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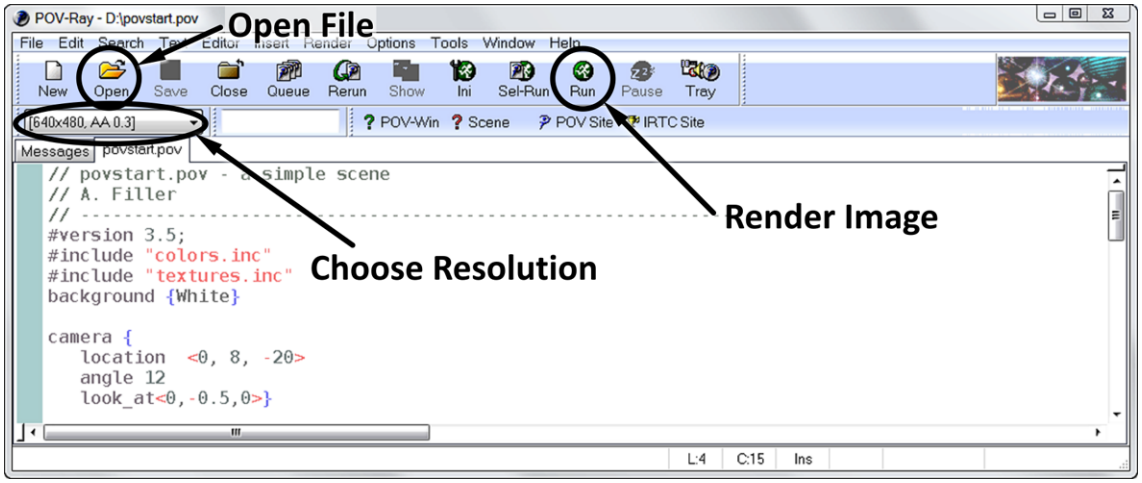
# First steps with POV-Ray

## Rendering the first picture

1. Download POV-Ray from the site www.povray.org. and install it on your computer.
2. Start POV-Ray. When you work under Microsoft Windows, the following window will appear.




3. Open a simple POV-Ray-File, e. g. download `povstart.pov`. and open it in POV-Ray. You'll see now the source code of the file in the editing window.
4. Choose a resolution for the image you want to render from the upper left menu. The selection AA stands for anti aliasing and will enhance the quality of the image. Choose 640x480, No AA for a first trial. When you choose higher resolutions the rendering of the image takes more time.
5. Start rendering the image by clicking the RUN button. A new window will open showing the rendered image.

You have just rendered your first image with POV-Ray. You can now change the scene by manipulating the source code, e.g. the size and position of the objects "sphere", "cone", "torus" and "cylinder" or the coordinates of the camera position (camera {location{… ) thus changing the point of view at the scene. The rendered images will be saved in a bitmap format (bmp suffix) in the directory of the source code and can easily be included in word processors or graphics programmes for further processing.

**Attention:** The scene description language of POV-Ray is **case sensitive** – you can't use capital letters instead of lower case characters or vice versa.

## Creating scenes using templates

Especially in the beginning the huge amount of POV-Ray's features can be overwhelming. Therefore you can download templates with predefined headers, light sources and camera settings:

- Download `template.pov` and use it as working file.
- Download also the include file `template.inc`, which is loaded when you render `template.pov`. In the include-file the camera, light sources, textures etc are defined. Both files should be located in the same directory. This "outsourcing" is meant to facilitate the beginner's first steps by keeping the working file small.

After opening the template you should save the working file with a different name. You can now change the geometric objects and add light sources. Position all objects in the vicinity of the origin. The camera captures approximately the space defined by the variable **`sightrange`**, which can be freely altered by the user. You can also change the camera's position with the variable **`ang`**.

**Hint:** The command **`ks`** creates a coordinate system that facilitates orienting yourself in the scene.

## Overview of common POV-Ray commands

The commands of all geometric objects that can be created with POVRay are described in the programme's help. We'll only give you a selection of objects here as a quick and easy start.

### Geometric Objects

Sphere: **sphere{<*x*,*y*,*z*>,*r*}**
(Coordinates of centre and radius),

Box: **box{<$x_1$,$y_1$,$z_1$>,<$x_2$,$y_2$,$z_2$>}**
(Coordinates of two opposite vertices),

Cylinder: **cylinder{<$x_1$,$y_1$,$z_1$>,<$x_2$,$y_2$,$z_2$>,*r*}**
(Coordinates of the centre of base an top surface,),

Truncated Cone: **cone{<$x_1$,$y_1$,$z_1$>,$r_1$,<$x_2$,$y_2$,$z_2$>,$r_2$}**
(Coordinates of the centres and radiuses of base and top surface).

Plane: **plane {<A, B, C>, D}** defines a plane with the equation $Ax + By + Cz = D$.
This command creates a "real" (i.e. infinitely stretched) plane and is therefore suitable as „base plane" (soil).

### Textures

There should be a definition of a texture for each geometric object otherwise it will be assumed black. Although creating your own textures can be highly fascinating because they look real, it distracts from geometric problems. You can use predefined textures for a start.

The following predefined textures are available in the template: [1]

**frostedwhite, black, blue_dull, blue_shiny, blue_transp, red_dull, red_shiny, red_transp, green_dull, green_shiny, green_transp, checkerboard, wooden, stone, silver, silvergrey**.

You can allocate these textures to any object according to the following example:

**sphere { <0, -1, 5> 1  texture { holz } }** creates a wooden ball.

### Transformations

If you include the following commands before the last closing parenthesis „}" of a geometric object, then this will be translated, rotated or stretched.

**translate <x,y,z>**  **rotate <$\varphi_x$,$\varphi_y$,$\varphi_z$>**  **scale <x,y,z>**

Examples:

**translate <1,2,3>** translates an object by 1 unit along the x-, by 2 units along the y- and by 3 units along the z-axis.

**rotate <90,15,30>** rotates an object by 90° around the x-xis, by 15° arond the y-axis and by 30° around the z-axis.

**scale <2,3,0.5>** stretches an object by 2 along the x-axis, by 3 along the y-axis and squeezes it by a half along the z-axis.

These transformations you can include in the description of objects in any combinations or sequence.

[1] A great variety of textures with sometimes complex names are included in the standard include-files of POVRay – e.g. metals.inc, woods.inc, glass.inc, etc.