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Affiliated to Vishveshwarya Technological University, Belgaum

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

2011-12

MINI PROJECT -COMPUTER GRAPHICS LAB

Perspective projections

by

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CERTIFICATE

This is to certify that the project entitled three point prespective projections has been successfully completed by **Gaurav G Manur(4JC09CS030), Bharath S N (4JC09CS014)** as part of partial fulfilment of requirement of **Computer Graphics Lab(CSL68)** continuous internal evaluation in their VI semester during the academic year 2011-12 for the course of **Bachelor of Engineering in Computer science and Engineering** under the guidance of Faculty of Computer Science and Engineering department **Smt Manimala R.**

DATE: 22-04-12

Signature of the guide

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INDEX

1.INTRODUCTION

1.1) PERSPECTIVE PROJECTIONS

Perspective in the graphic arts, such as drawing, is an approximate representation, on a flat surface (such as paper), of an image as it is seen by the eye. The two most characteristic features of perspective are that objects are drawn:

- Smaller as their distance from the observer increases
- Foreshortened: the size of an object's dimensions along the line of sight are relatively shorter than dimensions across the line of sight

1.2) TYPES OF PERSPECTIVE

Of the many types of perspective drawings, the most common categorizations of artificial perspective are one-, two- and three-point. The names of these categories refer to the number of vanishing points in the perspective drawing.

1.2.1)ONE POINT PERSPECTIVE PROJECTIONS

One vanishing point is typically used for roads, railway tracks, hallways, or buildings viewed so that the front is directly facing the viewer. Any objects that are made up of lines either directly parallel with the viewer's line of sight or directly perpendicular (the railroad slats) can be represented with one-point perspective.One-point perspective exists when the painting plate (also known as the picture plane) is parallel to two axes of a rectilinear (or Cartesian) scene — a scene which is composed entirely of linear elements that intersect only at right angles. If one axis is parallel with the picture plane, then all elements are either parallel to the painting plate (either horizontally or vertically) or perpendicular to it. All elements that are parallel to the painting plate are drawn as parallel lines. All elements that are perpendicular to the painting plate converge at a single point (a vanishing point) on the horizon.

1.2.2)TWO POINT PERSPECTIVE PROJECTIONS

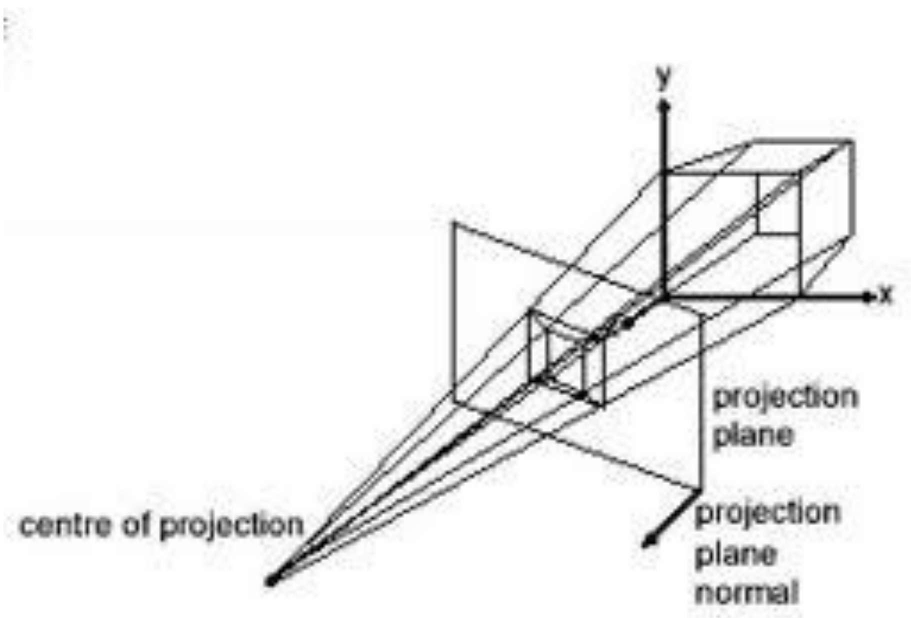
Two-point perspective can be used to draw the same objects as one-point perspective, rotated: looking at the corner of a house, or looking at two forked roads shrink into the distance, for example. One point represents one set of parallel lines, the other point represents the other. Looking at a house from the corner, one wall would recede towards one vanishing point, the other wall would recede towards the opposite vanishing point.

