

## Abstract

If you have written any papers lately, you know that a paper begins with something called an *abstract*. The purpose of an abstract is to condense the article into a brief summary so that readers can easily retrieve the essence of your article without having to wade through all of it. A common mistake in the formation of manuscripts is to treat the abstract as a subset of the paper, most notably as an excerpt from the introduction. However, after having our hands slapped a few times, we are reminded that the abstract serves a greater purpose than sheer material reduction. Rather, the abstract is a perspective or view of the *entire* paper. The goal of modeling systems is similar—to take a target system, and see it through a sort of information lens. The first kind of model is what we might call a “visual model” of a system, as exemplified by pieces of art that you find in a museum. When you view these pieces, you are looking at models of things that are inaccessible to you. Part of the history of modern art involves abstraction to the point where some artistic genres use “abstract” in their titles. *Abstract art* and *abstract expressionism* are two movements that rely upon the use of abstraction. They formed as a rejection of mimetic art, or art bearing a significant visual resemblance of a subject. As an example, consider the work of Piet Mondrian originally of the Dutch *de Stijl* movement in the early part of the 20<sup>th</sup> century. His work is sufficiently “abstract” that it is possible to render Mondrian-like pieces with a Java applet, as in Fig.1.

Originally, abstract art was viewed and generated by starting with a source object, such as a photograph, and then applying a set of rules to achieve greater degrees of abstract visual models. De Stijl painters Theo van Doesburg and Bart van der Leek

created sequences of drawings to illustrate the progression from realistic, and mimetic, to abstract. This same sort of process can be achieved today using a tool such as Photoshop filters. Most filters, when convolved over an image, integrate the underlying pixels to achieve a more abstract set of curves, lines, and contours. The original abstraction movement in art led way to the formation of “concrete art” where the artists rejected the source completely, to remove all evidence of there ever having been a subject. The concrete piece doesn’t *represent* anything.

Visual models are abstractions of target objects, with the “view” being the object’s appearance. Other types of models, such as dynamic models, do not abstract appearance. Instead, they capture those parts of the subject that are moving and changing state. The use of abstraction for dynamic models means that we pick objects and juxtapose them to

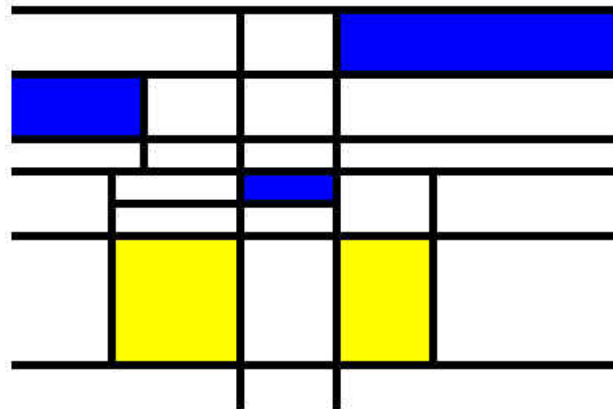


Figure 1: Abstract art

define how something works. The abstraction for dynamic models is not in their appearance, as it was for art, but in that they abstract away everything but the dynamic aspects, which may appear to us in a wide variety of forms, using letters, circles, spheres and complex texture-mapped geometry. For example, an event graph is an abstraction of a target system in that it captures temporal events and their relations to one another. The presentation for the graph, in terms of how a human interfaces to it, may be wide ranging based upon the multitude of artistic styles available to us. We need to remind ourselves that abstraction in presentation, as found in visual models, represents one of a thousand different genres throughout the history of art. Perhaps the most important result of the Modern Art experiment are the set of scientifically motivated qualities expressed by theorists such as Rudolph Arnheim. Shape, form, line, mass, movement are a subset of these qualities.

So, abstraction is reduction and condensation. But, abstraction is not minimalism, where less is more. Instead, abstraction is a reduction in the amount of *information* present in an object. As you remove bits of information, you achieve new views and perspectives of the world.