

# Viewing objects

A 3D object, shown on a flat computer screen, is not always shown in an appropriate way. Compare it with taking a photograph. The photographer has to think about a good position from which to take the photo. Also, he has to point the camera in the right direction. When he takes the photo, the result is projected onto a 2D rectangle on the film in the camera.

This is how Geocadabra makes the screen representation of an object.

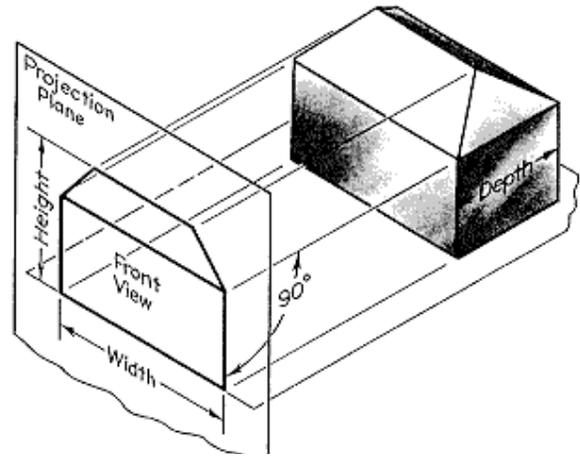
The computer screen corresponds to the film in the camera.

There are two standard drawing methods to make the screen representation:

1. Parallel projection.
2. Central projection.

## Parallel projection

The drawing is the shadow of the object when the light rays are mutually parallel. In the picture on the right the projection plane is orthographic to the light rays, but the plane can also be oblique.

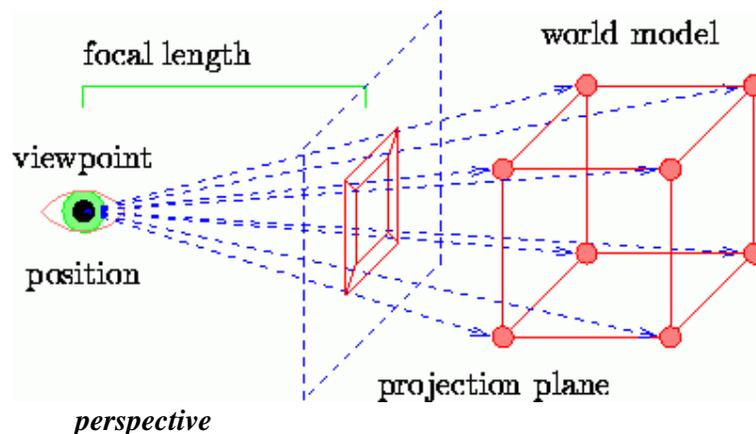
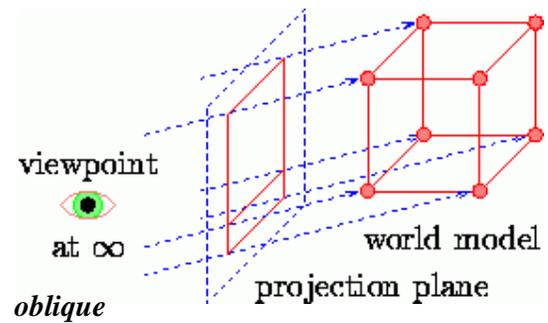
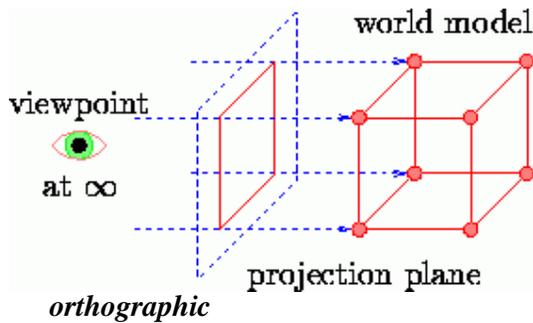
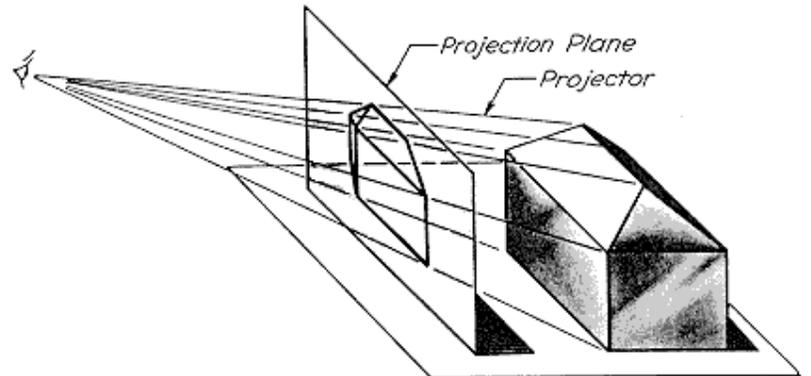


## Central projection

The drawing is the shadow of the object when the light rays come from a point, for example, a light bulb.

The same result is obtained when you look through a window at an object, and draw lines on the window as if tracing over the edges of the object.

