

OBJECT PROPERTY LISTS**TECHNICAL FIELD**

The present invention relates generally to data processing systems and, more particularly, to property lists of objects.

BACKGROUND OF THE INVENTION

An "object," as used in this disclosure, refers to an entity that is either displayed by a computer program or is part of a computer program and which has characteristics. An example of an object displayed by a computer program is a text box contained in a window of a computer program into which a user can input text. The characteristics of the text box include its color, the font of the text, and the point size of the text. An example of an object that is part of a computer program is an in-memory representation of an animal where its characteristics include its color, number of legs, and whether it is a carnivore. This in-memory representation could be implemented as a data structure with the elements of the data structure storing the characteristics. An example of such a data structure is the C++ class data structure. The characteristics of an object are referred to as properties of the object. Each property of an object typically has a value (e.g., the color property may have the value red).

The properties of an object can usually be modified by either a user or a computer program. For example, in a draw program that can display objects such as rectangles and triangles, a user can modify the objects' properties. These properties include the border width and shading of the objects and perhaps even the color of the objects. Using this example, a user may modify the properties of a rectangle such that a solid border becomes a dashed border and the shading becomes gray. Once these modifications are made, however, these modifications cannot be isolated and applied to another object in conventional systems. That is, if the user wants to make the same modifications (i.e., dashed border and gray shading) to either another triangle or a rectangle, the user must manually make such modifications, which is time consuming. It is thus desirable to provide functionality where the modifications made to the properties of one object can be easily isolated and applied to another object.

SUMMARY OF THE INVENTION

The system described herein stores the properties of an object in a property list. This property list has many advantages to both object developers and object users. One advantage of the property list is that it provides an implementation upon which arithmetic can be performed. The term "arithmetic" is used as an analogy between computations performed on property lists and computations performed on numbers. Using this arithmetic, a user's modifications to the properties of an object can be easily isolated by subtracting the original property values from the modified property values. Once isolated, the modifications can be applied to a different object so that the user does not have to manually recreate their modifications.

An additional advantage of the property lists is that the property lists not only contain properties, but can also contain other property lists, which provides flexibility in their use. These property lists within a property list are known as nested property lists. Furthermore, the property lists are stored in a contiguous block of memory. Storing the properties in this manner is advantageous when copying a property list, since the copy typically can be accomplished by a single command, whereas if the property list were

stored in noncontiguous areas of memory, multiple commands would be required to copy the property list.

In accordance with a first aspect of the present invention, a method is provided in a computer system having a first object with first properties and a second object with second properties. The method modifies one of the first properties of the first object from an original form to a modified form where one of the second properties corresponds to the modified first property of the first object. The method also determines the modification made to the first object by comparing the original form to the modified form and applies the modification to the corresponding property of the second object.

In accordance with a second aspect of the present invention, a computer system is provided that comprises a memory and a processor. The memory has an object with a first property list containing properties within which is defined a second property list. The first property list is stored in a contiguous block of the memory. The memory also has a program for accessing the first property list of the object. The processor runs the program and facilitates the access of the first property list.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A-1F depict an example of arithmetic being performed on two objects in accordance with a preferred embodiment of the present invention.

FIG. 2 depicts an object property list of a preferred embodiment within a computer suitable for practicing a preferred embodiment of the present invention.

FIG. 3 depicts the object property list of FIG. 2 in more detail.

FIG. 4 depicts an alternative object property list of the present invention.

FIG. 5A depicts a functional diagram of the generate OPL function.

FIG. 5B depicts a functional diagram of the subtract OPLs function.

FIG. 5C depicts a functional diagram of the add OPLs function.

FIG. 5D depicts a functional diagram of the apply OPL function.

FIG. 6 depicts a flow chart of the steps performed by the generate OPL function.

FIGS. 7A and 7B depict a flow chart of the steps performed by the subtract OPLs function.

FIGS. 8A and 8B depict a flow chart of the steps performed by the add OPLs function.

FIG. 9 depicts a flow chart of the steps performed by the apply OPL function.

FIG. 10 depicts a flow chart of the steps performed by the arithmetic application.

FIG. 11 depicts a flow chart of the steps performed by the format painting application.

FIG. 12 depicts a flow chart of the steps performed by the synchronization application.

FIG. 13 depicts a flow chart of the steps performed by the combination application.

DETAILED DESCRIPTION OF THE INVENTION

A preferred embodiment of the present invention provides a property arithmetic system that can isolate modifications