1.2.3)THREE POINT PERSPECTIVE PROJECTIONS

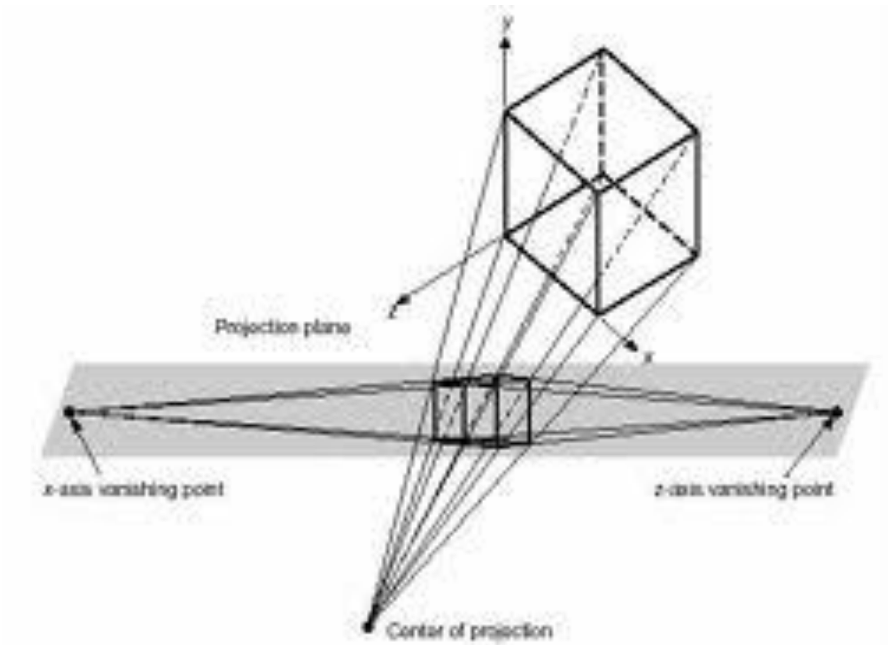
Three-point perspective is usually used for buildings seen from above (or below). In addition to the two vanishing points from before, one for each wall, there is now one for how those walls recede into the ground. This third vanishing point will be below the ground. Looking up at a tall building is another common example of the third vanishing point. This time the third vanishing point is high in space.Three-point perspective exists when the perspective is a view of a Cartesian scene where the picture plane is not parallel to any of the scene's three axes. Each of the three vanishing points corresponds with one of the three axes of the scene. Image constructed using multiple vanishing pointsOne-point, two-point, and three-point perspectives appear to embody different forms of calculated perspective. The methods required to generate these perspectives by hand are different. Mathematically, however, all three are identical: The difference is simply in the relative orientation of the rectilinear scene to the viewer

1.3) Representation of three point perspective projections:

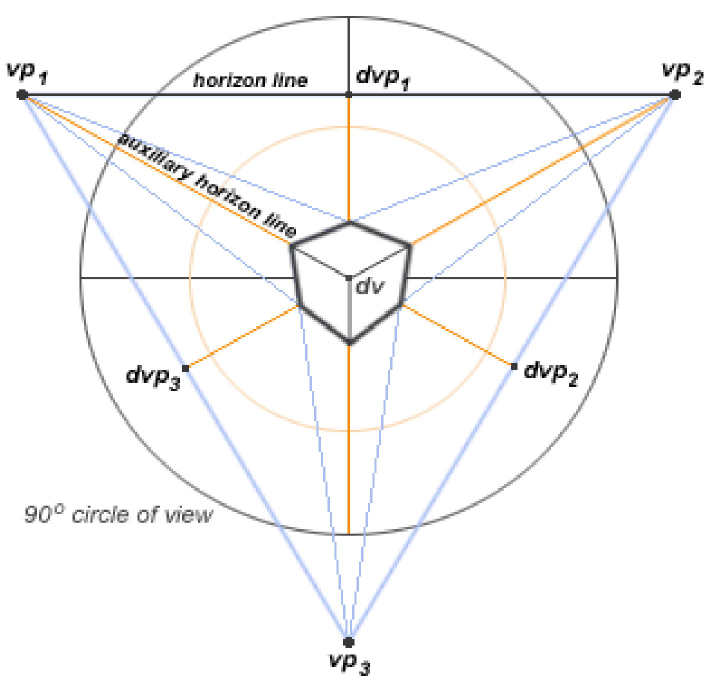
ORIENTATION OF A 1PP



ORIENTATION OF A 2PP



ORIENTATION OF A 3PP



ORIENTATION OF A 3PP WITH THE AXES

2. SOFTWARE REQUIRMENTS SPECIFICATION

2.1 PROBLEM DEFINITION

A perspective projection for the given number of vanishing points and for the graphical object at hand is to be shown.

