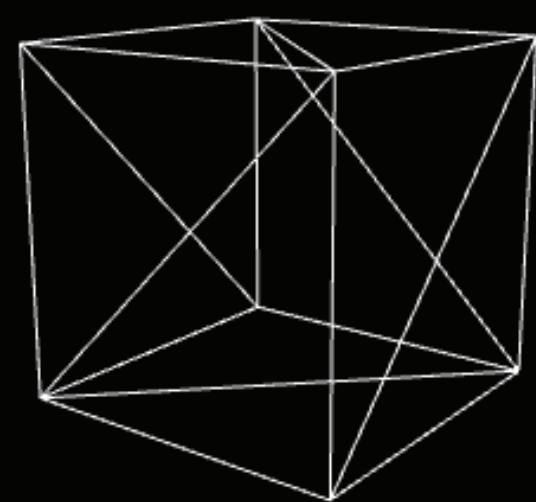


# Computer Graphics Demos

<http://cgdemos.tume-maailm.pri.ee>

Rendering 3D graphics is based on a basic concept of defining the corresponding geometry and applying transformations (e.g. translation, rotation, scale) on the defined geometry. This is done by representing the geometry as a number of vertices that form triangles and matrices that represent the applied transformations. In order to produce visually pleasing solid geometry, there are a number of lighting models that can be applied afterwards. Computer Graphics Demos project is meant to demonstrate those two basic ideas to students.

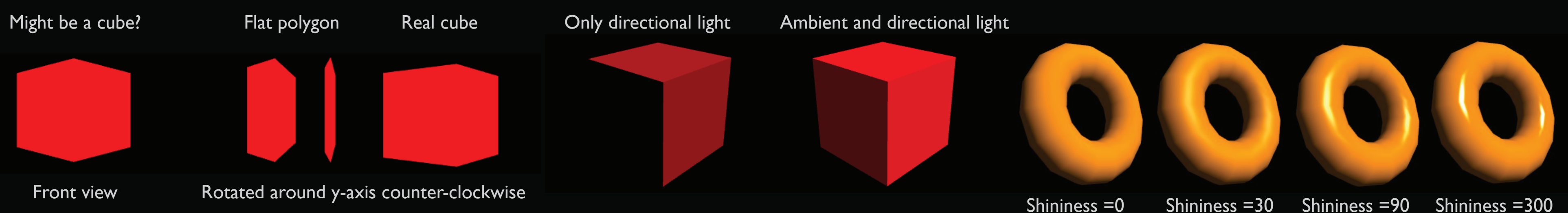
## Geometry and Transformations



$$\begin{matrix} & \text{Projection} & & \text{View} & & \text{Model} \\ \begin{pmatrix} 1.4 & 0 & 0 & 0 \\ 0 & 2.4 & 0 & 0 \\ 0 & 0 & -1 & -2 \\ 0 & 0 & -1 & 0 \end{pmatrix} & * & \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 40 \\ 0 & 0 & 0 & 1 \end{pmatrix} & * & \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \end{matrix}$$

Demo 1 shows the user how transformations affect points, lines and a cube. The model-view-projection matrix is decomposed into the model, view and projection components that each represent one part of the overall transformation chain. When users change the transformations, the change is visible also from the matrices.

## Lighting Models



Demo 2 demonstrates how the proper lighting can reveal more about the scene. One object that can be added to the scene is called *Fake Cube* that is actually a flat (2 dimensional) polygon that looks like the perspective projection of a monochrome cube without any lighting.

Users can then try out how Lambertian and Phong models illuminate a real cube or a torus. There is an option to add and remove ambient, diffuse and point light sources. With Phong's model users can see how different values of *shininess* affect the lighting.

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Project is managed in Assembla.com <https://www.assembla.com/spaces/computer-graphics-demos>



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