Stereo Simplified

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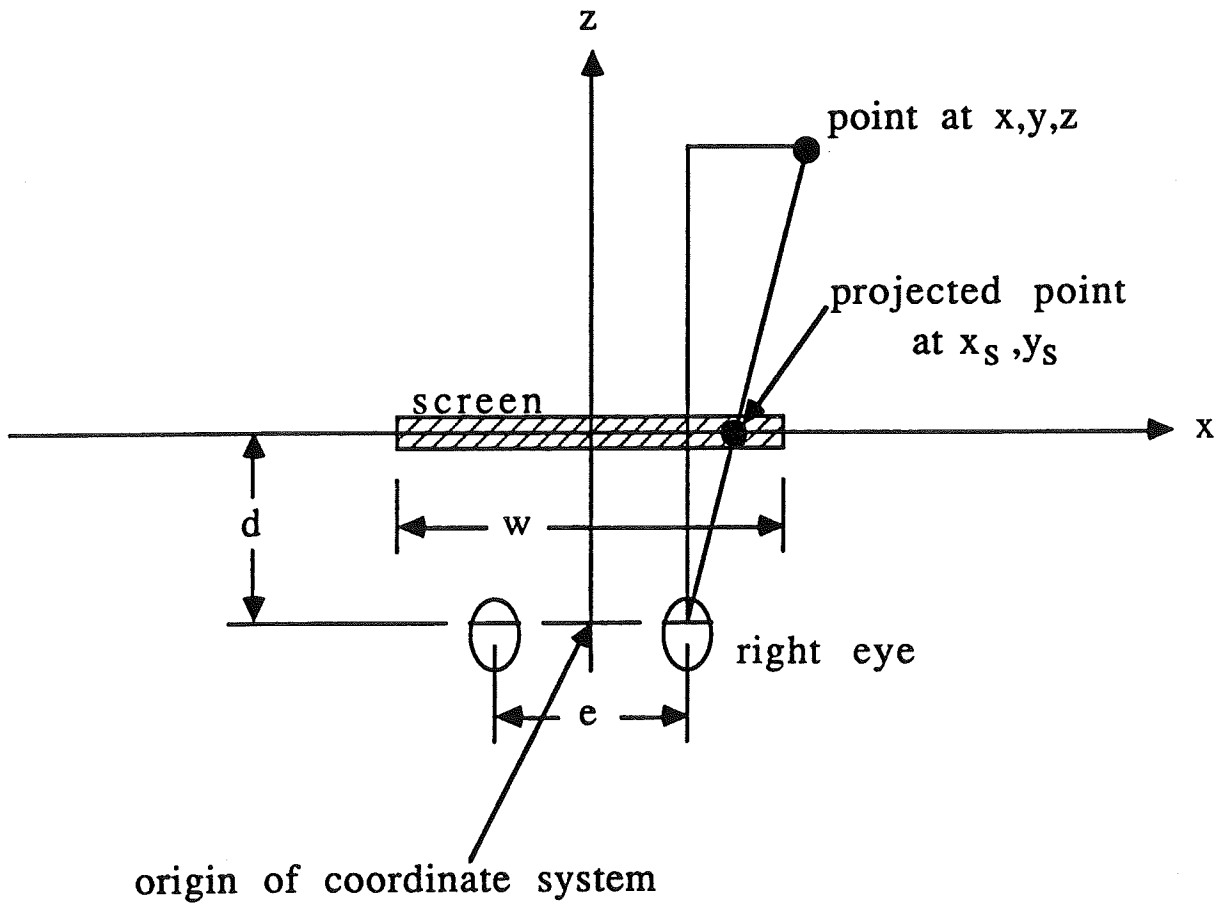
Introduction

The concept of creating stereo images on a workstation is simple, but applying the concept in practice is made conceptually less clear by the factors listed below. These notes show how the simple concept relates to the more complex application of the concept on a typical workstation. (The method of rotating the images is incorrect and will not be discused here -- see 1989 SIGGRAPH Course #24 Notes.) References are also given for stereo equipment.

The Simple Concept

The concept is merely to project each point of a computer graphics scene to the screen of the workstation as shown below. (Projection for the right eye is shown.)



By use of proportional triangles, one can see that

for the right eye	for the left eye
$x_S = (x - e/2)(d/z) + e/2$	$x_S = (x + e/2)(d/z) - e/2$
$y_S = yd/z$	$y_S = yd/z$

Factors that Make the Application on a Typical Workstation More Complex

Following are "gottschas" that make the application of the concept more complex.

1. Most graphics systems use homogeneous coordinate systems and matrix operations on these coordinates (which actually simplify coordinate manipulations once a person is familiar with them). A good reference for homogeneous coordinates is Foley and Van Dam

2. Most computer graphics texts show the multiplication of a matrix with a vector differently than linear algebra texts show the multiplication. One depiction is the transpose of the other.

3. Some computer graphics texts and systems use right hand coordinate convention and others use left hand coordinate convention.

4. Some systems have positive z going into the screen and others have positive z coming out of the screen.

5. Proper scaling must be used for the values "d", "w", and "e" above. In some cases these values need to be given in "world coordinates" and in other cases the values need to be given in "screen coordinates", which have different scales.

6. Viewing stereo on a workstation is different than viewing stereo projected onto a large screen -- a correction for the larger screen and the larger distance from the eye to the screen can be applied.

7. Some systems do not perform a perspective projection with their perspective command.