2.2.OBJECTIVE

To view the perspective projection of the given object and for the given set of vanishing points.

2.3. SCOPE OF THE PROJECT

The project at hand deals with perspective projections of the pre-defined set of objects in a 3-d space on the graphical layout of the computer screen(which is a 2D plane).

2.4. FUNCTIONAL REQUIREMENTS

- **Input**: Type of projection, Position of the vanishing points, the object that has to be projected and the projection plane.
- **Processing**: The algorithm/code takes the input and decides the type of projection, draws the vanishing points and the projection plane and connects the projection lines and redraws the object.
- **Output**: The projection of the object on the graphical plane.

2.5 NON-FUNCTIONAL REQUIREMENTS

- Reliability and Fault Tolerance: Save the program as and when completed in order to avoid loss of data due to failures and the system should recover data lost.
- Security: The Program and files should be made accessible to only the concerned users.
- The source code should execute with any version Turbo C/ Borland C
- Ease of use and good graphical representation.

2.6. HARDWARE AND SOFTWARE REQUIREMENTS

2.6.1 Hardware Interface

- A simple basic computer system
- Any Intel or AMD x86 processor .
- Minimum of 512 MB RAM is required

2.6.2 Software Interface

- Windows XP operating system which supports 16-bit graphic interface on Turbo C
- Windows Vista/7 operating system with dosbox 5.0+ installed to support 16 bit graphic interface on Turbo C or a turbo C emulator which creates 16-bit environment.

2.7 Design constraints

- Standards compliance**:** Report format either in .PDF or a word document.
- Hardware limitations**:** No limitation as such.
- Reliability and Fault Tolerance: Save the program as and when completed in order to avoid loss of data due to failures and the system should recover data lost.
- Security: The Program and files should be made accessible to only the concerned users.
- The source code should execute with any version Turbo C.

3.LITERATURE SURVEY

The earliest art paintings and drawings typically sized objects and characters hierarchically according to their spiritual or thematic importance, not their distance from the viewer, and did not use foreshortening. The most important figures are often shown as the highest in a composition, also from hieratic motives, leading to the "vertical perspective", common in the art of Ancient Egypt, where a group of "nearer" figures are shown below the larger figure or figures. The only method to indicate the relative position of elements in the composition was by overlapping, of which much use is made in works like the Parthenon Marbles.

A mathematical theory of perspective drawing (or projection) could only be developed when the Renaissance freed painters to depict nature in a way closer to what they observed. The biographer Vasari (1511-74) says that the Florentine architect Filipo Brunelleschi (1337-1446) studied Greek geometry, developed a theory of perspective and undertook painting just to apply his geometry [KM]. The first treatise, *Della pittura*(1435) by Leone Battista Alberti (1404-72) furnished most of the rules. Our diagram of the perspective view of the circle occurs in his text. A complete mathematical treatment *De prospectiva pingendi* (1478) was given by the Italian fresco painter Piero della Francesca (1410-1492). Leonardo da Vinci (1452-1519) incorporated geometry in his painting and wrote a now lost text on perspective *Tratto della pittura*. Albrecht Dürer (1471-1528) also wrote a text on the practice of geometry *Underweysung der Messung mid dem Zyrkel und Rychtscheyd* (1525) which was important in passing on to the Germans the Italian knowledge of perspective drawing. In it, Dürer invented several drawing machines to teach perspective. Alberti was first to ask if two drawing screens are interposed between the viewer and the object, and the object is projected onto both resulting in two different pictures of the same scene, what properties do the two pictures have in common [BC].

Plato was one of the first to discuss the problems of perspective. "Thus (through perspective) every sort of confusion is revealed within us; and this is that weakness of the human mind on which the art of conjuring and of deceiving by light and shadow and other ingenious devices imposes, having an effect upon us like magic... And the arts of measuring and numbering and weighing come to the rescue of the human understanding—there is the beauty of them—and the apparent greater or less, or more or heavier, no longer have the mastery over us, but give way before calculation and measure and weight?"

