Shearing Shiny App Documentation

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This document will outline the purpose behind the "Shearing Shiny App", what it is meant to display, and how to use it.

1 Purpose

The "Shearing Shiny App" is designed to demonstrate the effects of shear matrices. A shear matrix is a very simple linear algebra concept that is used frequently in computer graphics. A shear matrix can be used to distort and transform an image, just as the app transforms a simple barn.

2 More on Shear Matrices

A shear transformation starts with an initial set of points (or a single point), x and y in a matrix or vector. Then we use matrix/vector multiplication to shear the initial points by λ (or b in the Shiny App). The shear transformation can take place parallel the X or Y axes (you choose in the App). The equation for the shear transformation parallel to the x axis is:

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 1 & \lambda \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

And the equation for the shear transformation parallel to the y axis is:

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ \lambda & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

Play with the app to shear along the X and Y axes to note how this affects the transformation.

3 Use

There are two areas of user input in the app, selecting the axis to shear and the lambda value for the shear matrix (referred to as "b" in the app).

Selecting the axis in the drop down menu (from options "X" and "Y") will change the way shear transformation affects the barn image.

Selecting a lambda (b) value will change the magnitude of the shear transformation. At the moment this input value is limited to a sliding scale between -2 and 2. Note how changing this value affects the transformation of the image.