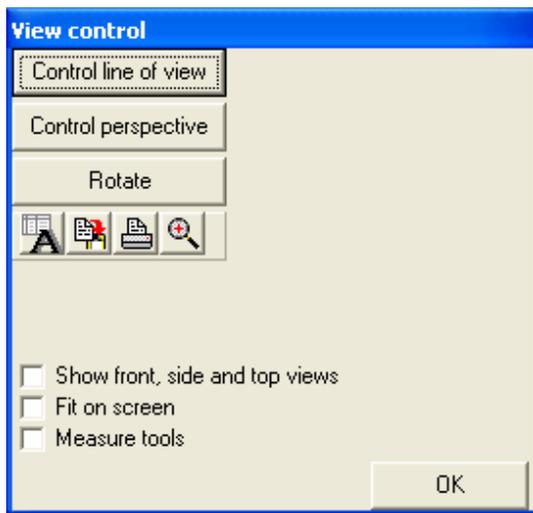
In the picture on the right the projection plane is parallel to the front of the house, but the plane can also be oblique.



## Control of projections in Geocadabra

When you are working with a 3D object in Geocadabra, you can control the drawing method by requesting the view control window:

- View, Tool bars, View control.



The button [Control line of view] gives you the opportunity to look at the object in parallel projection. You can guide the view direction.

The button [Control perspective] gives you the opportunity to look at the object in central projection. You can guide the view direction.

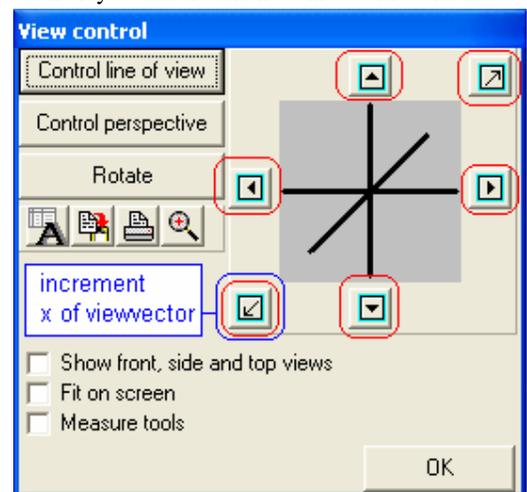
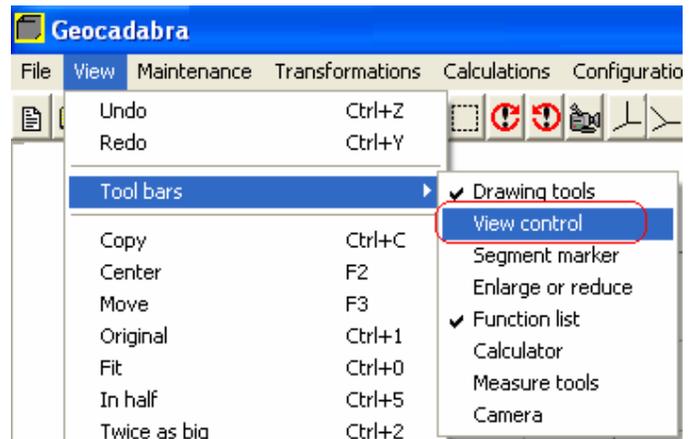
By rotating the object you can study the mutual position of separate lines: Do they intersect, are they parallel or do they cross each other in different planes?

After clicking one of the control buttons, you can change the view direction by dragging the mouse (while pressing the left button, move the mouse arrow around on the screen). This is a look-and-feel situation. Try to understand how mouse movement changes the picture.

A second way to control the view direction is to use the arrows that are shown in the control window after one of the control buttons is pressed.

The line of view is a 3D vector  $(x, y, z)$ . (On the status bar under the screen on the right, this vector is shown.)

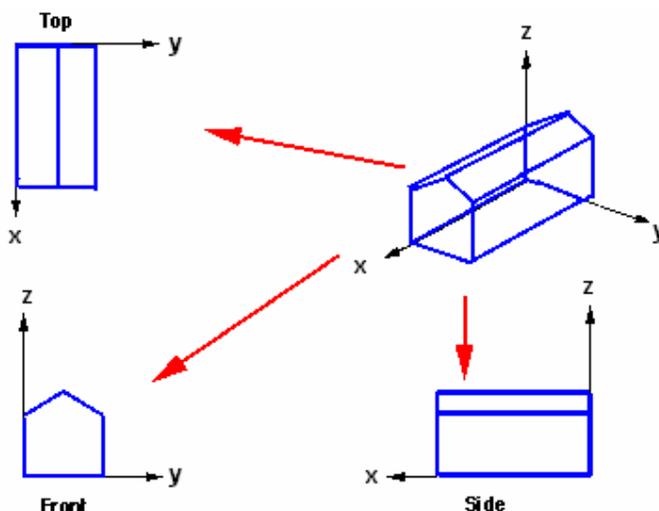
In the control window the three axes are shown. In the picture on the right the buttons circled in red allow you to increment the coordinates of the view vector.



and change the x-component;

and change the y-component;

and change the z-component.



### Front, side and top views

It is important to understand these three views. These views eliminate one of the coordinate components and show the remaining two coordinate views.

Try to draw the missing view when two others and the projective view are given.