Perspective images are calculated assuming a particular vanishing point. In order for the resulting image to appear identical to the original scene, a viewer of the perspective must view the image from the exact vantage point used in the calculations relative to the image. This cancels out what would appear to be distortions in the image when viewed from a different point. These apparent distortions are more pronounced away from the center of the image as the angle between a projected ray (from the scene to the eye) becomes more acute relative to the picture plane. In practice, unless the viewer chooses an extreme angle, like looking at it from the bottom corner of the window, the perspective normally looks more or less correct. This is referred to as "Zeeman's Paradox." It has been suggested that a drawing in perspective still seems to be in perspective at other spots because we still perceive it as a drawing, because it lacks depth of field cues.

For a typical perspective, however, the field of view is narrow enough (often only 60 degrees) that the distortions are similarly minimal enough that the image can be viewed from a point other than the actual calculated vantage point without appearing significantly distorted. When a larger angle of view is required, the standard method of projecting rays onto a flat picture plane becomes impractical. As a theoretical maximum, the field of view of a flat picture plane must be less than 180 degrees (as the field of view increases towards 180 degrees, the required breadth of the picture plane approaches infinity).

3-D computer games and ray-tracers often use a modified version of perspective. Like the painter, the computer program is generally not concerned with every ray of light that is in a scene. Instead, the program simulates rays of light traveling backwards from the monitor (one for every pixel), and checks to see what it hits. In this way, the program does not have to compute the trajectories of millions of rays of light that pass from a light source, hit an object, and miss the viewer.

CAD software, and some computer games (especially games using 3-D polygons) use linear algebra, and in particular matrix multiplication, to create a sense of perspective. The scene is a set of points, and these points are projected to a plane (computer screen) in front of the view point (the viewer's eye). The problem of perspective is simply finding the corresponding coordinates on the plane corresponding to the points in the scene. By the theories of linear algebra, a matrix multiplication directly computes the desired coordinates, thus bypassing any descriptive geometry theorems used in perspective drawing.

4. COMPUTER GRAPHICS

Computer graphics started with the display of data on hardcopy platters and cathode ray tube screens soon after the introduction of computers themselves. Until the early 1980s, computer graphics as a small , specialized field, largely because the hardware was expensive and graphics based application programs that were easy to use and cost- effective were few. Then, personal computers with built-in raster graphics displays – such as the Xerox Star and, later the mass produced, even less expensive Apple Macintosh and the IBM PC and its clones popularized the use of bitmap graphics.

Computer graphics concerns the pictorial synthesis of real or imaginary objects from their computer based models, whereas the related field of image processing treats the converse process: the analysis of scenes, or the reconstruction of models of 2D or 3D objects from their pictures.

Graphics provides one of the most natural means of communicating with a computer, since our highly developed 2D and 3D pattern recognition abilities allow us to perceive and process pictorial data rapidly and efficiently. In many design, implementation, and construction processes today, the information pictures can give is virtually dispensable.

Representative Uses of Computer Graphics

- User Interfaces : Word processing , spreadsheet, and desktop-publishing programs are typical applications that take advantage of such user interface techniques.
- Interactive plotting in business, science and technology : Office automation and electronic publication can produce electronic documents that contain text,tables, graphs, and other forms of drawn or scanned in graphs.
- Computer aided drafting and design : CAD is used to design components and systems of mechanical, electrical, electromechanical, and electronic devices, including strings such as buildings, automobile bodies etc.

- Simulation and animation for scientific visualization and entertainment : Computer produced animated movies and displays of the time varying behaviour of real and simulated objects are becoming increasing popular for scientific and engineering visualization.
- Cartography, process control, art and commerce.
- Satellite Imaging - geodesic images
- Photo Enhancement - sharpening blurred photos
- Medical imaging - MRIs, CAT scans, etc. - non-invasive internal examination.
- Engineering drawings - mechanical, electrical, civil, etc. - replacing the blueprints of the past.
- Typography - the use of character images in publishing - replacing the hard type of the past.

5. REFERENCES:

- Computer Networks by tennen baum
- www.Wikipedia.org
- www.arielnet.com/wizard/manual/.../geometry.perspective.html

6. ACKNOWLEDGEMENT

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