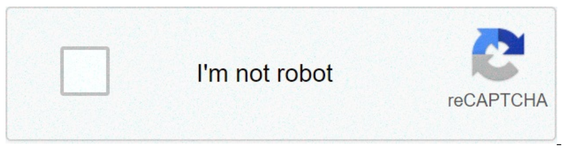

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Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, is the representation of information in a suitable way for communication or analysis from humans or machines Ãƒ ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, ã, ã, the data is the names of the world of programming: Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, objects that are manipulated Ã, Ã, Ã, Ã, Ã , Ã, Ã, Ã, the information that is processed Ã ¢ â ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, example: you want to develop a database software that preserves the information and record of all Employees in a certain company. The information you want to memorize and manipulate is the name An employee, age, denomination, salary etc. Types of data: Ã ¢ â ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, classification of Data divided by elements and operations of those supported items. Example: whole, character, float etc. Ã ¢ â ¢ Ã Ã, Ã, Ã, Ã ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, atomic or primitive Type of data: Type of data with individual data not disruptible. Example: int, float, char. Type A â ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, composite: Type of data whose elements are composed of more data elements. Example: Tuple, matrix, object of any class. Ã ¢ â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, structured type composite: a set of components in which the organization determines the method of access individual data components or subsets of the organized collection. Example: ordered array. Information Hiding: Ã ¢ â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, information hiding is the idea that only information (data, access routines, etc.) that need to be seen , I am. If any kind of information can be centralized and hidden from the program outside, this is good, for the simple fact that simplifies the rest of the program. Ã ¢ â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, is the idea begins in the design phase of a program, and goes to the right through the construction phase and the testing phase. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, ã, how do we hide the information? Dividing a program to modules, you allow specific information to be hidden. This can be particular data, complex logic, or specific software implementation details. Advantages of information hiding: Easy to reuse the most easy code for bugs isolate more easy construction - with small, well-defined sections easier abstraction (approaching the problem) Allows the isolation of the areas that could change allows concealment of complex data or logic allows you to hide programming language level of date abstraction and encapsulation an abstraction â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã is the process of organizing access to data from A program (for example, organizing the declarations and methods of variables for data access in class definitions). Ã ¢ â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, encapsulation of data, sometimes referred to as hidden data, is the mechanism by which the implementation details of a class are kept hidden to the user . Abstract data type Ã ¢ â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, a specification of a number of data and the set of operations that can be performed on the data. This type of data A is abstract, in the sense that it is independent of various concrete implementations. Ã ¢ â ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Example: all JavaÃ ¢ s predefined types such as int, double, char are all ATT. You can declare the variables of this type without understanding the underlying implementation details. You can initialize, modify, access information in possession of these variables through specific operations. Ã, â ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, can create your own ADT using class mechanism. Data structure: Ã ¢ â ¢ Ã, Ã, Ã Ã Ã Ã Ã Ã Ã Ã Ã Ã Ã Ã Ã ã a set of data elements whose logical organization reflects a relationship between the elements Ãƒ Ã ¢ Ã Ã Ã Ã Ã Ã Ã, Ã, Ã, Ã, Ã, is best for the design of data structures with ADT. Basic operations on encapsulated data Ã ¢ â ¢ is, Ã, Ã, Ã, Ã, Ã, Ã, Ã, is a manufacturer is an operation that creates a new instance (object) of the data type. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, transformers (sometimes called mutators) are transactions modify the status of one or more data values. In other words, these are called Setter Methods. Ã ¢ â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, an observer is an operation that allows us to observe the status of one or more data values with out change them. In other words, these are called Getter Methods. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, an iterator is an operation that allows us to allow Process all components in a sequentially data structure. Data level of an ADT Ã ¢ â ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, logic (or abstract) Level: Abstract view of data values (the domain) and the set of operations to manipulate them . Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Application (or user) Level: Here the application programmer uses the ADT to solve a problem. