Mathematics

Virgil
Zhejiang Normal Univercity
Advanced Game Engineering

Abstract

Mathematics is a basic element of a video game. The character's health, damage, money all need mathematics. The way that items move in the game is related to vector and point. People always use angle to make sure the directions in a game. Mathematics is everywhere in a game.

Introduction

In a video game we always need to measuring locations, distances and angles precisely and mathematically[Yusong Xuan 2012].

Point

Point is a very important element of a video game. Points can help people to ensure the locations of items. The whole space consists of incalculable points. If there are two points having been ensured, we can figure the distance between these two points out[André LaMothe 2011]. A point can always stand by (x, y, z).

Angles

An angle measures an amount of rotation in the plane. Variables for angles are often given the Greek letter θ[Figure 1]. Humans usually measure angles using degrees(°). One degree measures 1/360th of a revolution.

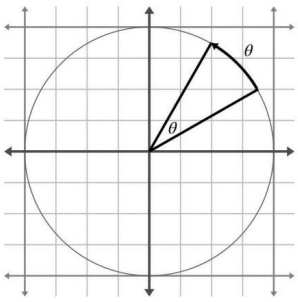

Figure 1: Angle & Degree

Vector

To the vector, scalars are more general in people's daily life. Ordinary numbers like 1, 2, 3 are called as scalars. Vector dimension is the number of numbers in the list[Figure 2]. Typically people use dimension 2 for 2D work, dimension 3 for 3D work. A vector consists of a magnitude and a direction[Figure 3]. Actually The point (x,y) is the point at the head of the vector [x,y] when its tail is placed at the origin.

$$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

Figure 2:Column Vector

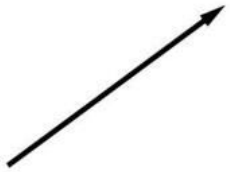

Figure 3: Vector

Matrix

Matrix is a table of scalars in square brackets. Matrix dimension is the width and height of the table, w x h.People use dimensions 2 x 2 for 2D work, and 3 x 3 for 3D work[Figure 4]. Matrix is always used in 3D animation development. It can also be used in game development[Weiling Xiong 2012].

$$\begin{bmatrix} m_{11} & m_{12} & m_{13} \\ m_{21} & m_{22} & m_{23} \\ m_{31} & m_{32} & m_{33} \end{bmatrix}$$

Figure 4: Matrix

Reference

Yusong Xuan 2012 *Unity 3D Game Development* Posts & Telecom Press
Weiling Xiong 2012 *Linear Algebra* Higher Education Press
André LaMothe 2011 *Windows Game Development* Posts & Telecom Press