# Computer Graphics - Assignment 5 - Starfield

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## 1 Introduction

In this assignment you will implement perspective projection by simulating what a starship sees when flying through a starfield. You will also implement a "roll" movement that the starship can make by rotating around the z-axis upon pressing the "left" and "right" keyboard keys.

## 2 Implementation Details

You will use HTML5 canvas and Javascript to complete this assignment. In the skeleton program given, the window-to-viewport transformation creates a space from (-1, 1) on both the x and y axes.

You are given a partially complete setPixel function with three parameters: x, y and depth. You have to determine the final color of the "star" using the depth. The closer a star is to the view plane, the brighter it is. The function uses the *strokeStyle* property of the graphics context to set the color using a function that converts an (r, g, b) tuple to a hex string.

The "spaceship" movement is achieved by translating the stars closer to the origin of the 3D coordinate system along the z axis. Once a star moves past (behind) the view plane, you can either reset only its z coordinate to place it in front of the camera (negative z axis, in front of the view plane) or reset all x, y, and z coordinates.

The simple perspective projection matrix is a function of the focal length. The skeleton program contains a slider will adjust focal length of the camera. You have to implement that functionality, and change the perspective projection matrix as the slider changes.

## 3 Requirements

Your program has to:

- Implement perspective projection using the simple perspective projection matrix taught in class. Matrix multiplication has to be done using Mathjs framework. You can find the library at: `http://mathjs.org/`
- Implement star movement (translation) using matrix multiplication.
- Implement "roll" using matrix multiplication.

# 4 Due Date

This assignment is due before midnight on Sunday, February 24th

# 5 Grading Rubric

- Perspective projection implemented and stars are drawn (30%)
- Roll implemented (30%)
- Motion implemented (20%)
- Focal length changes correctly (10%)
- Color changes with respect to depth (10%)

# 6 Extra credit up to 50% if you turn it into a game.