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, level of implementation: a specific representation of the structure to contain data elements, and the coding of operations in a programming language. Communication between implementation level and Application Level JavaÃ ¢ s guys built-in classy java construct â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, can be a mechanism for creating types of composite data. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, is, Ã ã, is composed of fields denominated data (class variables and instance) and methods. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, is not structured because the meaning does not depend on the sorting of the members. Create a new instance of the Circle Class An Assignment Statement: Primitives Type vs Object Consequences Using References ÃƒÂ ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, system.out.println (C1) ; C2. Changevalue (); System.out.println (C1); Ã, alias: we can have two references / names for the same object. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, space garbage of memory that was assigned to a program, but can no longer be accessible by a program. Parameter passing topics â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, all java java have passed by value. Ã ¢ â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, is, if the variable is primitive, the actual value (INT, DOUBLE, and so on) is switched to the method. Ã ¢ â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, is, if it is a reference type, then the reference that contains is passed to the method. Ã, ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, ã, is, Ã, ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, ã, is, Ã, ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, ã, is, Ã, ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, ã, is, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, java interfaces Ãƒ â ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, all variables declared in an interface must be final variables , Static. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, all methods declared in an interface must be abstract. Method at â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, abstract: method to one declared in a class or interface without a body of the method. Interfaces can be used in the following ways: Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, like Capture contracted an abstract vision of a class or classes in an interface. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, for constant altitude define constant in an interface and having each class implements the interface. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, to replace more classic inheritanceÃ ¢ can extend a superclass, but can implement many interfaces. Ã, â ¢ Ã, Ã, Ã, Ã, Ã, Ã, Ã, is, to provide a generic mechanism ¢ type in chapter 3 you learn to use the Java construct interface to provide generic structures. Array VS Class AN Class differs matrix from a class in the following three ways: to â ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, ã, Ã is a homogeneous structure, while classes are heterogeneous structures. Ã ¢ â ¢ is, Ã, Ã, Ã, Ã, Ã, Ã, Ã, a component of an array is accessible from its position in the structure, while a component of a class is accessible from an identifier (name). Ã ¢ â ¢ Ã Ã, Ã, Ã, Ã, Ã, Ã, Ã, Ã, Because matrix components are available, an array is a structured composite type. Example of combining multiple objects Suppose you define: Public Class Point {public int xvalue; int yvalue public; } Then, we could define a new circle class as: Public Class Newcircle {Point Point Point; floating radius; Public Boolean solid; } An array of objects Ã, ã, Example of two dimensional array Ã, #### Software in 6.005 provisional from Bugseasy to UnderstandReady for the correct change today and correct in the future unknown. Communicate clearly with future programmers, as the future yes. Designed to accommodate change without having to rewrite. #### Objectives introduces class of today different ideas: Types of abstract data + Independence representation + Exposure representation + Invariants + Implementation VS Interface In this reading, we look at a powerful idea, types of abstract data, which allow us to separate the way to use a data structure in a one From the particular form of the same data structure. The types of abstract data deal with a particularly dangerous problem: customers who have hypotheses on the internal representation of the type. We will see why this is dangerous and how it can be avoided. We will also discuss the classification of operations and some good design principles for abstract data types. ### Access control in Java You should already have read: ** [Checking access to members of a class] ** in Java tutorials. [Checking access to members of a class]: mitx: c2bcfc22d8544cd6b2d5e143c877a343 access control ## Which abstraction means that abstract data types are An instance of a general principle in software engineering, which goes from many names with slightly different shades of meaning. Here are some of the names that are used for this idea: + ** abstraction. ** omit or hide low-level details with a simpler and higher idea. + ** modularity. ** Divide a system into components or modules, each