

Math IA 2024

Rotation Using Matrix Math

Bear BlinSchauer

Abstract

abstract goes here.

Contents

| | |
|---------------------|----------|
| Introduction | 1 |
| 1 Problem | 1 |

Introduction

IB often pushes people to create projects that connect to their personal life or interests. As an individual I am fascinated by 3d graphics and research the topic on my own time. I think that mathematical applications in computer graphics is a fascinating part of both computer science and math. The idea that math is able to describe entire virtual environments is incredible. There is a multitude of different parts of math used in 3d graphics but in this essay I will research vectors and rotational transformation.

Often while trying to learn graphics I get roadblocked by rotation vectors and the trigonometry inside the function appears intimidating. In this math Internal Assessment I decided to learn how rotation matrices work using the unit circle and implement the algorithm into a simple program that rotates a triangle 3-dimensionally. This essay will connect to trigonometry because I will utilize basic trigonometry to reason vector composition and I will use the unit circle in order to visualize rotation.

This essay connects to personal academic ventures of mine. As a side project I wish to write a renderer on my computer. I believe that it is important as a learner to understand how to make transformations in three dimensional space because it allows the individual to make an end product more intuitively and to work in 3d space without any help or helper libraries.

In this project I hope to write about the process of trigonometry applied to rotation in three dimensional space. During this project I will be writing a program applying the math with the end goal of getting a triangle to rotate in 3d space on my screen.

$$\vec{v} = \begin{bmatrix} x \\ y \end{bmatrix}$$

1. Problem

[1]

References

- [1] Dr Peyam, *Rotation Matrix*, Feb. 2019. [Online]. Available: <https://www.youtube.com/watch?v=Ta8cKqltPfU> (visited on 03/05/2024).
- [2] *Basis Vectors in Linear Algebra - ML*, en-US, Section: Engineering Mathematics, Jul. 2020. [Online]. Available: <https://www.geeksforgeeks.org/basis-vectors-in-linear-algebra-ml/> (visited on 03/05/2024).
- [3] *Essence of linear algebra - YouTube*. [Online]. Available: https://www.youtube.com/playlist?list=PLZHQObOWTQDPD3MizzM2xVFitgF8hE_ab (visited on 03/05/2024).
- [4] T. Shin, *manga guide to linear algebra* (manga guide). no starch, 2012, ISBN: 978-1-59327-413-9.
- [5] S. Takahashi and I. Inoue, *The manga guide to linear algebra*, eng. San Francisco: No Starch Press, 2012, ISBN: 978-1-59327-413-9.
- [6] J. McKesson, *Learning Modern 3D Graphics Programming*, 2012. [Online]. Available: <https://paroj.github.io/gltut/index.html> (visited on 03/05/2024).