**Program Three:** **The Interactive Camera of the 3D Cube**

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## **Reflection**

In this week’s exploration of computer graphics, we delve into how three-dimensional scenes are masterfully transformed into two-dimensional images, a cornerstone concept in digital imagery. This transformation is not merely a technical procedure but an art form, requiring a deep understanding of the camera’s positioning, orientation, and, critically, the chosen projection method. These elements collectively shape how a 3D scene is portrayed on a 2D plane, influencing the visual outcome and the viewer’s perception and interaction with the graphical environment.

In computer graphics, the key to rendering 3D scenes onto 2D screens lies predominantly in two types of projections: orthographic and perspective. Orthographic projection is characterized by its unique way of viewing objects along parallel lines, ensuring their size remains consistent irrespective of their distance from the camera. This technique is particularly favored in technical and engineering domains, such as CAD software used by engineers, where precise measurements and an undistorted view of each design component are paramount.

Conversely, perspective projection offers a view that closely resembles human visual perception, where objects diminish in size with increasing distance, thus imparting a sense of depth. This projection style is crucial in creating realistic environments in video games, simulations, and other virtual settings. It hinges on the concept of a vanishing point, a singular focus where all projection lines converge, essential for crafting the illusion of depth. The complexity and resource intensity of perspective projection and the need for meticulous calibration of viewing angles and distances present their own challenges.

Beyond these conventional methods, other specialized viewing functions like fisheye and panoramic projections are tailored to specific applications such as wide-angle photography or immersive virtual reality experiences. The choice of projection technique significantly impacts the viewer’s experience, making understanding these viewing functions a vital skill for graphics programmers and designers. This knowledge enables them to create graphical representations that are not only visually compelling but also functionally apt for their intended application.

# **Images of the 3D Cube**

**Figure 1a.**

Cube Sides Blue, Cyan, Red

A screenshot of a computer

Description automatically generated

**Figure 1b.**

Cube sides Blue, Magenta, Green

A screenshot of a computer

Description automatically generated

**Figure 1c.**

Cube sides Blue, Red, Magenta

A screenshot of a computer

Description automatically generated

**Figure 1d.**

Cube sides Yellow, Cyan, Red

**A screenshot of a computer

Description automatically generated**

**Figure 1e.**

## Cube sides Yellow, Green, Cyan

A screenshot of a computer

Description automatically generated

**Figure 1f.**

## Cube side Yellow, Magenta, Green

A screenshot of a computer

Description automatically generated

**Figure 1g.**

## Cube sides Yellow, Red, Magenta

**A screenshot of a video game

Description automatically generated**