of which can be designed, implemented, tested, motivated and reused separately from the rest of the system. + ** encapsulation. ** Build walls around a module (a hard hull or a capsule) so that the module is responsible for your internal behavior and bugs in other parts of the system cannot damage your integrity. + ** Information you hide. ** Hide the details of the implementation of a module from the rest of the system, so that these details can be changed later without changing the rest of the system. + ** Separation of concerns. ** Perform a function (or "concern") the responsibility of a single module, rather than spreading it on multiple modules. As a software engineer, you should know these terms, because you will meet them frequently. The fundamental purpose of all these ideas is to help achieve the three important properties that interest us in 6.005: bug security, ease of understanding and readiness for change. ### User-defined types In the first days of the calculation, a programming language was supplied with integrated types (such as integers, booleans, strings, etc.) and integrated procedures, for example for input and output. Users could define their procedures: it is the way in which large programs were built. An important progress in software development was the idea of abstract types: that a programming language could be designed to also allow user-defined types. This idea is released by the work of many researchers, in particular Dahl (the inventor of the simula language), Hoare (who has developed many of the techniques we now use for the reason for abstract types), Parnas (who coined the term information that we hid and first articulated the idea of organizing program modules around the secrets that have encapsulated), and here in MIT, Barbara Liskov and John Gattag, who has done seminal works in the specification of abstract types and in the language programming program For them - and developed the original 6,170, the predecessor at 6.005. Barbara Liskov has earned the Turing Award, the equivalent of computer science of the Nobel Prize, for her work on abstract types. The key idea of data abstraction is that a type is characterized by the operations you can run on it. A number is something you can add and multiply; A string is something you can concatenate and take substrings of; A boolean is something you can cancel, and so on. In a sense, users may already define their own types in early programming languages: you can create a date of the type of record, for example with entire fields for the day, month and year. But what made the types New and several has been the focus on operations: the user of the type should not worry about how its values were actually archived, in the same way as a programmer can ignore how the compiler actually stores whole numbers. All that matters is the operations. In Java, as in many modern programming languages, the separation between integrated types and user-defined types is a bit blurry. The classes in Java.lang, such as such Integer and Boolean are integrated; Whether you consider all the collections of Java.util as incorporated is less clear (and not very important anyway). Java complicates the problem with primitive types that are not objects. The set of these types, like Int and Boolean, cannot be extended by the user. ## Classification of types and types of operations, if defined by integrated or defined by the user, can be classified as ** mutable ** or ** immutable **. The mutable objects can be modified: ie, provide operations that when performed causes the results of other operations on the same object to provide different results. So the date is changeable, because you can call SetMonth and observe the change with the Getmonh operation. But the string is immutable, because its operations create new string objects rather than changing the existing ones. Sometimes a type will be supplied in two forms, a changeable and immutable form. Stringbuilder, for example, is a mutable version of string (even if the two are certainly not the same Java type and are not interchangeable). The operations of an abstract type are classified as follows: + ** Creators ** Create new objects of the type. A creator can take an object as a topic, but a type of kind was not built. + ** Manufacturers ** Create new objects from old type objects. The string concat method, for example, is a manufacturer: it takes two strings and produce a new one that represents their concatenation. + ** Observatories ** Take objects of the abstract type and return objects of a different type. The size list method, for example, returns an int. + ** Mutters ** Change objects. Adding the list method, for example, changes a list by adding an element to the end. We can summarize these schematically such distinctions such as this (explanation to follow): + Creator: T * Ã, â € ™ T + Manufacturer: T +, T * â € œ T + Observer: T +, T * â € 'T + mutator : T +, t * Ã ¢ â € void | t | t This informs the form of the signatures of the operations in the various classes. Every t is the abstract type itself; Every t is another type. The marker + indicates that the type can occur one or more times in that part of the signature, and the marker * indicates that it occurs zero or more. For example, a manufacturer can take two values of the abstract