

# Slit Scan – Generate an effect similar to 2001’s star gate sequences

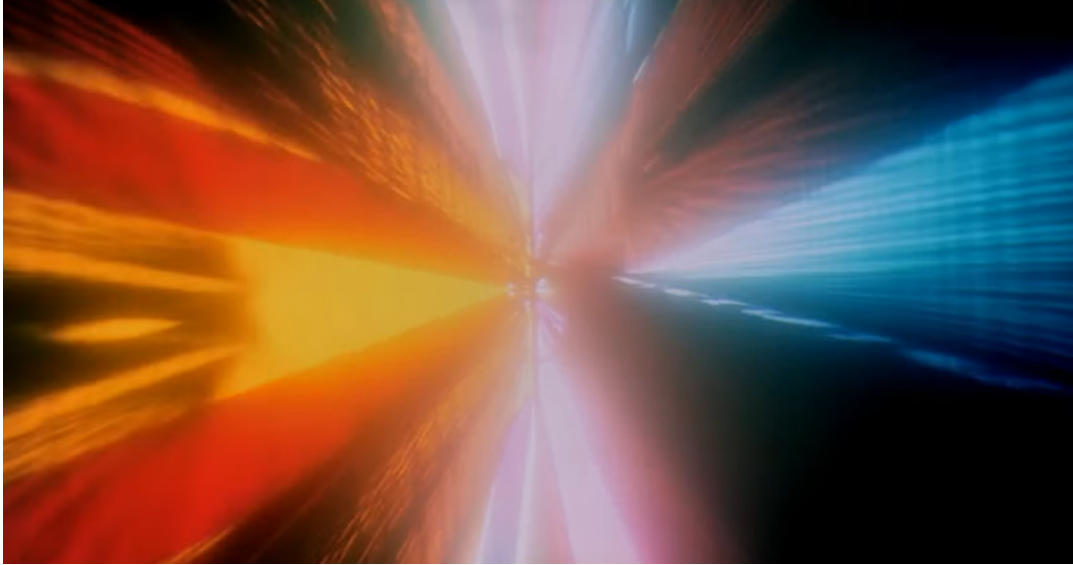
Fred Mitchell

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# 1 Fundamentals and Design



## 1.1 Introduction

Slit-Scan is the command-line tool that allow you to create slit-scans similar to the star-gate sequences in 2001: A Space Odyssey. The idea here is to add a lot of flexibility to allow you to acheive results even beyond what was acheived in what is arguably the greatest Science Fiction film of all time.

## 1.2 Mathematics

Here, we fully specify the mathematics involved with the slit-scan function.

### 1.2.1 Generating the slit

Firstly, we define the slit function as a function between 2 points.

$t$  is time, in seconds, and

$p_1, p_2$  are points defining tbe beginning and ending of the slit, and

$$slit(p_1, p_2, \rho) = g(p_1, p_2, curve(\rho)) \Big|_{\rho=0}^{\rho=1}$$

where

$$\begin{aligned} p_1 &= (x_1, y_1) \\ p_2 &= (x_2, y_2) \end{aligned}$$

and  $0 \leq x, y, \rho \leq 1$

where  $curve(\rho)$  defines the shape of the slit. For the traditional case,  $curve(\rho)$  will be 0, defining a straight line from  $p_1$  to  $p_2$ . In other cases,  $curve(\rho)$  will result in perturbations in the  $(p_1, p_2)$  line, perpendicular to the line itself.

$\rho$  is the parametric for the slit.  $x$  and  $y$  represents the idealized coordinates of the image being scanned by the slit, which will be converted to the actual physical coordinates of the pixels in the image, along with pixel averaging in the 3x3 or 5x5 square with the physical coordinate being at the center.

Secondly, we define the movement of the slit across an image in terms of time  $t$  (in seconds):

$$\begin{aligned} p_{1t} &= p_1(t) \\ p_{2t} &= p_2(t) \end{aligned}$$

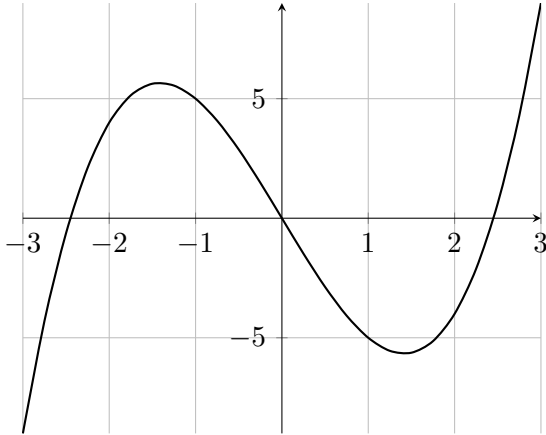
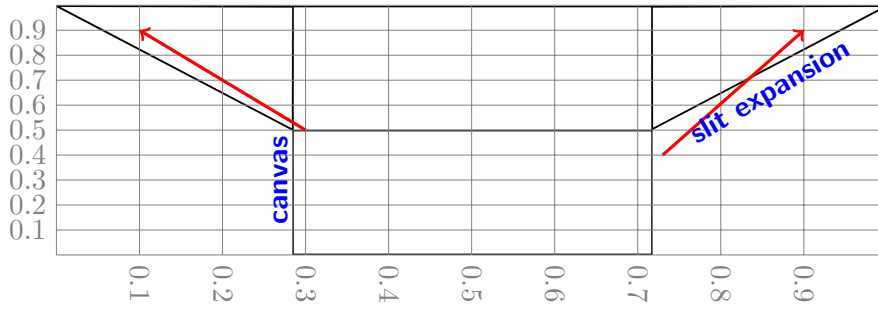
Where said movement of  $p_1$  and  $p_2$  may be independent with each other, solely with  $t$  as their common parametric basis, but in most cases the "trivial" or traditional approach will be taken as the movement being equivalent, basically to "scan" the image from one side to the other.

Thirdly, we define the compositor function. The compositor is responsible for compositing the time-varying contents of the slit unto the final canvas. Here, the canvas is bisected either horizontally or vertically by a straight-line slit, and with each time instant, the slit contents is forwarded away from the slit.

- The Hip library provides a way to navigate the image via map functions. The `imap` provides (x,y) coordinates of the pixels given. We can and will probably have to do some sort of lookup "table" on the coordinates to perform the expected operation, but I need to give this more thought.

### 1.2.2 The Compositor

The compositor may "stretch" the contents of the slit as a function of the distance from the slit until it reaches the end of the canvass.



$$\frac{f(x) - f(a)x - a}{g}$$

## 2 General Documentation and Use of Slit Scan

This covers the usage from the command-line. Rather than go into extensive documentation on the command-line commands and options (the program itself provides this), we shall give some helpful examples.

### 2.1 Simple case – one image, simple vertical slit

```
slit-scan -i1 flower.jpg -format png -out film/
```

- 2.2 Typical – 2 images simple vertical and horizontal slits
- 2.3 Advanced 1 – 2 images, straight line rotating slit
- 2.4 Advanced 2 – 2 images, sine slit
- 2.5 Advanced 3 – 2 images, rotating sine slit
- 2.6 Advanced 4 – 2 images, arbitrary function for the slit and the 2 endpoints