency injection[19]).	Yes	Yes	N/A
Lazy initialization	Tactic of delaying the creation of an object, the calculation of a value, or some other expensive process until the first time it is needed.	No	No	*PoEAA*[20]
Multiton	Ensure a class has only named instances, and provide global point of access to them.	No	No	N/A
Object pool	Avoid expensive acquisition and release of resources by recycling objects that are no longer in use. Can be considered a generalisation of connection pool and thread pool patterns.	No	No	N/A
Prototype	Specify the kinds of objects to create using a prototypical instance, and create new objects by copying this prototype.	Yes	No	N/A
Resource acquisition is initialization	Ensure that resources are properly released by tying them to the lifespan of suitable objects.	No	No	N/A
Singleton	Ensure a class has only one instance, and provide a global point of access to it.	Yes	Yes	N/A

Structural patterns				
Name	**Description**	**In *Design Patterns***	**In *Code Complete*[18]**	**Other**
Adapter or Wrapper or Translator [21].	Convert the interface of a class into another interface clients expect. An adapter lets classes work together that could not otherwise because of incompatible interfaces. The enterprise integration pattern equivalent is the Translator [21].	Yes	Yes	N/A
Bridge	Decouple an abstraction from its implementation allowing the two to vary independently.	Yes	Yes	N/A
Composite	Compose objects into tree structures to represent part-whole hierarchies. Composite lets clients treat individual objects and compositions of objects uniformly.	Yes	Yes	N/A
Decorator	Attach additional responsibilities to an object dynamically keeping the same interface. Decorators provide a flexible alternative to subclassing for extending functionality.	Yes	Yes	N/A
Facade	Provide a unified interface to a set of interfaces in a subsystem. Facade defines a higher-level interface that makes the subsystem easier to use.	Yes	Yes	N/A
Flyweight	Use sharing to support large numbers of similar objects efficiently.	Yes	No	N/A
Front Controller	The pattern relates to the design of Web applications. It provides a centralized entry point for handling requests.	No	Yes	N/A
Module	Group several related elements, such as classes, singletons, methods, globally used, into a single conceptual entity.	No	No	N/A
Proxy	Provide a surrogate or placeholder for another object to control access to it.	Yes	No	N/A

Behavioral patterns				
Name	**Description**	**In *Design Patterns***	**In *Code Complete*[18]**	**Other**
Blackboard	Generalized observer, which allows multiple readers and writers. Communicates information system-wide.	No	No	N/A
Chain of responsibility	Avoid coupling the sender of a request to its receiver by giving more than one object a chance to handle the request. Chain the receiving objects and pass the request along the chain until an object handles it.	Yes	No	N/A
Command	Encapsulate a request as an object, thereby letting you parameterize clients with different requests, queue or log requests, and support undoable operations.	Yes	No	N/A
Interpreter	Given a language, define a representation for its grammar along with an interpreter that uses the representation to interpret sentences in the language.	Yes	No	N/A
Iterator	Provide a way to access the elements of an aggregate object sequentially without exposing its underlying representation.	Yes	Yes	N/A
Mediator	Define an object that encapsulates how a set of objects interact. Mediator promotes loose coupling by keeping objects from referring to each other explicitly, and it lets you vary their interaction independently.	Yes	No	N/A
Memento	Without violating encapsulation, capture and externalize an object's internal state allowing the object to be restored to this state later.	Yes	No	N/A
Null object	Avoid null references by providing a default object.	No	No	N/A
Observer or Publish/subscribe	Define a one-to-many dependency between objects where a state change in one object results in all its dependents being notified and updated automatically.	Yes	Yes	N/A
Servant	Define common functionality for a group of classes	No	No	N/A

Specification	Recombinable business logic in a Boolean fashion	No	No	N/A
State	Allow an object to alter its behavior when its internal state changes. The object will appear to change its class.	Yes	No	N/A
Strategy	Define a family of algorithms, encapsulate each one, and make them interchangeable. Strategy lets the algorithm vary independently from clients that use it.	Yes	Yes	N/A
Template method	Define the skeleton of an algorithm in an operation, deferring some steps to subclasses. Template method lets subclasses redefine certain steps of an algorithm without changing the algorithm's structure.	Yes	Yes	N/A
Visitor	Represent an operation to be performed on the elements of an object structure. Visitor lets you define a new operation without changing the classes of the elements on which it operates.	Yes	No	N/A

Concurrency patterns

Name	Description	In *POSA2*[22]	Other
Active Object	Decouples method execution from method invocation that reside in their own thread of control. The goal is to introduce concurrency, by using asynchronous method invocation and a scheduler for handling requests.	Yes	N/A
Balking	Only execute an action on an object when the object is in a particular state.	No	N/A
Binding properties	Combining multiple observers to force properties in different objects to be synchronized or coordinated in some way.[23]	No	N/A
Double-checked locking	Reduce the overhead of acquiring a lock by first testing the locking criterion (the 'lock hint') in an unsafe manner; only if that succeeds does the actual lock proceed. Can be unsafe when implemented in some language/hardware combinations. It can therefore sometimes be considered an anti-pattern.	Yes	N/A
Event-based asynchronous	Addresses problems with the asynchronous pattern that occur in multithreaded programs.[24]	No	N/A
Guarded suspension	Manages operations that require both a lock to be acquired and a precondition to be satisfied before the operation can be executed.	No	N/A
Lock	One thread puts a "lock" on a resource, preventing other threads from accessing or modifying it.[25]	No	*PoEAA*[20]
Messaging design pattern (MDP)	Allows the interchange of information (i.e. messages) between components and applications.	No	N/A
Monitor object	An object whose methods are subject to mutual exclusion, thus preventing multiple objects from erroneously trying to use it at the same time.	Yes	N/A
Reactor	A reactor object provides an asynchronous interface to resources that must be handled synchronously.	Yes	N/A
Read-write lock	Allows concurrent read access to an object, but requires exclusive access for write operations.	No	N/A
Scheduler	Explicitly control when threads may execute single-threaded code.	No	N/A
Thread pool	A number of threads are created to perform a number of tasks, which are usually organized in a queue. Typically, there are many more tasks than threads. Can be considered a special case of the object pool pattern.	No	N/A
Thread-specific storage	Static or "global" memory local to a thread.	Yes	N/A