type, like `string.concat ()" Fa. The necessary t-left occurrences can also be omitted, since some observers do not take non-abstract arguments and some take different. Mutators They are often reported by a type of return of the `void`. A method that returns void * must * be called for some kind of side effect, since otherwise it does not return anything. But not all the mutators return anything. For example, [set .add ()] (Returns a boolean indicating whether the set was actually changed . In the graphical user interface of Java Toolkit, [component.add ()] (. HTML # add-java.awt.component-) Returns the object itself, so that multiple additional calls () may be [chained] (. ### Ese Abstract data type MPI Here are some examples of abstract data types, along with some of their operations, grouped. ** INT ** is the primitive integer type of Java. Int is immutable, so it has no mutator. + Creators: Numerical programs 0, 1, 2, ... + manufacturers: Arithmetic Operators +, -, £ -, Â · + Observatories: Operator comparison == ,! =, + Mutters: None (is immutable) ** List ** is the list of Java list. The list is mutable. List is also an interface, which means that other classes provide actual data type implementation. These classes include ArrayList and LinkedList. + Creators: buildings of and LinkedList, collections.SingletonList + Manufacturers: collections.UnmodiaFiaplist + Observatories: Size, Get + Mutars: Add, Remove, AddTall, Collection.Sort ** String ** It is the type of Java string. The string is immutable. + Creators: String Builders + Manufacturers: Concat, Substritch, Substritch, + Observers: length, charAt + mutators: none (it is immutable) This rating gives some 'useful terminology, but it's not perfect. Types of complex data, it can be an operation that is both a manufacturer and a modifier, for example. Some people reserve the term * manufacturer * only for operations that no mutation do. MITX: 1315A3A555604A088DCC6EEC45CE6FD1 Operations ## Design an abstract type design An abstract type involves the choice of good operations and determine how they should behave. Here are some inch rules. It is better to have ** a few simple operations ** that can be combined in powerful ways, rather than a lot of complex operations. Every operation must have a well-defined purpose, and should have a coherent ** ** behavior rather than a whole series of special cases. Probably we should not add a sum operation to the list, for example. Could help customers work with entire numbers lists, but regarding string lists? Or listed lists? All these special cases would summarize a difficult task to understand and use. All transactions should be adequate ** ** in the sense that there has to be enough to make the kind of customers might want to do calculations. A test is used to verify that every property of a type object can be extracted. For example, if there was no GET operation, we would not be able to find out what the elements of a list are. Basic information should not be excessively difficult to get. For example, the size method is not strictly necessary for List, because you could apply we get on the increase indices until you get a failure, but this is inefficient and uncomfortable. The type can be generic: a list or a group, or a graph, for example. Or can be dominated-specific: a road map, a database of employees, a phone book, etc. but ** should not mix generic functions and the specific domain ** type a deck wants to represent a sequence of game cards shouldn. 't have a generic add method that accepts arbitrary objects like integers or strings. On the contrary, it would not make sense to put a specific domain method as Dealcards in the generic type list. ## Rendering critical independence, a good type of abstract data should be ** ** independent representation. This means that the use of an abstract type is independent of its representation (the data structure or data data used to implement it), so that the changes in the representation have no effect on the outer code of the abstract type itself. For example, the operations offered by list are independent if the list is represented as a linked list or as an array. It will not be able to change the representation of an ADT to everyone unless its operations are completely specified with preconditions and postconditions, so that customers know what it depends, and you know what you can change safely. ### Example: different representations for the LET strings look at a simple type of abstract data to see which means of independence and because it is useful. The type MyString under has far fewer operations than the actual Java String, and their specifications are a bit 'different, but it's still illustrative. Here are the specifications for the ADT: `` `java / ** string represents a sequence of immutable characters. * / Public class MyString {//////////////////// example of an operation /////////////// creator / ** @ param ba @return boolean * representation of the B string, either "true" or "false" * / public static MyString valueOf (boolean b) {...} ///////////// // ///// examples of observatori transactions ////////////// / ** @return the number of characters in this length of the * / Public int () {...} / ** @Param i Position of the font (Requires 0

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